N00236.002692
ALAMEDA POINT
SSIC NO. 5090.3

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

FINAL
TIME-CRITICAL REMOVAL ACTION WORK PLAN
March 2, 2007

INSTALLATION RESTORATION SITES 1, 2, AND 32
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0015

FINAL

TIME-CRITICAL REMOVAL ACTION WORK PLAN
March 2, 2007

INSTALLATION RESTORATION SITES 1, 2, AND 32
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

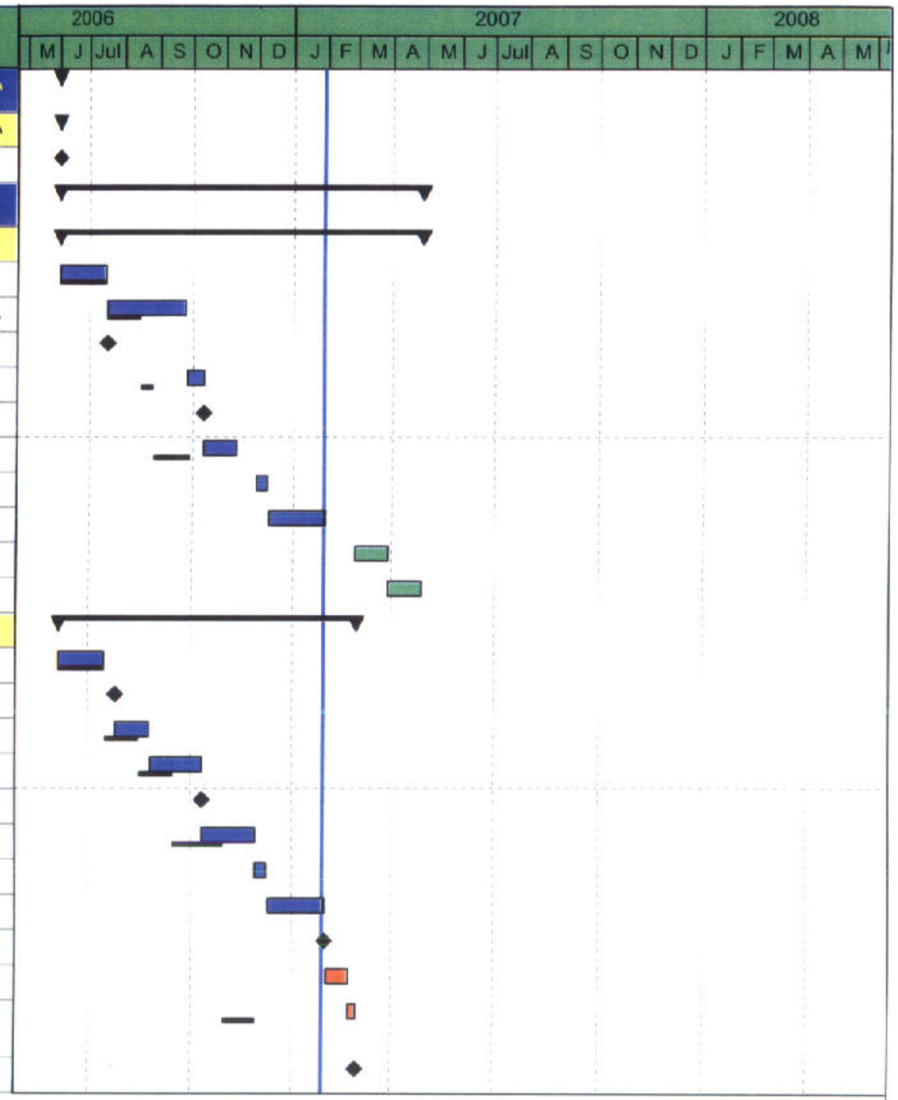
DCN: ECSD-RACIV-07-0748

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, California 92101-8536

Clifford Stephan, M.Sc., CHP
Project Health Physicist

Abram Eloskof, M.Sc., M. Eng., CIH
Project Manager

Activity Name	At Completion Duration	Start	Finish
PMO and Pre Award Activities	0	31-May-06 A	31-May-06 A
CTO Award	0	31-May-06 A	31-May-06 A
CTO Award	0	31-May-06 A	
Pre-Construction Submittals	232	31-May-06 A	27-Apr-07
Action Memo	232	31-May-06 A	27-Apr-07
Prepare Internal Draft Action Memo	32	31-May-06 A	14-Jul-06 A
Navy Review of Action Memo	50	17-Jul-06 A	25-Sep-06 A
Submit Internal Draft Action Memo	0		17-Jul-06 A
Prepare Draft Action Memo	12	26-Sep-06 A	11-Oct-06 A
Submit Draft Action Memo	0		11-Oct-06 A
Regulatory Agencies Review	22	12-Oct-06 A	10-Nov-06 A
Incorporate Comments	8	29-Nov-06 A	08-Dec-06 A
Prepare and Issue Action Memo for Public Review	36	11-Dec-06 A	31-Jan-07
Public Review	22	27-Feb-07	28-Mar-07
Address Public Comments	22	29-Mar-07	27-Apr-07
Work Plan	190	31-May-06 A	28-Feb-07
Prepare Internal Draft Work Plan	32	31-May-06 A	14-Jul-06 A
Submit Internal Draft Work Plan	0		24-Jul-06 A
Navy Review of Internal Draft Work Plan	23	25-Jul-06 A	24-Aug-06 A
Prepare Draft Work Plan	33	25-Aug-06 A	11-Oct-06 A
Submit Draft Work Plan	0		11-Oct-06 A
Regulatory Agencies Review	32	12-Oct-06 A	28-Nov-06 A
Complete RTCs	8	29-Nov-06 A	08-Dec-06 A
Prepare Draft Final Work Plan	36	11-Dec-06 A	31-Jan-07
Submit Draft Final Work Plan to Agencies	0		31-Jan-07
Review of Draft Final Work Plan by Regulators	15	01-Feb-07	21-Feb-07
Incorporate Regulators Comments and Issue Final Work Plan	5	22-Feb-07	28-Feb-07
Submit Final Work Plan	0		28-Feb-07



Remaining Level of Effort
Actual Level of Effort
Primary Baseline
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

SWDIV RAC IV

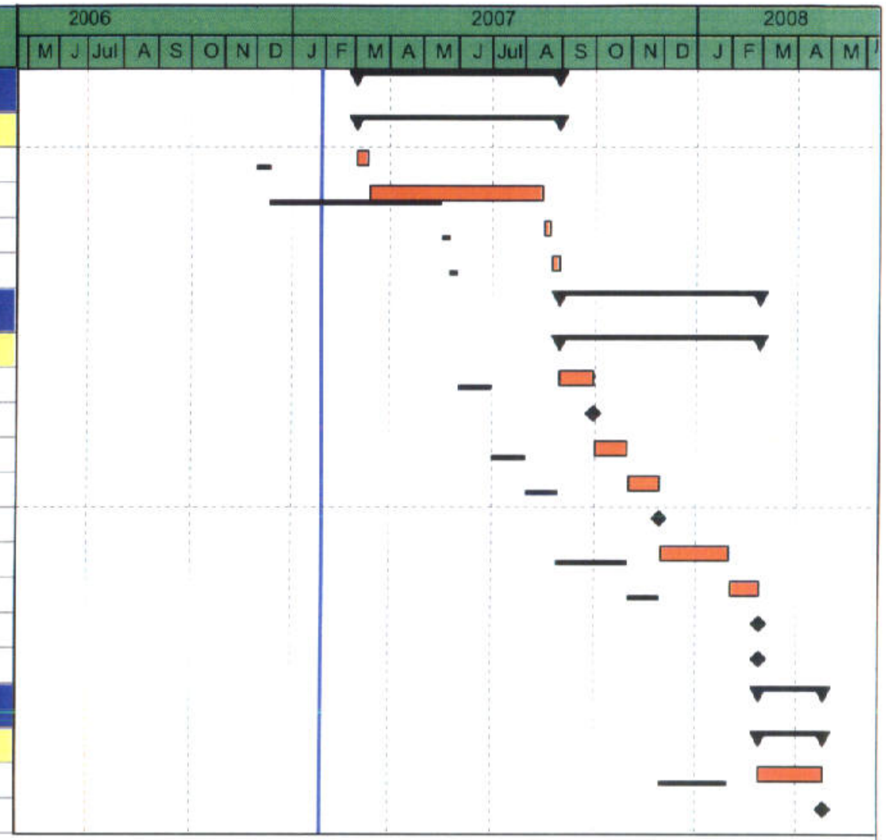
CTO 0015

Figure 10-1

Project Schedule

TETRA TECH EC, INC.

Activity Name	At Completion Duration	Start	Finish
Construction	128	01-Mar-07	29-Aug-07
Construction	128	01-Mar-07	29-Aug-07
Mobilization	8	01-Mar-07	12-Mar-07
Time Critical Removal Action	110	13-Mar-07	15-Aug-07
Site Restoration	5	16-Aug-07	22-Aug-07
Demobilization	5	23-Aug-07	29-Aug-07
Post-Construction Reports	125	30-Aug-07	27-Feb-08
Post-Construction Reports	125	30-Aug-07	27-Feb-08
Prepare Internal Draft Post Construction Report	21	30-Aug-07	28-Sep-07
Submit Internal Draft PCR	0		28-Sep-07
Navy Review of Internal Draft PCR	21	01-Oct-07	29-Oct-07
Prepare Draft PCR	20	30-Oct-07	28-Nov-07
Submit Draft PCR	0		28-Nov-07
Regulatory Agencies Review	43	29-Nov-07	30-Jan-08
Prepare Final PCR	20	31-Jan-08	27-Feb-08
Submit Final PCR	0		27-Feb-08
Technical Completion	0		27-Feb-08*
Project Closeout	42	28-Feb-08	25-Apr-08
Project Closeout	42	28-Feb-08	25-Apr-08
CTO Closeout	42	28-Feb-08	25-Apr-08
CTO Complete	0		25-Apr-08*



- Remaining Level of Effort
- Actual Level of Effort
- Primary Baseline
- Actual Work
- Remaining Work
- Critical Remaining Work
- Milestone
- Summary

SWDIV RAC IV

CTO 0015

Figure 10-1

Project Schedule

TETRA TECH EC, INC.

RESPONSE TO COMMENTS
DRAFT TIME-CRITICAL REMOVAL ACTION WORK PLAN
FOR
INSTALLATION RESTORATION SITES 1, 2, AND 32
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-06-0442

Erich Simon Project Manager California Regional Water Quality Control Board, San Francisco Bay Region November 21, 2006	
General Comments	
Comment 1. No discussion of the potential radiological contamination located to the east of the Site 2 disposal area is included in this report. Please include a discussion of the known contamination in the area east of Site 2 and why it was not included in this TCRA.	**Response 1.** Comment noted. There are no known disposal areas immediately east of IR Site 2. This TCRA is limited to IR Sites 1, 2 and 32. If there are potential radiological contamination locations identified outside of the IR Site 2 boundary to the east, these locations would be addressed under a different contract vehicle managed by the Department of Navy.
Specific Comments	
Comment 1. Page 3-3, Section 3.3. ARARs – Please include substantive requirements of the Porter Cologne waste discharge requirements and 401 certification in the event that construction activities may impact adjacent to wetlands or other sensitive habitat. Please contact Brian Wines at our office for further clarification of these requirements, if needed.	**Response 1.** Comment noted. The DON accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives (WQOs), waste discharge requirements, and promulgated policies of the Basin Plan for the San Francisco Bay Region, as potential ARARs. Section 3.3 will be revised to include these potential ARARs.
Comment 2. Page 6-3, Section 6.3. Environmental Resources Survey – If there might be any impacts on wetlands due to removal action efforts, please include a discussion of wetlands mitigation efforts that would be included to minimize potential effects on special status species and communities of concern.	**Response 2.** Comment noted. Seasonal wetlands are located east of the road that traverses the site in a north-south direction. All excavation and stockpiling activities will take place west of the road so wetlands will not be impacted.
Comment 3. Page 9-1, Section 9.1. Existing Environmental Conditions – Please include a discussion of any existent data that may indicate a potential for radioactive contamination of underlying groundwater. Include a discussion of existing and potential future environmental conditions (such as rising sea levels) that may influence the mobility of residual radioactive contamination left on site after the TCRA is complete.	**Response 3.** Comment noted. Section 2.3. Chemical and Radiological Characteristics includes a summary of existing groundwater data. A sentence will be added stating that existing and potential future environmental conditions (such as heavy rains/flooding and rising sea levels) could have the potential to influence the mobility of residual radioactive contamination.

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Comment 4. Page 10-3, Section 10.2. Table - Change the Water Board RPM contact to: Erich Simon, (510) 622-2355, ersimon@waterboards.ca.gov. Also make the same change on page C.2-7 in Appendix C.	**Response 4.** Comment noted. The Water Board RPM contact will be changed as requested.
Comment 5. Page C.3-1, Section 3.0. Definable Features of Work – Include protection of sensitive habitat and wetlands mitigation, as needed, in the list (and Table C.3-1) of control measures required to verify compliance with requirements.	**Response 5.** Comment noted. Protection of sensitive habitat will be added to the DFW list and Table C.3-1. Wetlands will not be impacted by field activities.
Comment 6. Page E.10-1, Section 10.0. Table – The Environmental Compliance Manager is listed as 'To Be Determined' - has this personnel been determined?	**Response 6.** Comment noted. Greta Neuman has been designated as the Environmental Compliance Manager. The text will be updated to reflect this.

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Brad Parsons, Senior Scientist DTSC November 21, 2006	
DTSC Comments: Appendix B: Sampling and Analysis Plan	
Comment 1. Table B.3-1, Section 3.3 Summary of Data Quality Objectives. Step 1: Please add a Data Quality Objective (DQO) for Waste Characterization sampling to Step 1, which is discussed in Section 6.3.3. Step 2 and 5: Clarify the reference to 3 sigma and 1 sigma above background in steps 2 and 5, respectively. Is there a level that would trigger a removal action? If so then it should be added as a decision statement. Step 6: Reference the QSM limits for precision and accuracy in the tables. If a statistical basis is used for making any of these decisions, false positive and negative error rates may be missing.	**Response 1.** Comment noted. A DQO for waste characterization will be added to Steps 1, 2, 3, and 5. In Step 2, the reference to "3 sigma above background" is the trigger level and step 5 describes the decision rule. The reference to "1" sigma in Step 5 is incorrect and has been revised to "3" sigma. Step 6 has been revised to reference the precision and accuracy limits listed in Table B.7-3.
Comment 2. Page B5.1, Section 5.1 Post Excavation Sampling, last paragraph. Clarify and provide rationale why strontium 90 (Sr90) is analyzed in 10% of the samples while radium is analyzed in 100% of the samples. Additionally, clarify the Remedial Action Objective (RAO), if appropriate.	**Response 2.** Comment noted. Radium is the primary contaminant of concern; however, per the request of the RASO, 10 percent of samples will be analyzed for ^{90}Sr since previous investigations have detected minimal amounts of ^{90}Sr. The source of ^{90}Sr contamination at IR Sites 1 and 2 is suspected to originate from the disposal of ^{90}Sr deck markers, which if intact would be found with gamma scanning. In the event that these devices have deteriorated, which would make them less readily identifiable with gamma scans, 10 percent of all soils samples that undergo gamma spectroscopy will also be analyzed for ^{90}Sr at an offsite laboratory. If ^{90}Sr is identified in the off site laboratory sample results or ^{90}Sr deck markers are discovered during hot spot removals, more frequent ^{90}Sr analysis may be directed by the DON. An RAO has not been established for ^{90}Sr.

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Comment 3. Page B.5-2, Section 5.2 Import Fill Material Sampling, last sentence. Instead of arbitrarily taking four samples, DTSC recommends that a geologist familiar with mafic rock inspect and authoritatively select suspected asbestos containing soil or rock.	**Response 3.** Comment noted. Typically, sources that are identified as having potential backfill material are not easily accessible such that a geologist could inspect all the material so samples could be collected from suspected asbestos containing soil. Instead, random samples are collected to provide a representative sample of the potential import material.
Comment 4. Page B.6-5, Section 6.3.3.1, Procedure Step 7 for sampling stockpiled soil. Subsampling a disturbed sample in a jar is not an appropriate method for collection of Encore© samples, because volatilization will occur. Proecedures described in U.S. EPA Method 5035 should be followed. Thus, you should collect and subsampling a core sample rather than a disturbed sample in a jar. Alternatively, the stockpile samples could be field preserved, as described in U.S. EPA Method 5035.	**Response 4.** Comment noted. Section 6.3.3.1 and Table B.6-1 will be revised to collect Encores directly from a sampling core that contains a stainless steel liner. Section 6.3.2 (sampling import fill for VOCs) will also be revised to reflect this change from sampling directly from an auger bucket to using a core sampler to collect an undisturbed sample.
Comment 5. Page B.7-2, Section 7.1.3, Radioactive Isotopes. Please clarify what modifications are proposed or reference the modified analytical method for 901.1, that resulted in the Modifier "M". Provide a reference or a description of how the samples are prepared.	**Response 5.** Comment noted. Method 901.1 is a drinking water method. The "M" is used by the laboratory to denote that the method has been modified for analysis of soil. The preparation and analysis of the samples remains the same regardless of the matrix.
Comment 6. Pages B.7-8 to 7-9, Section 7.2.4 Completeness. This completeness calculation is based on the number of analytes targeted; an increase in the number of target compounds results in an increase in the completeness. For example, if the method targets 10 analytes and 5 of the 10 results are rejected for Quality Control (QC) problems, the results show a 50% completeness rate. Using the same result, but targeting 30 analytes (most of which are not detected (ND)), the results show a completeness of 83%. Calculations should be conducted by analyte group (most conservative), risk drivers, or with detectable analytes only. The Navy should propose a modification to the completeness calculation or provide rationale for the proposed completeness calculation method.	**Response 6.** Comment noted. The completeness calculation is based on the total number of analytes targeted. If a full scan is used, then the calculation must include all analytes whether detected or not. Failure to do so would interject a bias in the completeness calculation and result in an erroneous result. If a "targeted" or truncated list is used, it must be agreed upon initially during the initial project planning stage. Once determined, the completeness calculation is fixed and not changed based on the total amount of potential information received (e.g. 10 versus 30). For the example stated above, the completeness does not increase due to increasing the number of analytes. It is higher in the 5 out of 30 anaytes versus the 5 out of 10 analytes because the amount of useable information is greater in the second case (i.e., 25 out of 30 analyte results are acceptable and valid).

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Comment 7. Table B.7-1, Reference Limits for Soil Samples. U.S. EPA Preliminary Remediation Goals (EPA PRGs) have been proposed for the action level for imported soil. California Human Health Screening Levels (CHHSLs) for Soil (Commercial/Industrial) should be used for imported soil action levels for available constituents, www.calepa.ca.gov/brownfields/documents/2005/CHHSLsGuide.pdf (California Environmental Protection Agency, January 2005. DTSC also issued a guidance dated October 2001 regarding imported fill material (attached). For numerical comparison purposes with the EPA PRG publication, it would also be helpful if the imported soil actions levels are listed in this table in units of milligrams per kilogram (mg/kg), rather than micrograms per kilogram (µg/kg).	**Response 7.** Comment noted. Instead of using the CHHSLs, background values have been established for Alameda and those values will be incorporated in Table B.7-1. Subsequently, a footnote will be added to distinguish which are background values. Units listed in Table B.7-1 are in conjunction with laboratory reporting units for each analyte grouping. Therefore, where necessary, action levels have been converted to be consistent with laboratory reporting units.
Comment 8. Table B.7-3, Quality Control Acceptance Criteria. Please provide justification for the low accuracy goals for selected analytes (i.e., accuracy water (% R) of 0-125 for 4-Nitrophenol and 0-115 for phenol. These limits appear to have been set by laboratory experience over a number of matrices. Higher accuracy goals result in a higher incidence of flagged data, which can then be reviewed a later date for validity.	**Response 8.** Comment noted. The limits listed for 4-nitrophenol and phenol in Table B.7-3 are the lower and upper limits for these compounds from Table D-2 of the DOD Quality Systems Manual. These analytes are considered poor performers due to the lower control limit below 10 percent.
Comment 9. Page B.8-3, Data Validation, first reference. The National Functional Guidelines for Organic Data Review should be updated to EPA 540-R-04-009, January 2005.	**Response 9.** Comment noted. Since the analytical methods proposed for this project are following SW-846 method guidance and not CLP method guidance, we propose to use the National Functional Guidelines for Organic Review dated 1999.

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Charlie Huang, Ph.D., Staff Toxicologist,
California Department of Fish and Game-Office of Spill Prevention and Response (CDFG-OSPR)

November 21, 2006

CDFG-OSPR Comments Related Only to Ecological Risk Assessment and Biological Resources

Comment 1. CDFG-OSPR is in general concurrence with the TCRA Workplan, but several areas of concern should be addressed.	**Response 1.** Comment noted.
Comment 2. Sections 6.3 and 6.5, which describe environmental survey and clearing of vegetation, are of particular concern. Please see comments previously provided to the Navy in an e-mail on October 2, 2006, regarding the "Final Vegetation Clearance Plan for Radiological Survey Work Plan at IR Site 32 and the Shorelines of IR Sites 1 and 2," dated August 11, 2006.	**Response 2.** Comment noted. The DFG comments from October 2, 2006 regarding the Final Vegetation Clearance Plan have been reviewed. It appears they have been reiterated in the comments submitted on November 21, 2006 and are addressed below.
Comment 3. The scope of any pre-project environmental survey should be expanded to include State-listed species as well as federally listed species. The California Least Tern forages for small fish by sight. Turbidity in San Francisco Bay caused by soil erosion could reduce feeding success for this species. Thus, DFG concurs with the goal of controlling erosion of soils from the project areas to San Francisco Bay.	**Response 3.** Comment noted. The pre-project survey will be expanded to include State-listed species as well as federally listed species. Soil erosion is being controlled on site per the BMPs identified in the SWMP (Appendix E of the TCRA Work Plan). Sediment control measures will prevent erosion into California Least Tern foraging habitat.
Comment 4. Avoidance measures should be implemented if an active nest/special-status species is present. For example, potential Burrowing Owl habitat and burrows were identified at the Alameda Point. The owl will be potentially impacted during the clearing of surface vegetation prior to the start of field activities. DFG recommends that the survey protocol and mitigation guidelines in DFG's Staff Report on Burrowing Owl Mitigation be followed. This staff report is available at the following website: http://www.dfg.ca.gov/hcpb/species/stds_gdl/bird_sg/burowlmit.pdf. In addition, the Burrowing Owl Consortium's 1993 guidance contains DFG's recommended survey methodology: http://www.dfg.ca.gov/hcpb/species/stds_gdl/bird_sg/boconsortium.pdf.	**Response 4.** Burrowing Owls are not known to occur on IR Sites 1, 2 and 32. During biological monitoring activities taking place over several months and IR Sites 1, 2 and 32, no Burrowing Owls were ever observed. However, construction monitoring by a qualified biologist will occur per the TCRA Work Plan; any special status species observed using the site (e.g., Burrowing Owls), will be noted and the appropriate agency contacted. Avoidance and minimization measures will be implemented by the on-site construction biological monitor to ensure no impacts to special status species occur. All appropriate survey protocols will be followed as indicated. In the event that Burrowing Owls are observed, protocols and mitigation guidelines in CDFG's Staff Report on Burrowing Owl Mitigation will be followed.

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Comment 5. The TCRA Workplan does not state when the survey will be conducted. Winter surveys should be conducted between December 1 and January 31 when wintering owls are most like to be present. Nesting season surveys should be conducted between April 15 and July 15 because this is the peak of the breeding season. Please follow the details specified in the recommended survey protocol above. Moreover, disturbance should not occur within within 75 meters of nests between February 1 and August 31 (breeding season), or within 50 meters of nests between September 1 and January 31 (the non-breeding season), rather than the 10 meter distance stated on page 6-4, #5 in the TCRA Workplan.	**Response 5.** Burrowing Owls are not known to occur on IR Sites 1, 2 and 32. However, surveys will be conducted for special status species known to occur on site or found on-site immediately before or during construction activities. Winter surveys will be conducted, as necessary, as well as breeding season surveys, if deemed appropriate by the construction biological monitor. All set back distances for active nests will be complied with.
Comment 6. All vegetation clearing should be conducted from September through January outside of the main bird breeding season if at all possible. This would serve to protect nesting California Least Terns and other ground nesting bird species that may otherwise be present. More restrictive work periods may be applicable for the Burrowing Owls, and perhaps other species. Since Burrowing Owls are present in the vicinity, the Navy should avoid clearing during their breeding season from February 1 to August 31.	**Response 6.** All vegetation clearing will be conducted from September through January outside of the main bird breeding season, if at all possible. However, no appropriate nesting habitat for the California Least Tern exists at IR Sites 1, 2, or 32. As discussed in Response 4, Burrowing Owls are not known to occur on site.
Comment 7. The California Least Tern is State and federally listed as endangered. It nests on open ground and nest locations may shift from year to year. Clearance of vegetation may result in increased risk from predators as well as direct mortality to nestlings and/or nests. To help insure substantive compliance with applicable State requirements for this species, CDFG-OSPR is contacting the appropriate DFG offices to determine whether specific recommendations may be applicable. Any recommendations will be provided to the Navy in the near future. The U.S. Fish and Wildlife Service should also be contacted to determine any requirements for formal or informal consultation for this species. It is likely that the stated 10 meter minimum distance to active nests may need to be increased, as stated in comment 4, above, based on additional recommendations from the DFG or U.S. Fish and Wildlife Service. Additionally, adverse impacts to western meadowlarks and other ground nesting bird species should be avoided.	**Response 7.** No nesting habitat for California Least Terns occurs on IR Sites 1, 2 and 32; however, biological monitors have previously contacted the USFWS tern biologist at the nearby tern breeding colony site (approximately 0.25 miles west of IR Site 2) to coordinate site clearing and construction activities. Additionally, adverse impacts to western meadowlarks and all other special status, ground nesting bird species will be avoided to the maximum extent feasible, based on on-site biological monitoring during construction activities.

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Comment 8. Criteria for determining the presence of endangered species during initial surveys should be revised. Nesting by the California Least Tern or by other bird species could easily go undetected or be precluded unless focused surveys are conducted at the right time of the year. California Least Terns may nest at the proposed worksite and forage in adjacent waters. The DFG Natural Diversity Database indicates that the presence of the California Least Tern has been recorded near the proposed work areas. California Least Terns in flight over the sites or adjacent waters may provide evidence of likely nesting or foraging activity at proposed work areas. For project planning purposes, the California Least Tern nesting season should be considered March 20 through August 31. Thus, vegetation clearance or removal activities should not be completed at IR Site 2 during this period. IR Site 2 is adjacent to a main foraging area for Least Terns and such work would be expected to increase the risk of mortality to that species from predation. Such activities should only be conducted at Sites 1, 2, and 32 during this time period if it can be demonstrated that this will not result in adverse impacts to the Least Terns or other species. More specific recommendations for the protection of the California Least Tern may be provided by the U.S. Fish and Wildlife Service.	**Response 8.** Nesting by the California Least Tern has not been detected previously in IR Sites 1, 2 and 32. California Least Terns nest at a nearby USFWS breeding colony (approximately 0.25 miles west of IR Site 2) and forage in adjacent waters. California Least Terns have been noted in-flight off shore from the proposed project site, (approximately 200 yards or more off shore of the proposed site, indicating they may forage adjacent to the work areas. The California Least Tern nesting season is March 20 through August 31. Work activities will be conducted at IR Sites 1, 2, and 32 during the non-breeding season to the greatest degree possible. However, construction activities conducted during this time period will be coordinated with the appropriate regulatory agencies to ensure impacts are minimized as much as possible.
Comment 9. The biological survey (Page 6-4, Section 6.3.1) methods that are presented here should be revised to insure compliance with applicable DFG Applicable and Relevant or Appropriate Requirements. Recommendation #4 relates to the temporary avoidance of occupied nests. It only requires that species and nesting status be verified, without any additional requirements for protection. This section should be revised to specifically prohibit the loss or destruction of eggs, nests, nestlings, or adults of the California Least Tern or any other bird species, in substantive compliance with Section 3503 and 3503.5 of the Fish and Game Code.	**Response 9.** Survey methods used on site for this project will be revised to ensure compliance with applicable DFG Applicable and Relevant or Appropriate Requirement, including temporary avoidance of occupied nests. Specifically, the loss or destruction of eggs, nests, nestlings, or adults of the California Least Tern or any other bird species protected by the MBTA, will be prohibited in substantive compliance with Section 3503 and 3503.5 of the California Fish and Game Code (CFGC).

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Comment 10. Consideration should be given to the methods employed for any revegetation of the work areas. Revegetation plans should take into consideration any potential problems with planting of trees, which can create perches for American Kestrels or other birds that prey on California Least Terns.	**Response 10.** No planting of trees is anticipated because trees can provide perches for various raptors known to frequent the area (Peregrine Falcon, Red-tailed Hawk, American Kestrel, White-tailed Kite) or other birds such as gulls and Western Scrub Jays, which could prey on California Least Terns.
Comment 11. Avoidance Measure #5 should be revised to include a minimum 1,000 foot distance between field-related activities and California Least Tern nests. Appropriate distances should also be established between work areas and nests of any other bird species such as the Burrowing Owl. Applicable text in Section 6.5 should also be revised to reflect this requirement.	**Response 11.** Avoidance Measure #5 will be revised to include a minimum 1,000-foot distance setback between field-related construction activities and active California Least Tern nests. Appropriate distances will be established between all known work areas and nests of any other bird species protected under the MBTA, such as the Burrowing Owl, when observed on site.
Comment 12. Editorial Comments: Section 10.1, Page 10-1: "Figure 10-1" is missing in the copy that was sent to DFG.	**Response 12.** Figure 10-1 will be provided in the Draft Final version.

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ALAMEDA POINT, ALAMEDA, CALIFORNIA

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Robert Wilson, Associate Health Physicist California Department of Health Services (CDHS) November 21, 2006	
General Comments	
Comment 1. CDHS is aware that supplemental radiological characterization surveys at numerous locations within IR Sites #1, 2 and 32 will be forthcoming and these surveys could produce relevant information that may impact this TCRA Work Plan. If any additional survey information is to be incorporated into the TCRA Work Plan after the Work Plan is finalized, how will this information be addressed in the future? If radiological anomalies are located within the shoreline/rip-rap areas, sampling and removal techniques may differ from the procedures outlined in the current TCRA Work Plan due to differences in geometry and topography between the shoreline/rip-rap and landfill areas.	**Response 1.** Comment noted. Figures 2-1 and 2-2 will be updated to show the radiological hot spots to be removed (as determined by the survey results of IR Site 32 and the shorelines of IR Sites 1 and 2) will be included in the TCRA Work Plan. All data generated from the radiological characterization survey of IR Site 32 and the shorelines of IR Sites 1 and 2 will be presented in a separate report (the Radiological Characterization Survey Report). If removal techniques are required that differ from those discussed in the TCRA Work Plan, a Field Change Request will be issued to incorporate the new techniques.
Comment 2. The removal approach specified within this document may not support unrestricted release of the sites at a later date.	**Response 2.** Comment noted. It is the DON's intention to release IR Sites 1, 2 and 32 for unrestricted use; however, the scope of this removal action does not include unrestricted release. Unrestricted release requires a Final Status Survey following MARSSIM guidelines and protocols. Unrestricted release of the sites will be included in a future task order at a later time.
Specific Comments	
Comment 1. Section 5, Sub-section 5.6.4.3, pages 5-10 thru 5-12 inclusive: Equation 5-4 for Minimal Detectable Count Rate (MDCR) for beta scans is shown to have a calculated result of "96.4 [counts per minute] *cpm*". The following Equation 5-5 used to calculate the "scan MDC", applied the MDCR result of Equation 5-4 (96.4 *cpm*). On page 5-12, the calculation of the scan MDC equation indicates the MDCR as "86.4 *cpm*" instead of "96.4 *cpm*" as previously stated in the document. The result of the scan MDC calculation is based upon the "86.4 *cpm*" factor. Is "86.4 *cpm*" a result of a typographic error? The calculation may need to be refined to include the proper MDCR input. On page 5-11, is the selection of the scan MDC for "structural surfaces"	**Response 1.** Comment noted. The MDCR calculation will be revised to include the proper input. The inclusion of "structural surfaces" is relevant for surveying equipment and material that may need to be unconditionally released.

relevant for land area sites in IR #1, 2 and 32? CDHS requests that all equations and calculation ns in Section 5 be reviewed for typographic errors and mathematic relevance.	
Comment 2. Section 6, subsection 6.8.1, page 6-13, 2nd paragraph: A section of the paragraph states: "Following removal of the source of elevated gamma activity, an additional 12 inches of soil in all directions from the source will also be removed." CDHS assumes that the term "in all directions" includes the 12 inches below the excavated area and a resurvey of the completed excavation area to ensure the complete removal of the source of elevated gamma readings. The Navy may need to amend the "Depth" column of Table B.5-1 to reflect any changes in excavation requirements.	**Response 2.** Comment noted. DHS is correct in their assumption that "all directions" include soil removal 12 inches below the excavated area and will then be resurveyed. The DON intends to remove all radiological contamination above background levels at the anomaly areas outside of the former IR Site 1 disposal area (the proposed cover area). The text, including the RAOs will be revised for clarification. Table B.5-1 will also be revised.
Comment 3. Appendix B. MARLAP guidance specifies that that one of the most important parameters for specifying data quality requirements is required method uncertainty. Please show calculations and provide your required method uncertainties for each radionuclide contaminant of concern in soil and water samples.	**Response 3.** Comment noted. The laboratory will be contacted to provide the method uncertainty for the constituent of concern, radium-226, in soil and water.
Comment 4. Appendix B, Table B.7-4: Please provide the Navy's reasoning for a Measurement Performance Criteria in determining a Relative Percent Difference (RPD) value of <50% for soil for a field duplicate QC sample as noted in the Table B.7-4. The Navy may want to reference their Quality System Manual (QSM) and have a designated data validation company review the Navy's RPD for soil criteria in determining acceptance of that RPD value in meeting DQO. CDHS is concerned that an RPD of 50% for field duplicates may not result in reproducible enough results to support project decisions.	**Response 4.** Comment noted. An RPD of 50 percent equates to a pair of analytical results falling within ± 25 percent of the mean. Complete disagreement results in a RPD of 200 percent (i.e., ± 100 percent of the mean). A field duplicate RPD limit of 50 percent was specified since: 1) it has been used in numerous approved SAPs in EPA Regions 9, 1 and 2, and California, thus, there is precedent; 2) it is used as a criterion in several EPA region specific data validation standard operating procedures for evaluating field duplicate data (i.e., Region 1, Region 2, etc.); and, 3) is comparable to Method Quality Indicators (MQIs) specified in the MQI table in EPA Region 9's Office of Quality Assurance.

Comment 5. Appendix D-4, section 4.6: There is no mention of the validity of any previous survey work performed by a survey instrument that has failed an operational check at the beginning of next workday. There is lack of a post-survey operational check to "bookend" the initial operational check of the survey instrument. CDHS recommends that results of operational checks include the written entry of the source check readings in appropriate measurements.	**Response 5.** Comment noted. The morning operational check serves as both the "bookend" for the previous day's survey activities and the "initial" for the current day's survey activities. The current practice is to record the source check readings; however, the SOP will be revised to clearly state that the reading be recorded.

RESPONSE TO COMMENTS
DRAFT TIME-CRITICAL REMOVAL ACTION WORK PLAN
FOR
INSTALLATION RESTORATION SITES 1, 2, AND 32
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-06-0442

United States Environmental Protection Agency Region IX (EPA)	
Specific Comments – November 14, 2006	
Comment 1. Page 3-2, Section 3.2 and Page 6-11, Section 6.8: The text in Section 6.8, Excavation Activities, implies that excavations of the hot spots will stop after reaching 2 feet bgs. My understanding from earlier meetings and discussions was that once an excavation was begun, that it would continue until the hot spot was removed. Given that the areas outside the cover will not have the same level of long-term controls as the areas inside the cover, please revise the text to make it clear in the RAOs and Section 6.8 that excavations will continue until the hot spots are completely removed.	**Response 1.** Comment noted. The DON intends to remove all radiological contamination above background levels at the anomaly areas outside of the former IR Site 1 disposal area (the proposed cover area). The RAOs and Section 6.8 will be revised for clarification.
Comment 2. Page 6-2, Section 6.3: Please add the actual dates of the breeding season for the Least Tern (the excluded work dates) in the first bullet.	**Response 2.** Comment noted. The dates of the breeding season for the California least tern will be added to the first bullet. The breeding season begins in late April and lasts through the end of August.
Comment 3. Page 6-13, Section 6.8.1: This section states that all excavated soil will be surveyed for radiation and sampled according to procedures in Appendix B. However, Appendix B does not include procedures for the stockpiles from the scattered anomalies. Also, Section 6.8.1 states that contaminated soil will be transported offsite to an approved disposal facility, but does not state what will be done with noncontaminated soil. Noncontaminated soil may be replaced onsite.	**Response 3.** Comment noted. The soil "stockpiled" from the excavation of the "scattered anomalies" will be managed in the same manner as the soil stockpiled from the other excavations Page 6-14, second paragraph states that "Soil stockpiles will be managed per Section 6.8.4….". Section 6.8.4 discusses the general approach for soil stockpiles. Section 5.1 of Appendix B discusses the sampling strategy and Section 6.3.3.1 of Appendix B discusses the sampling procedure. In accordance with Section 6.12, "All excavated material will be disposed off site and will not be used to backfill any excavations. The excavations will be backfilled with clean import material." Section 7.5, Waste Disposal states that "Soil excavated during this project, which may include RCRA and non-RCRA hazardous wastes, is to be disposed of off site at an appropriately permitted CERCLA waste disposal facility."

RESPONSE TO COMMENTS
DRAFT TIME-CRITICAL REMOVAL ACTION WORK PLAN
FOR
INSTALLATION RESTORATION SITES 1, 2, AND 32
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-06-0442

Comment 4. I could not find a description of the characterization of the rip-rap areas or the Former Radiological Shack area, or plans for the removal actions at these areas. Please identify the appropriate sections in the Navy's Response to Comments, or provide the appropriate characterization and work plan details.	**Response 4.** Comment noted. Characterization surveys of these areas have been completed and will be included in the Radiological Characterization Survey Report for IR Site 32 and the Shorelines of IR Sites 1 and 2, which will be finalized in 2007. Figures 2-1 and 2-2 will be updated to show the radiological hot spots to be removed, as determined by the characterization survey results, will be included in the TCRA Work Plan. Any detected anomalies identified in the Radiological Characterization Report for these areas will be removed in accordance with Sections 5.0, 6.8 (specifically Sections 6.8.1, 6.8.4, 6.8.5, 6.8.6), 6.10 and 6.12 of the TCRA Work Plan. If removal techniques are required for these locations that differ from those discussed in the work plan a Field Change Request will be issued to incorporate the new techniques.

EXECUTIVE SUMMARY

This Time-critical Removal Action (TCRA) Work Plan has been prepared to describe the specific activities pertaining to the removal actions that are scheduled to be performed at Installation Restoration (IR) Sites 1, 2, and 32 at Alameda Point, Alameda, California. Regulatory oversight and guidance for the removal action will be provided by the U.S. Environmental Protection Agency (EPA), the California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC), and the Radiological Affairs Support Office (RASO). In addition, the United States Fish and Wildlife Service (USFWS) will provide guidance with regard to sensitive species. The decision to undertake a TCRA is documented in the *Action Memorandum, Comprehensive Environmental Response, Compensation, and Liability Act Time-Critical Removal Action, IR Sites 1, 2, and 32, Alameda Point, Alameda, California* (hereafter referred to as the Action Memorandum [AM]) (Tetra Tech EC [TtEC], 2007).

The primary goal of this response action is to mitigate the potential risk posed by material potentially presenting an explosive hazard (MPPEH) and radioactive contamination at IR Sites 1, 2, and 32, and the threatened release of hazardous substances to the environment. Based on previous investigations, geophysical findings, and the sites' location, the following specific removal action objectives (RAOs) were established in the AM (TtEC, 2006):

- To prevent ingestion, dermal contact, or inhalation of radiological anomalies with concentrations that significantly exceed background concentrations
- To assure that the total effective dose equivalent received through all potential pathways from the radium-impacted waste in the surface and subsurface to any member of the public does not exceed 15 millirem per year

The MPPEH-specific RAOs are as follows.

- To reduce the risk to humans and the environment from MPPEH-related items buried at the site
- To reduce the risk of the public coming into contact with MPPEH, resulting in severe injury or even death
- To reduce the risk to humans and the environment from contaminants in site soils
- To minimize impacts to the surrounding areas and surface waters

TCRA activities include removing previously identified surface and subsurface radiological anomalies at IR Sites 1, 2, and 32, eliminating the disposal trench containing radiological material in IR Site 1, and removing the former Firing-range Berm and debris pits containing

MPPEH. Area 1a, located within IR Site 1, is proposed to be covered and is not covered under this TCRA Work Plan.

IR Sites 1 and 32 are located in the northwest corner of Alameda Point, while IR Site 2 is located in the southwest corner. IR Site 1 was operated between 1943 and 1956 as the former Naval Air Station Alameda's main site for waste disposal. IR Site 2 was used as a disposal area for Alameda Point from approximately 1952 through 1978. An open space area in the eastern portion of IR Site 32 was used for equipment, vehicle, and aircraft storage.

In 2004, TtEC conducted a radiological characterization survey at IR Sites 1 and 2. The primary objective of the survey was to characterize the potential radium-226 contamination that may be present. Due to accessibility issues, neither the shorelines of IR Sites 1 and 2 nor the former Radiological Shack area located within IR Site 2 were surveyed. During the radiological survey of IR Site 1, an elevated radiological reading was identified on the eastern boundary, which borders IR Site 32. Subsequent radiological surveys were completed in November 2006 and encompassed the shorelines of IR Sites 1 and 2, the former Radiological Shack located within IR Site 2, and all of IR Site 32. The results of these surveys were used to determine the radiological contamination addressed in this Work Plan. MPPEH continue to surface in the vicinity of the former Firing-range Berm, suggesting that after rain events or heavy surf, debris pits may be located within the vicinity of the former Firing-range Berm. In addition, a disposal trench reportedly containing radiological material is located north of the former Firing-range Berm. Radiological anomalies identified during previous surveys within IR Sites 1 (excluding Area 1a, the proposed cover area), 2, and 32, along with the disposal trench reportedly containing radiological material and the former Firing-range Berm and debris pits containing MPPEH, will be removed as part of this TCRA.

This TCRA Work Plan provides detailed descriptions of the proposed removal activities including preparatory, mobilization, pre-construction, construction, demobilization, and post-construction activities. Project-specific plans will be referenced, as appropriate, to provide further detailed support to the TCRA Work Plan and are included as appendices. These plans include the Site Health and Safety Plan, Sampling and Analysis Plan, Site-specific Contractor Quality Control Plan, Standard Operating Procedures, Explosive Safety Submission, and a Stormwater Management Plan.

Mobilization activities include mobilization of equipment, manpower and supplies; conducting site-specific training; conducting environmental resources, land MPPEH and geophysical surveys; vegetation clearance; and taking radiological measurements in three background reference areas. Pre-construction activities will include construction of the soil stockpile area and the soil screening area, installation of the screening plant, and conducting the surface radiological survey to confirm the location of all previously identified radiological anomalies. Construction work will initiate upon completion of the pre-construction activities. Construction activities include the excavation of the disposal trench and radiological anomalies, MPPEH excavation and screening, MPPEH demilitarization, waste characterization confirmation sampling and analysis, backfilling of the excavated areas, and restoration of the site including hydroseeding. Fieldwork is estimated to begin in December 2006 and finish in June 2007.

Post-construction activities involve preparing a TCRA Final Report to provide a record of activities conducted during the project and to document that RAOs were met.

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ALAMEDA POINT
SSIC NO. 5090.3

DRAFT
ADDENDUM
TO THE FINAL TIME-CRITICAL
REMOVAL ACTION WORK PLAN

DATED 20 AUGUST 2007

IS FILED AS ADMINISTRATIVE RECORD NO.
N00236.002817

FINAL
ADDENDUM
TO THE FINAL TIME-CRITICAL
REMOVAL ACTION WORK PLAN

DATED 30 AUGUST 2007

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APPENDICES

ABBREVIATIONS AND ACRONYMS

1,2-DCE	1,2 -dichloroethene
2,4-DMP	2,4-dimethylphenol
µg/L	microgram per liter
µR/hr	microroentgen per hour
ALARA	as low as reasonably achievable
ALI	annual limits on intake
AM	Action Memorandum
ARAR	applicable or relevant and appropriate requirement
BCT	BRAC Cleanup Team
BEI	Bechtel Environmental, Inc.
bgs	below ground surface
BIP	blow-in-place
BMP	Best Management Practice
BRAC	Base Realignment and Closure
BSFR	Bulk Survey for Release
Cal. Code Regs.	California Code of Regulations
Cal/EPA	California Environmental Protection Agency
Cal-OSHA	California Occupation Health and Safety Administration
CDFG	California Department of Fish and Game
CEHPML	Chemical Engineering and High Polymer Materials Lab
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
cm	centimeter
cm^2	square centimeter
cm^3	cubic centimeter
COC	chemical of concern
cpm	count per minute
CQC	Contractor Quality Control

ABBREVIATIONS AND ACRONYMS
(Continued)

CRM	count rate meter
CSO	Caretaker Site Office
DAC	derived airborne concentration
DCGL	derived concentration guideline level
delta-HCH	delta-hexachlorocyclohexane
DERP	Defense Environmental Restoration Program
DGPS	differential global positioning system
DMP	dimethylphenol
DoD	Department of Defense
DOE	Department of Energy
DON	Department of the Navy
DOT	Department of Transportation
dpm	disintegration per minute
DTSC	Department of Toxic Substances Control
E&E	Ecology and Environment
EMI	electromagnetic instrument
EMM	earthmoving machinery
EO	Executive Order
EOD	Explosives Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity – Distance
ESS	Explosives Safety Submission
FFA	Federal Facilities Agreement
FWENC	Foster Wheeler Environmental Corporation
g/cm^3	grams per cubic centimeter
GPS	global positioning system
HDPE	high-density polyethylene

ABBREVIATIONS AND ACRONYMS
(Continued)

HE	high-explosive
HHRA	human health risk assessment
HI	hazard index
HPGe	high-purity Germanium
IR	Installation Restoration
IRP	Installation Restoration Program
LARADS	Laser-assisted Ranging and Data System
LDR	land disposal restriction
LLRW	low-level radioactive waste
m/s	meter per second
m^2	square meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MBTA	Migratory Bird Treaty Act
MC	munitions constituents
MCL	Maximum Contaminant Level
MD	munitions debris
MDA	minimum detectable activity
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
MDER	minimum detectable exposure rate
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MGFD	munition with the greatest fragmentation distance
min	minute
mm	millimeter
MPPEH	material potentially presenting an explosive hazard
mR/hr	milliroentgen per hour
mrem/y	millirem per year

ABBREVIATIONS AND ACRONYMS
(Continued)

mSv	millisiervert
NaI	sodium iodide
NAS	Naval Air Station
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NEW	net explosive weight
NIST	National Institute of Standards and Technology
NORM	naturally occurring radioactive materials
NOSSA	Naval Ordnance Safety and Security Activity
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NTR	Navy Technical Representative
NVLAP	National Voluntary Laboratory Accreditation Program
NWRSA	National Wildlife Refuge System Administration Act
OEW	Ordnance and Explosives Waste
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzodioxin
PCDF	polychlorinated dibenzofuran
pCi/g	picocurie per gram
PE	polyethylene
PESM	Project Environmental Safety Manager
PHP	Project Health Physicist
PIC	pressurized ion chamber
PjM	Project Manager
PMO	Program Management Office
PPE	personal protective equipment

ABBREVIATIONS AND ACRONYMS
(Continued)

PQCM	Project Quality Control Manager
PRC	PRC Environmental Management, Inc.
PRG	Preliminary Remediation Goal
PVC	polyvinyl chloride
Q&P	qualification and protocol
Q/D	Quantity/Distance
QA	quality assurance
QC	quality control
^{226}Ra	radium-226
RAB	Restoration Advisory Board
RAC	Remedial Action Contract
RAO	removal action objective
RASO	Radiological Affairs Support Office
RBSL	risk-based screening level
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RI	Remedial Investigation
^{220}Rn	radon-220
^{222}Rn	radon-222
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RWP	Radiation Work Permit
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental & Infrastructure
SHSP	Site Health and Safety Plan
SHSS	Site Health and Safety Specialist
SOP	Standard Operating Procedure
^{90}Sr	strontium-90

ABBREVIATIONS AND ACRONYMS

(Continued)

SSPORTS	Supervisor of Shipbuilding, Conversion and Repair, Portsmouth
STLC	Soluble Threshold Limit Concentration
SUXOS	Senior UXO Supervisor
SVOC	semivolatile organic compound
SWMP	Stormwater Management Plan
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	time-critical removal action
TDEM	time domain electromagnetics
TEDE	total effective dose equivalent
tit.	Title
total DDx	sum of the total dichlorodiphenyldichloroethane, dichlorodiphenyldichloroethene, and dichlorodiphenyltrichloroethane
TP	target practice
TPH	total petroleum hydrocarbons
TPH-extractable	total extractable petroleum hydrocarbons
TRV	toxicity reference value
TSDF	treatment, storage, and disposal facility
TtEC	Tetra Tech EC, Inc.
TtEMI	Tetra Tech EM, Inc.
TtFW	Tetra Tech FW, Inc.
UMTRCA	Uranium Mills Tailings Radiation Control Act
USACE	United States Army Corps of Engineers
USC	United States Code
USFWS	United States Fish and Wildlife Service
UXO	Unexploded Ordnance
VOC	volatile organic compound
Water Board	Regional Water Quality Control Board
WL	Working Level
WMP	Waste Management Plan

1.0 INTRODUCTION

This Time-critical Removal Action (TCRA) Work Plan describes the specific activities pertaining to the removal activities scheduled to be performed at Installation Restoration (IR) Sites 1, 2, and 32 located at Alameda Point, Alameda, California (Figure 1-1). The Naval Facilities Engineering Command, Southwest (NAVFAC SW) has authorized Tetra Tech EC, Inc. (TtEC) to perform the subject TCRA under Contract Task Order No. 0015 through the contracting mechanism of NAVFAC SW, Remedial Action Contract (RAC) IV No. N64273-06-D-2201. Regulatory oversight and guidance for the removal action will be provided by the U.S. Environmental Protection Agency (EPA), the California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC), and the Radiological Affairs Support Office (RASO). In addition, the United States Fish and Wildlife Service (USFWS) will provide guidance with regard to sensitive species.

IR Sites 1 and 32 are located in the northwest corner of Alameda Point, while IR Site 2 is located in the southwest corner (Figures 1-1 and 1-2). IR Site 1 operated between 1943 and 1956 as the former Naval Air Station (NAS) Alameda's main site for waste disposal. IR Site 2 was used as a disposal area for Alameda Point from approximately 1952 through 1978. An open space area in the eastern portion of IR Site 32 was used for equipment, vehicle, and aircraft storage.

In 2004, TtEC conducted a radiological characterization survey at IR Sites 1 and 2. The primary objective of the survey was to characterize the potential radium-226 (^{226}Ra) contamination that may be present. Due to accessibility issues, neither the shorelines of IR Sites 1 and 2 nor the former Radiological Shack area located within IR Site 2 were surveyed. During the radiological survey of IR Site 1, an elevated radiological reading was identified on the eastern boundary, which borders IR Site 32. Subsequent radiological surveys were completed in November 2006 and encompassed the shorelines of IR Sites 1 and 2, the former Radiological Shack located within IR Site 2, and IR Site 32. The results of these surveys were used to determine the radiological contamination addressed in this Work Plan.

This TCRA Work Plan discusses the requirements and provides the procedures for removing surface and subsurface radiological anomalies identified during these previous surveys within IR Sites 1 (excluding Area 1a, the proposed cover area), 2, and 32. Within IR Site 1, a disposal trench reportedly containing radiological material and the former Firing-range Berm and debris pits containing material potentially presenting an explosive hazard (MPPEH) will also be removed as part of this TCRA. Area 1a, located in IR Site 1, is proposed to be covered and is not covered under this TCRA Work Plan.

1.1 SCOPE OF WORK

This TCRA will be conducted to remove previously identified radiological anomalies within IR Sites 1 (except in the proposed cover area), 2, and 32, and the disposal trench. In addition, the TCRA includes the removal of MPPEH from the former Firing-range Berm and debris pits. This TCRA Work Plan includes the procedures for excavation, soil screening and waste disposal. A Site Health and Safety Plan (SHSP), Sampling and Analysis Plan (SAP), Site-specific Project Contractor Quality Control (CQC) Plan, Standard Operating Procedures (SOPs), Stormwater Management Plan (SWMP), an Explosive Safety Submission (ESS), and Transportation and Disposal Plan are included as Appendices A through G and provide additional details of the work to be performed. The scope of the TCRA at IR Sites 1, 2, and 32 includes the following main work elements:

- TCRA Work Plan preparation
- Environmental resources surveying
- Mobilization
- Clearing of vegetation
- Geophysical surveying
- Radiological surface screening and removal of previously identified low-level radioactive waste (LLRW)
- Soil excavation and removal of radioactive material and MPPEH
- Segregation and stockpiling of the screened material (soil, radioactive material, MPPEH, construction debris)
- Backfill placement and compaction
- Demobilization
- Final report preparation

These work elements are based on the scope of work provided by the Department of the Navy (DON) on March 7, 2006.

1.2 WORK PLAN ORGANIZATION

The TCRA Work Plan has been structured to provide details on the major aspects of the removal activities. The TCRA Work Plan has been organized into 12 sections and seven appendices (Appendices A through G). Section 1.0 provides an introduction and defines the scope of work. Section 2.0 discusses the background and past operational history of the site; the physical, chemical, and radiological characteristics of the site; and a brief discussion of the results of previous surveys and removal actions. The regulatory framework and the applicable, relevant, and appropriate requirements (ARARs) are presented in Section 3.0. Project and personnel requirements, including training, inspection, and audit requirements, are identified in Section 4.0.

Section 5.0 provides the radiological controls and discusses investigation levels, instrumentation, and survey implementation. Removal activities, including mobilization, land and geophysical surveys, excavation, stockpiling and screening activities, and site restoration and demobilization are discussed in Section 6.0. Waste management procedures are provided in Section 7.0. The Traffic Control Plan is detailed in Section 8.0. Section 9.0 identifies the environmental protection requirements and includes a discussion of the pre-survey site conditions, existing natural resources and endangered species, specific site protection requirements, and spill prevention procedures. Section 10.0 describes project management and identifies key project personnel from the DON, regulatory agencies, and TtEC. A project schedule and miscellaneous management functions are also presented. Community relation activities, including public information and participation, are discussed in Section 11.0. References are included in Section 12.0.

2.0 SITE CONDITIONS AND BACKGROUND

Several investigations have been performed to assess the physical and environmental conditions at IR Sites 1, 2, and 32. Background information pertinent to the radiological survey includes the site-specific features, history of land usage, site geology and hydrogeology, and previous investigations describing the chemical and radiological characteristics of the site.

2.1 SITE DESCRIPTION AND HISTORY

Alameda Point is located on the western end of Alameda Island, which lies on the eastern side of San Francisco Bay, adjacent to the city of Oakland. Alameda Point is rectangular in shape, approximately 2 miles long east-to-west, 1 mile wide north-to-south, and was occupied by the 1,734-acre former NAS Alameda until its closure in 1997. IR Sites 1 and 32 are located at the northwestern corner, while IR Site 2 is located at the southwest corner of Alameda Point, Alameda, California.

2.1.1 Site Description

IR Site 1

IR Site 1 encompasses approximately 78 acres. San Francisco Bay borders the site to the west and the Oakland Inner Harbor borders the site to the north. IR Site 2, which consists of a former disposal area and wetlands, and Runway 7 are located to the south. IR Site 32, the remaining section of Runway 13, and a former sewage pump station are located east of the site.

IR Site 1 is relatively flat with slight depressions that sometimes flood during the winter rains. Shoreline slopes exist on the northern and western boundary and are currently stabilized by large boulders (riprap). The site was previously used as a waste disposal site and consisted of several disposal areas. A portion of Runway 13 runs northwest-southeast through the site. There are a few uninhabited buildings and building foundations, a former picnic area, and a basketball court located in the southwestern portion of the site. The former small arms range is located near the center of the western border. An earthen berm (dike) 10 to 15 feet high is located adjacent to the shoreline near the former small arms range area. There are several paved roads that run through the site. Public access to IR Site 1 is currently restricted and a chain-linked fence west of Runway 13 restricts access to the main portion of the site. A site detail map of IR Site 1 is provided as Figure 2-1.

IR Site 2

IR Site 2 encompasses approximately 110 acres and is bordered by San Francisco Bay to the south and west. The disposal area at IR Site 2 covers approximately 77 acres. A wetland covers approximately 33 acres and the wetland is bounded by the disposal area within IR Site 2 to the north and east and by the coastal margin adjacent to San Francisco Bay on the south and west. The wetland contains two perennial ponds. The northern pond is connected to the bay by a culvert. The southern pond was created by removal of dredged materials for use as landfill cover. Hypersaline water has since filled the excavation area and created the pond.

The thin strip of land between the disposal area or wetland and the bay is referred to as the coastal margin. It acts as a buffer for the disposal area and the wetland and is composed of the perimeter dike and riprap seawall. Subsurface materials in the coastal margin differ from those in the disposal area and wetland. The interior margin lies outside the disposal area and wetland to the north and east. It also contains part of the perimeter dike and includes all areas outside the dike to the north and east. An earthen berm was constructed around the perimeter of IR Site 2 after landfill operations ceased in 1978. A site detail map of IR Site 2 is provided as Figure 2-2.

IR Site 32

IR Site 32 is approximately 5.8 acres in size and includes three environmental baseline survey subparcels (Subparcels 8A, 5E, and a portion of 5D). The site was previously referred to as the Northwestern Ordnance Storage Area. Recently, the DON expanded the boundaries of IR Site 32 north to the Oakland Inner Harbor by annexing the northern portion of Subparcel 5D.

Most of IR Site 32 is open space covered with asphalt, gravel, weeds, and brush. Structures on the site include two buildings: Building 594, the Physical Section Reaction Force Facility, and Building 82, a guard shack. A site detail map of IR Site 32 is provided as Figure 2-1.

2.1.2 Site History

IR Site 1

IR Site 1 was mainly used for waste disposal at former NAS Alameda from 1943 to 1956. Prior to 1940, early maps show that the disposal area at IR Site 1 was underwater (San Francisco Bay) at a depth of approximately 20 feet along the current western shoreline of the site. This area was reclaimed by dredging operations, which involved the placement of sunken barges and pontoons on the western edge of the disposal area and clay and silt sediments in the disposal area. These operations are visible in aerial photographs taken in the 1940s. A jetty was later transformed into a seawall protecting the harbor entrance, which is now the northern edge of the disposal area. New taxiways and runways were extended over the disposal area in the 1950s.

Information regarding the history of disposal area contents is limited. The primary method used by NAS Public Works to dispose of wastes was to bulldoze trenches to the water table, fill them with waste, and then compact the surface. In the early years of operation, the waste was simply pushed into the water. There are no records of placement of any liners in the disposal area. Soil cover material was applied to the disposal area in later years.

Accurate estimates of the types and amounts of wastes deposited at IR Site 1 over the years are not available, but are believed to be approximately 15,000 to 200,000 tons of assorted refuse and debris, including scrap metal, waste oil, aircraft engines, LLRW (mainly ^{226}Ra from the rework of dials and gauges), solvents, paint wastes, cleaning compounds, creosote, waste medicines, reagents, asbestos, pesticides, mercury, and construction debris. Other naval installations, including Oak Knoll Naval Hospital, Naval Supply Center Oakland, and Treasure Island, also used the site for waste disposal.

The former pistol range area is located in the western portion of IR Site 1 and consists of a pistol range, a shotgun range, and an area immediately north of the pistol range used for disposal of spent ordnance (spent lead bullets and pellets). An earthen impact berm lined with sandbags is located behind the firing line and is referred to as the former Firing-range Berm. The entire pistol range area is approximately 220 by 200 feet in size. The pistol range was in operation between the early 1940s and 1993. The types of weapons used at the pistol range include 9 millimeter (mm), 0.22, 0.38, 0.45, 0.357 and 0.44 caliber weapons, as well as 12-gauge shotguns at the shotgun range. During the construction of the pistol range, excavation was conducted to a depth of about 8 feet below ground surface (bgs) in order to remove buried debris such as fence material and aircraft engine parts. An unknown quantity of 55-gallon drums filled with fired 20mm projectiles were then placed in this excavation. These projectiles were also mixed into concrete (as aggregate) and used for the foundations in the pistol range (Tetra Tech EM, Inc. [TtEMI], 1999).

IR Site 2

IR Site 2 was used as the main disposal area for Alameda Point from approximately 1952 through 1978. An estimated 1.6-million tons of waste were deposited (Ecology and Environment [E&E], 1983). The wastes included municipal solid waste, waste chemical drums (contents unknown), solvents, oily waste and sludge, paint waste, plating wastes, industrial strippers and cleaners, acids, mercury, polychlorinated biphenyl (PCB)-containing liquids, batteries, LLRW from radium dials and dial painting, scrap metal, inert ordnance, asbestos, several pesticides (solid and liquid), tear gas agent, biological waste from the Oak Knoll Naval Hospital, creosote, dredge spoils, and waste medicines and reagents (E&E, 1983). MPPEH may have also been deposited in the 2.5-acre (approximate) possible Ordnance and Explosives Waste (OEW) Burial Site located in the southern part of the disposal area. A seawall was constructed along the southern and western edges of the site, and a 36-inch culvert was installed in the seawall to hydraulically connect San Francisco Bay to waters within the seawall. A substantial (10- to 15-foot) dike was installed around the perimeter of the site when disposal operations ceased.

The former Radiological Shack was located on the west side of the northern boundary. The only other permanent structures that are documented as having existed at the site are two earthen ammunition bunkers located in the northern portion of the site. The former Radiological Shack was demolished; however, the two bunkers still exist.

IR Site 32

An open space area in the eastern portion of the site was used for equipment, vehicle, and aircraft storage. Two buildings are located within IR Site 32: Buildings 594 and 82. Building 594 contains dormitory rooms, a kitchen, and a security-monitoring panel and was previously used as a storage and repair shop for underwater weapons. Building 82 is a concrete guard shack. Buildings 594 and 82 were constructed in 1979. There are no documented releases of hazardous substances in either of these buildings.

In 1883, the South Coast Pacific Railroad constructed a rail causeway over 2 miles long that extended into San Francisco Bay from the northwest corner of Alameda Island (Bechtel Environmental, Inc. [BEI], 2005a). The former causeway crossed the northern portion of present-day IR Site 32 and consisted of railroad tracks built on a mud- and rubble-filled double-rock wall, with a rail yard and a passenger terminal built on a trestle at the end. A fire destroyed the original rail line in 1902; a second line was built parallel to the original rail path. Based on aerial photographs, it appears that all railroad tracks in the vicinity of and at IR Site 32 were removed by 1960; no surface evidence of the former railroad is visible at IR Site 32.

Fill activities at IR Site 32 began in 1919 and the area was completely filled by 1936. Except for the Alameda Mole, the site had been entirely underwater prior to 1919.

2.2 PHYSICAL CHARACTERISTICS

Alameda Point is located on Alameda Island, at the base of a gently sloping plain that extends from the Berkley Hills on the east to the shore of the San Francisco Bay on the west. Alameda Island is a low-lying flat area composed partly of artificial fill and partly of tidal-flat marshy sediments. Originally, the island was a peninsula connected to land on the southeast, but dredging in the late 19th century and the early part of the 20th century deepened and extended the San Antonio Creek channel southeasterly to form the Oakland Inner Harbor, thus creating the island. The island was enlarged by extending it northwesterly with materials dredged from the surrounding San Francisco Bay and Oakland Inner Harbor. IR Sites 1, 2, and 32 are located entirely over this dredged material.

2.2.1 Geologic Setting

IR Sites 1, 2, and 32 at Alameda Point are located on Alameda Island on the eastern side of the central San Francisco Bay. The San Francisco Bay region is located within an elongated basin or valley that extends southeasterly to the Santa Clara Valley. San Francisco Bay and Santa Clara Valley are bounded by the Santa Cruz Mountains to the southwest and the East Bay Hills and Diablo Range to the northeast.

There are no known faults directly at or in the near vicinity of the subject sites. No earthquake fault zones (Alquist-Priolo Zones) have been designated at the sites. The nearest active fault is the Hayward Fault, which is about 6.5 miles east of the site. Another nearby active fault is the San Andreas Fault within the hills on the west side of San Francisco Bay at a distance of about 12 miles. Other major faults in the region include the Calaveras Fault system on the east side of the East Bay Hills and the Green Valley and Greenville Fault systems, which are located farther to the east.

Five Quaternary time (within the past two million years) sedimentary rock units have been identified as underlying IR Sites 1, 2, and 32. These sedimentary units record a sequence of fillings and evacuations of San Francisco Bay in response to global glacial/climate changes and local tectonics. The five rock units, from oldest to youngest, are the Alameda Formation, the Yerba Buena Mud, the San Antonio Formation, the Merritt Sand and the Young Bay Mud. These sedimentary units are overlain by artificial fill deposited by mechanical processes.

A brief geological description specific to each site is provided below.

IR Site 1

The artificial fill comprising most of IR Site 1 is composed of mixtures of sand, silt, and clay dredged from the surrounding bay and a rock dike to retain the fill in place. The fill ranges in thickness from about 10 to 30 feet. The fill is thinnest in the eastern part of the site. The varying thickness is a result of natural variation in the depth of the estuary before filling, which began in the late 1800s. Throughout most of the site, the bottom of the fill is near sea level. The fill is predominantly a sandy silt similar to the Merritt Sand, which served as the primary source of the fill. The fill typically has abundant shell fragments and debris including gravel. As reported earlier, the fill area incorporates the 1943–1956 Disposal Area. Due to lack of sufficient waste disposal characterization information, the lateral and vertical extent of existing waste material in the fill is not entirely defined. Refuse was observed under a thin cover of fill in selected test pits during the geotechnical investigation (Foster Wheeler Environmental Corporation [FWENC], 2002) and included items such as cables, plexi-glass, wire, asphalt, and miscellaneous wood, aluminum, and metal objects.

IR Site 2

The Young Bay Mud is thinnest in the eastern and southern parts of IR Site 2 and is thickest in the northern part of IR Site 2 where it appears to represent an ancient channel fill. In previous reports (TtEMI, 1999), the Young Bay Mud unit was considered to consist of both the mud (clay, silty clay, clayey silt) and some of the underlying sands, and these were combined into a unit called Bay Sediments. Recent geotechnical investigations revealed that most of the sands underlying the upper soft mud are generally soft to moderately dense sands, silts, and clayey sands and these appear to also be Holocene-age bay deposits. Adopting the terminology from previous reports, these are Bay Sediments and range from about zero to 50 feet thick and also appear to represent an ancient channel. Both the Young Bay Mud and the Bay Sediments appear to pinch out to the south, where they may have been removed by dredging in the offshore area (Tetra Tech FW, Inc. [TtFW], 2004a).

The Merritt Sand shows indications of marine reworking during the most recent sea level rise. The unit has been entirely removed by erosion in the northern part of IR Site 2. The Merritt Sand is up to 25 feet in thickness in the south and pinches out toward the northern part of the site. The underlying Upper San Antonio Formation is also discontinuous at IR Site 2. Broad channels were eroded within the surface of the upper San Antonio Formation. The San Antonio Formation is present in the southern portion of the site, but absent through the erosional channeling to the north.

The fill encountered at most of the site is composed of mixtures of sand, silt, and clay dredged from the surrounding bay and a rock dike to retain the fill in place. The fill ranges in thickness from about 25 feet in the northwest to 45 feet in the southwest part of IR Site 2. The varying thickness is a result of natural variation in the depth of the estuary before filling, which began in the late 1800s. The lower Young Bay Mud and Merritt Sand served as primary sources of the fill. The fill typically has abundant shell fragments and debris including gravel. The strength of the fill varies widely because of the wide variety of materials it contains. The existing waste material in the fill is not entirely defined due to lack of sufficient information on the waste disposal history at the site. Solid wastes deposited in the disposal area included dredge spoils, batteries, ordnance, radiological materials (instrument dials with radium paint), asbestos, scrap metal, and spent sandblast abrasives. Liquid wastes placed in the disposal area include solvents, paints, plating bath sludge, waste oil, PCBs, pesticides, and medical wastes (TtEMI, 1999; E&E, 1983). Also, the existence of MPPEH at the site has been a major concern and a critical part of recent investigation and remediation activities.

IR Site 32

The fill material that comprises IR Site 32 is composed of mixtures including sand, silt, and clay dredged from the surrounding bay. A rock dike serves as the northernmost boundary of IR Site 32 adjacent to the Oakland Inner Harbor. The fill ranges in thickness from about 10 to 30 feet. The fill is thinnest in the eastern part of the site. Throughout most of the site, the bottom of the fill is near sea level. The fill is predominantly silty sand similar to the Merritt Sand, which served as the primary source of the fill. Because of lack of sufficient information on the waste disposal history at the site, the existing waste material in the fill is not entirely defined.

2.2.2 Hydrogeologic Setting

Two aquifer zones specific to remedial investigations have been identified beneath IR Sites 1, 2, and 32 by others (TtEMI, 1999). The first water-bearing zone is unconfined and present in the artificial fill. Depth to water ranges from 2 to 8 feet bgs. The Young Bay Mud situated beneath the artificial fill acts as a semi-confining layer that separates the first water-bearing zone from the second water-bearing zone. The second water-bearing zone is situated in the lower portion of the Young Bay Mud unit and top of the Merritt Sand and extends into the San Antonio Formation. The Yerba Buena Mud unit acts as an aquitard. Previous site investigations by others suggest that a vertical gradient between the first and second water-bearing units is minimal.

Groundwater flow in the first water-bearing zone is horizontal and flows radially from the center portion of Alameda Point toward Oakland Inner Harbor, San Francisco Bay and Seaplane Lagoon. In the vicinity of IR Sites 1 and 32, groundwater flow is generally west toward San Francisco Bay and north and northwest into the Oakland Inner Harbor. In the vicinity of IR Site 2, groundwater flow is generally west and south toward San Francisco Bay. The first water-bearing zone is tidally influenced and seawater intrusion is a consequence of climatic variations. Investigators report that the first water-bearing zone at the site is characterized by thin lenses of freshwater recharged by precipitation floating on brackish to saline water.

2.3 CHEMICAL AND RADIOLOGICAL CHARACTERISTICS

The nature and extent of the chemical and radiological contamination at IR Sites 1, 2, and 32 have been investigated and are detailed in various site investigation reports.

The following sections summarize the findings of the previous investigations but are not intended to provide the complete detailed history. Readers are directed to review the referenced reports for more detailed information. The information was reviewed for the purpose of establishing the specific health and safety requirements in the SHSP (Appendix A) prepared for this work activity.

2.3.1 Chemical Characterization

IR Site 1

Soil and groundwater chemical investigations were conducted at various locations on IR Site 1 in 1984, 1990, 1991, 1994, 1995, 1996, 1998, 1999, and 2000. The Feasibility Study (BEI, 2005b) summarizes each investigation, as well as human health and ecological risk assessments that have been performed.

Soil investigation activities showed that total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs, radionuclides, and metals are present in IR Site 1 soils. The most prominent chemicals are SVOCs of the polynuclear aromatic hydrocarbons (PAHs) class that were detected at several locations. Metals and radionuclides were also detected at various locations and depths. TPH, pesticides, and PCBs were detected in shallow soil samples. Although no apparent distribution pattern was identified for these chemicals, many of the highest concentrations were detected in samples collected at soil boring clusters along the western boundary near the shoreline extending from the "former burn area" to south of the pistol range (TtEMI, 1999).

According to site historical information, the disposal area was originally filled with dredge spoils from the bay before wastes were placed in the area. When the construction of Runways 13 and 7 began, spoils stockpiled during dredging operations were used again as fill. The origin of some of the detected chemicals is believed to be the hydraulic fill. However, because the highest chemical concentrations are at locations adjacent to the disposal area, the disposal activities are also likely to have contributed to the elevated chemical concentrations detected. The consistently elevated concentrations of soil borings located in the burn area suggest that refuse burning in the early 1950s contributed to both the SVOCs and metals detected.

Analytical results from soil samples collected at the former pistol range in 1995 and 1996 indicated that lead concentrations were highest in the target trench (30 to 60,000 milligrams per kilogram [mg/kg]) and the portion of the firing-range berm behind the pistol range (from less than 10 to 34,000 mg/kg) (Chemical Engineering and High Polymer Materials Lab [CEHPML], 2005). Additional samples were collected in the pistol range in 1998 in order to characterize the areas containing potential lead contamination. The highest lead concentrations (total lead up to 47,000 mg/kg) were found in samples collected from the firing-range berm.

The Feasibility Study (BEI, 2005b) summarizes the human-health risk assessments (HHRAs) and ecological risk assessments (ERAs) that were performed as part of the IR Site 1 Remedial Investigation (RI) Report and addendum (TtEMI, 1999; 2002), as well as risk calculations performed to support the Feasibility Study. Two sets of risk calculations (EPA and Cal/EPA) were prepared because of technical differences in their risk assessment methodologies. Only the results for soil for a recreation receptor are discussed below.

Based on the IR Site 1 RI Report (TtEMI, 1999), the total carcinogenic risk for a recreational receptor in surface soil was 4.4×10^{-5} (using EPA assumptions) and 4.9×10^{-4} (using Cal/EPA assumptions). The risk was attributable to the PAHs benz[a]anthracene, benzo[b]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene, the PCBs Aroclor 1254 and Aroclor 1260, and chromium. Hazard indices (HIs) in surface soil for a recreational receptor were 0.095 using EPA assumptions and 0.43 using Cal/EPA assumptions.

In 2002, a RI Addendum HHRA report (TtEMI, 2002) was prepared. A total chemical cancer risk value for a recreation receptor was calculated to be 1×10^{-4} (EPA) or 5.5×10^{-4} (Cal/EPA) with contributions from radionuclides and chemicals of concern (COCs) of 2.0×10^{-5} (EPA and Cal/EPA) and 8.5×10^{-5} (EPA) or 8.9×10^{-4} (Cal/EPA), respectively. The HI was calculated based entirely on COCs as 0.1 (EPA) or 0.42 (Cal/EPA).

As part of the Feasibility Study, recreational use risk-based screening levels (RBSLs) for soil were calculated for chemicals that were risk drivers in the RI Addendum HHRA, and the cancer risk in outdoor air was recalculated for vinyl chloride. The updated RBSL was calculated to be

6,011 micrograms per liter (µg/L). It was determined that the potential risk associated with inhalation of vinyl chloride in outdoor air would be less than 10^{-6}.

As part of the RI (TtEMI, 2001), an ERA for groundwater at IR Site 1 was performed. Results indicated that concentrations of 2,4-dimethylphenol, 2-methylphenol, 1,2-dichloroethene (1,2-DCE), toluene and xylene present in monitoring well samples (M028-A, M028-E, and M034-A [identified as the groundwater hot spot]) could adversely impact aquatic receptors. However, potential ecological risks would not exceed applicable criteria outside the hot spot.

As part of the Feasibility Study (BEI, 2005b), an ERA was conducted for terrestrial receptors. Cadmium and lead were determined to be potential ecological risk drivers. The ecological soil screening levels based on the EPA toxicity reference values (TRVs) for cadmium and lead were calculated to be 0.92 and 63 mg/kg, respectively.

Groundwater investigation activities showed that TPH, VOCs, SVOCs, radionuclides, and metals are present in IR Site 1 groundwater. VOCs and SVOCs are the most prominent chemicals detected in groundwater at IR Site 1; however, radionuclides were also frequently detected. VOCs, SVOCs, and radionuclides were detected in the first water-bearing zone and, to a limited degree, in the second water-bearing zone. Groundwater in the first water-bearing zone, downgradient of the disposal area, appears to have been impacted by site activities. Studies have indicated that local distribution of chemicals in groundwater can be very heterogeneous at IR Site 1. Several factors may contribute to the heterogeneous distribution of chemicals in groundwater at the site. Multiple source locations are likely because IR Site 1 is primarily a disposal area. Construction of the site by placement of fill in layers may have created preferential flow paths that resulted in "fingered" plumes (TtEMI, 1999). However, a recent radiological groundwater evaluation on data collected from IR Site 1 and IR Site 2 in winter 2003 indicated that uranium was naturally occurring and that it was not possible to determine if the source of radium is natural or contamination (Shaw Environmental & Infrastructure, Inc. [Shaw], 2004).

Although the local distribution of chemicals in groundwater may be heterogeneous, a well cluster most impacted by the chemical classes identified above is located in the former skeet shoot/former aircraft storage area. Solvent- and petroleum-related organic compounds were detected at the most elevated concentrations at the groundwater hot spot. The results of subsequent studies indicate that 2,4-dimethylphenol (DMP); 2-methylphenol; 1,2-DCE; toluene; and xylene at the groundwater hot spot may have an adverse impact on aquatic biota. The chemical 2,4-DMP was detected in three shallow samples collected from the hot spot wells at concentrations exceeding the ecological reference values.

IR Site 2

Soil and groundwater chemical investigations have been conducted at various locations on IR Site 2. Based on historical information, contaminants detected in soil at IR Site 2 include the following:

- Volatile organic substances
- TPH
- SVOCs
- PAHs
- PCBs
- ^{226}Ra

Metals, pesticides, and PCBs were detected in the sediments from ponds associated with the wetlands. Pesticides and PCBs were detected in soil above 1996 EPA Region 9 Preliminary Remediation Goals (PRGs). The presence of these constituents in soil, although not necessarily found in groundwater, identifies them as potential COCs (Shaw, 2004).

According to site historical information, the disposal area was originally filled with dredge spoils from the bay before wastes were placed in the area. When the construction of Runways 13 and 7 began, spoils stockpiled during dredging operations were used again as fill. The origin of some of the detected chemicals is believed to be the hydraulic fill. However, because the highest chemical concentrations are at locations adjacent to the disposal areas, the disposal activities are also likely to have contributed to the elevated chemical concentrations detected.

Previous groundwater sampling results indicated the detection of VOCs and petroleum hydrocarbons in the groundwater at concentrations above petroleum remediation criteria. The current monitoring well network at IR Site 2 includes 47 monitoring wells installed in and around the disposal area (Shaw, 2004). A recent radiological groundwater evaluation on data collected from IR Site 1 and IR Site 2 in winter 2003 indicated that uranium was naturally occurring and that it was not possible to determine if the source of radium is natural or contamination (Shaw, 2004).

An RI was conducted in 2004 and 2005 to address data gaps from previous investigations in order to evaluate the nature and extent of contamination at IR Site 2. Results of the RI indicate that subsurface soil is more highly impacted compared to surface soil and the landfill is more highly impacted than the wetland portion of the site (Battelle, 2006). The results indicate that groundwater is not substantially impacted by contamination. As part of the RI for IR Site 2, an HHRA and ERA were performed to evaluate potential adverse effects of the contamination to human health, ecological receptors and the environment. The HHRA determined that arsenic, benzo[a]pyrene, benzo[k]fluoranthene, dibenz[a,h]anthracene, naphthalene, dieldrin and delta-hexachlorocyclohexane (delta-HCH), total PCBs, polychlorinated dibenzodioxins (PCDDs)/polychlorinated dibenzofurans (PCDFs) and ^{226}Ra are potential risk drivers for at least one human receptor class. Specific pathways of potential concern identified in the HHRA include direct dermal contact with surface soil, shallow groundwater, or surface water, incidental ingestion of surface soil, inhalation of vapors from surface or subsurface soil, and exposure to external radiation from surface or subsurface soil.

The ERA identified several metals, SVOCs/PAHs, total high-molecular-weight PAHs, total PCBs, several pesticides, the sum of total dichlorodiphenyldichloroethane, dichlorodiphenyldichloroethene, and dichlorodiphenyltrichloroethane (total DDx), PCDDs/PCDFs as potential risk drivers to at least one ecological receptor. Chromium, lead, mercury, nickel, total HPAHs, and total DDx were determined to be the most significant risk contributors. Specific pathways of potential concern at the site identified in the ERA include direct dermal contact with surface soil or sediment, incidental ingestion of surface soil, sediment, or surface water, and root contact with surface or subsurface soil.

IR Site 32

IR Site 32 was identified as an IR site after the evaluation of data resulting from soil and groundwater sampling were performed during previous investigations. These investigations identified VOCs at levels above California Maximum Contaminant Levels (MCLs) in shallow groundwater in the vicinity of Building 594. Soil and groundwater samples were analyzed for VOCs, TPH, SVOCs, pesticides, PCBs, metals, gross alpha and beta, and radium. Analytical results for soil samples were compared to residential PRGs. Metal results in soil were also compared to Alameda Point background ranges. The only analyte with results that exceeded the corresponding PRG was arsenic. However, naturally occurring arsenic concentrations in soil exceeded the PRG throughout Alameda Point, and arsenic results for soil at IR Site 32 were within the background range.

Groundwater samples from IR Sites 1 and 32 contain levels of a variety of analytes exceeding MCLs, including aromatic and chlorinated VOCs, SVOCs, metals, and radionuclides (Innovative Technical Solutions, Inc., 2005). The highest concentrations are generally found in the first water-bearing zone and along the western shoreline of the former IR Site 1 landfill. A smaller area of trichloroethene contamination exists along the northern shoreline of IR Site 1, and a low-concentration VOC plume is found in the area east of IR Site 32.

2.3.2 Radiological Characterization

IR Sites 1 and 2

In 1983, a DON Environmental Initial Assessment Report (E&E, 1983) reported the use of radioactive materials at Alameda Point starting in the 1940s, particularly at the dial painting section of the instrument shop at Building 5. Dial painting consisted of a two-step process. First, refurbished old aircraft dials were scraped and cleaned in solvent. Then the dials were repainted with radioluminescent paint containing ^{226}Ra.

Radium-impacted waste (scraping solids, rags, used paint brushes, and so forth from refurbishing dials and gauges) was collected from the shop and discarded at IR Site 1 and IR Site 2. The radium painting shop was closed in the early 1960s (exact dates unknown), and a contractor decontaminated the facility. According to site personnel interviews, the contractor was unable to decontaminate an unknown number of work materials from the facility and disposed of them in IR Site 1. The radioactive material was reported to have been disposed in an unlined trench 50 feet long, 11 feet wide, and 8 feet deep in the vicinity of the rifle range, located at the north end of IR Site 1, west of the runway.

Additional radium contamination was detected in 1979 in Building 400. Operations associated with radium dials at Building 400 were restricted to their removal and replacement with non-radioluminescent materials. Radium-contaminated benches, ducting and drains were removed and disposed off site.

One surface soil sample was collected in the pistol range in 1998 and analyzed for radionuclides. Gross alpha (3.48±2.6 picocuries per gram [pCi/g]), gross beta (11.0±5.1 pCi/g), and ^{226}Ra (0.314±0.055 pCi/g) were detected in the sample.

The IR Site 1 RI Report (TtEMI, 1999) evaluated radiological risks for a recreational receptor. This assessment concluded that the total risk peaked at 2.3x 10^{-5} at 3 years with most of the risk presented by external exposure. The calculated dose received also peaked at 3 years, at 2.06 millirem per year (mrem/y), and decreased after that time. The RI noted that the estimated dose was below the EPA residential limit of 15 mrem/y for exposure to surface soils, and the radium soil concentrations were below the 5 pCi/g level, which is acceptable for residential exposures and would, therefore, be more protective than for recreational use (TtEMI, 1999). Existing and potential future environmental conditions, such as heavy rains, flooding, and rising sea levels, could have the potential to influence the mobility of residual radioactive contamination.

IR Site 32

IR Site 32 is not considered to be a source of radiological constituents. An elevated radium reading identified at the site is considered to be an isolated detection associated with the disposal activities at the adjacent IR Site 1.

2.4 PREVIOUS RADIOLOGICAL SURVEYS

IR Sites 1 and 2

Preliminary radiological surveys were completed at IR Sites 1 and 2 in September 1995. In June 1996, a second preliminary radiological survey was conducted at a different area within

IR Site 1. Details on the methodology used during the preliminary surveys and the data results are presented in the IR Sites 1 and 2 radiation survey report (PRC Environmental Management, Inc. [PRC], 1997). Based on results from the preliminary surveys, a comprehensive radiological survey was initiated by the DON in September 1998. The Supervisor of Shipbuilding, Conversion and Repair, Portsmouth (SSPORTS) Environmental Detachment conducted a more comprehensive radiological survey at IR Sites 1 and 2 in 1998 and 1999. The details of this survey are provided in the *Alameda Naval Air Station Landfill #1 and #2 Final Radiological Survey Report* (SSPORTS, 1999).

In 2004, TtEC conducted a radiological characterization survey at IR Sites 1 and 2. The primary objective of the survey was to characterize the potential ^{226}Ra contamination that may be present. The survey included a 100 percent surface scan using 2-inch by 2-inch sodium iodide (NaI) detectors, as well as fixed gamma and exposure rate surveys, gamma energy analysis with a portable high-purity Germanium (HPGe) system, and soil sampling. However, due to accessibility issues, neither the shorelines of IR Sites 1 and 2 nor the former Radiological Shack area located within IR Site 2 were surveyed. The findings of the radiological characterization surveys are presented in the *Final Installation Restoration Site 1 Radiological Characterization Survey Report* (TtFW, 2005a) and the *Final Installation Restoration Site 2 Radiological Characterization Survey Report* (TtFW, 2005b). Figures 2-1 and 2-2 show the hot spot areas (net counts per minute [cpm] greater than or equal to 4,000) that were identified during the 2004 radiological survey and were selected for removal under this TCRA.

A Final Radiological Survey Work Plan (TtEC, 2006) was prepared and submitted to the DON in August 2006 for the radiological survey of the shorelines of IR Sites 1 and 2 and the former Radiological Shack in IR Site 2 and IR Site 32. These radiological surveys were completed in November 2006. The results were used to determine the radiological contamination addressed in this Work Plan (Figures 2-1 and 2-2).

IR Site 32

The DON is currently within the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) RI process for IR Site 32. IR Site 32 has no historical indications of being radiologically impacted. However, during the IR Site 1 radiological characterization survey conducted in 2004, an elevated radiological reading was found to exist along the border between IR Sites 1 and 32 (TtFW, 2005a). Another incidental elevated radiological reading was documented during the IR Site 32 RI field activities conducted by BEI (BEI, 2005a). A radiological survey of the entire site was recently completed in November 2006. Anomalies identified in this survey are shown in Figure 2-1 and will be addressed under this Work Plan.

2.5 MATERIAL POTENTIALLY PRESENTING AN EXPLOSIVE HAZARD CHARACTERIZATION

IR Site 1

A radiological survey of IR Site 1 in 1998 resulted in the discovery of 335 live, 20mm high-explosive (HE) projectiles and two small arms rounds. These MPPEH items were thermally treated (explosive demolition) as a part of an Emergency Removal Action completed by Unexploded Ordnance (UXO) technicians from SSPORTS Environmental Detachment. A geophysical survey of the former pistol range was conducted subsequent to the Emergency Removal Action. The anomalies detected in the survey were not indicative of buried MPPEH, but were consistent with results expected for any survey of a landfill with known subterranean metal debris.

In 2001, prior to a geotechnical and seismic investigation at IR Site 1, a surface sweep for MPPEH was performed. The MPPEH characterization was conducted by FWENC (FWENC, 2002). During the investigation, UXO technicians conducted a 100 percent surface (exposed soil or grass) characterization of IR Site 1 to verify that no MPPEH were missed during the previous sweeps. MPPEH characterization activities performed at IR Site 1 identified 1,086 20mm target practice/inert projectiles and an empty 40mm grenade casing at five different locations. Most MPPEH were found in large groups in the vicinity of the former small arms range, but some were found in individual units.

Activities conducted on IR Site 1 in the years subsequent to the surface sweep discovered approximately 30 accumulated 20mm projectiles that percolated to the ground surface from debris pits after rain events or heavy surf.

IR Site 2

In 2002, prior to a geotechnical and seismic investigation at IR Site 2, a surface sweep for MPPEH was performed. MPPEH characterization was conducted (TtFW, 2004b). During the investigation, UXO technicians conducted a 100 percent surface (exposed soil or grass excluding wetland areas) characterization of IR Site 2 to verify that no MPPEH were missed during the previous sweeps. During the surface characterization of IR Site 2, one anti-tank/anti-personnel inert land mine and one 20mm target practice projectile were found.

In addition to the surface characterization activities, a TCRA was performed in 2002 at the Possible OEW Burial Site, a 2.3-acre area located at the southern part of IR Site 2. The site was excavated to a depth of 1 foot and the MPPEH and large debris were removed. The TCRA activities that were completed resulted in the removal and demilitarization of 8,882 20mm target practice rounds and some miscellaneous ordnance and explosives scrap in the form of casing fragments (FWENC, 2002).

IR Site 32

There is no history of MPPEH presence at IR Site 32.

2.6 FUTURE SITE USE

IR Site 1 is proposed to be conveyed to the City of Alameda for recreational use. The site will likely be used as a golf course and regional park trail. IR Site 32 has also been designated for future recreational use. IR Site 2 is to be transferred to another federal agency to become part of the planned wildlife refuge.

3.0 REGULATORY FRAMEWORK

The TCRA is being conducted under the Installation Restoration Program (IRP). Activities conducted under the IRP are to be performed in accordance with the CERCLA and National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Under Executive Order (EO) 12580, the DON is the lead agency responsible for the implementation of the IRP. The EPA is the lead regulatory agency with state regulatory oversight provided by DTSC. USFWS will provide guidance regarding sensitive species issues.

3.1 REGULATORY PROCESS

Alameda Point is listed on the National Priority List (NPL), which is a list developed by the EPA of hazardous waste sites nationwide that pose the greatest risk to the public health, and thus, warrant priority responses under the CERCLA. Therefore, the TCRA activities will be conducted in accordance with the CERCLA and NCP regulatory process.

Federal EO 12580 delegates the President's authority to undertake CERCLA response actions to the Department of Defense (DoD). Congress further outlined this authority in its Defense Environmental Restoration Program (DERP) Amendments, which can be found at 10 United States Code (USC), Sections 2701 through 2705. Both CERCLA, Section 120(f), and 10 USC, Section 2705, require that the DON ensures that the EPA and state and local officials be given the timely opportunity to review and comment on DON-proposed response actions and related studies under the DoD's IRP. CERCLA Section 120 further requires the DON to consider state regulatory requirements at its facilities. Accordingly, EPA and DTSC have provided technical advice, and regulatory oversight during previous activities conducted under the IRP at Alameda Point.

EPA and DTSC currently provide technical oversight to the IRP, assist at monthly program management meetings for Alameda Point, and review documents produced under the IRP for the Alameda Point facility. Monthly Base Realignment and Closure (BRAC) Cleanup Team (BCT) meetings are held to facilitate the IRP process. The BCT consists of the DON, the EPA, DTSC, and the San Francisco Bay Regional Water Quality Control Board (Water Board, formerly known as the RWQCB). The status and schedule for the various IRP sites are discussed, and pertinent technical topics and issues are presented. The BCT participation and oversight will continue throughout the IRP process.

Former NAS Alameda was deactivated by the DON in 1997 after being selected in 1993 and approved for closure under the BRAC Program. In 1999, former NAS Alameda, now renamed Alameda Point, was placed on the NPL. Inactive or abandoned sites are evaluated, scored, and, if sufficiently contaminated, placed by on the NPL by the EPA. As a result of Alameda Point being placed on the NPL, EPA and the DON negotiated a cooperative agreement, known as a Federal

Facilities Agreement (FFA), to set in writing their respective roles and responsibilities. Pursuant to EO 12580, the DON is the lead agency authority for cleanup with EPA exercising lead regulatory oversight. Also, due to the NPL status of Alameda Point, EPA holds the ultimate authority to choose remedial (but not removal) actions at Alameda Point. While placement on the NPL would qualify Alameda Point for cleanup under the EPA "Superfund" program, the DON, as the party responsible for most of the contamination at Alameda Point, has continued to fund cleanup under the DERP.

3.2 REMOVAL ACTION OBJECTIVES

The primary goals of this response action are to mitigate the potential risk posed by radioactive contamination and MPPEH at IR Sites 1, 2, and 32, and the threatened release of hazardous substances to the environment. Based on previous investigations, geophysical findings, and the sites' location, the following specific removal action objectives (RAOs) were established in the AM (TtEC, 2006).

- To prevent ingestion, dermal contact, or inhalation of radiological anomalies with concentrations that significantly exceed background concentrations
- To assure that the total effective dose equivalent received through all potential pathways from the radium-impacted waste in the surface and subsurface to any member of the public does not exceed 15 mrem/yr
- To reduce the risk to humans and the environment from MPPEH-related items buried at the site
- To reduce the risk of the public coming into contact with MPPEH, resulting in severe injury or even death
- To reduce the risk to humans and the environment from contaminants in site soils
- To minimize impacts to the surrounding areas and surface waters

3.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

ARARs Section 300.415(j) of the NCP (40 Code of Federal Regulations [CFR], Part 300) provides that removal actions must attain ARARs to the extent practicable, considering the exigencies of the situation. In accordance with the NCP requirements, the ARARs for this TCRA are presented in the AM (TtEC, 2006). A summary of the potential chemical-specific, action-specific, and location-specific ARARs identified for this removal action are as follows.

Chemical-specific ARARS

- Resource Conservation and Recovery Act (RCRA) hazardous waste identification requirements [Title (tit.) 22 Cal. Code Regs., Sections 66261.21, 66261.22 (a)(1), 66261.23, 66261.24(a)(1), and 66261.100]

- RCRA, waste characterization requirements [tit. 22 Cal. Code Regs. Section 66261.22(a)(3) and (4), 66261.24(a)(2)-(a)(2)(C) or 66261.3(a)(2)(F)]
- Non-RCRA hazardous waste identification requirements [tit. 22 Cal. Code Regs., Sections 66261.22(a)(3) and (4), 66261.24(a)(2)-(a)(8), 66261.101, 66261.3(a)(2)(C) or 66261.3(a)(2)(F) and tit. 27 Cal. Code Regs., Sections 20210, 20220, and 20230]
- Identification and storage of military munitions (20 CFR Part 266, Subpart M)
- Radiological criteria for unrestricted use at closing Nuclear Regulatory Commission (NRC) licensed facilities (10 CFR 20.1402)
- Radiological criteria for license termination under restricted conditions [10 CFR 20.1403(a)]
- UMTRA, cleanup standards [40 CFR 192.12(a), 192.32(b)(2), and 192.41]
- UMTRA, annual average radon decay product concentration requirements [40 CFR 192.12(b)(1), and 192.41(b)(2)
- Dose limits for individual members of the public [10 CFR 20.1301(a)(1)]
- Annual limits on intake and derived airborne concentration (DACs) of radionuclides for occupational exposure (10 CFR, Part 20, Appendix B, Table 2)

Action-specific ARARs

- Hazardous waste generator requirements [22 CFR 66262.10(a), 66262.11, 66264.13(a) and (b)]
- Hazardous waste accumulation and container storage (22 CFR 66262.34; 66264.171, 66264.172, 66264.173, 66264.175(a) and (b), 66264.178)
- Storage and Control of Licensed Material (10 CFR 20.1801 and 20.1802)
- Management of temporary units (tit. 22 Cal. Code Regs., Section 66264.553(b), (d), (e), and (f))
- Management and closure of staging piles [40 CFR 264.554(d)(1)i-ii) and (d), (e), (f), (h), (i), (j) and (k); 22 CFR 66264.258(a) and 66264.111]
- Standard for transportation and storage of military munitions (40 CFR 266.203, 266.205, and 266.206)
- Clean Water Act Stormwater Discharge Requirements [40 CFR 122.44(k)(2) and (4)]
- State Water Resources Control Board Order No. 99-08
- Fugitive Dust, Bay Area Air Quality Management District Regulation 6-301

Location-specific ARARs

- Federal Coastal Zone Management Act (16 USC 1451-1464 and 15 CFR 930)
- Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703)
- Endangered Species Act of 1973 (16 USC 1531-1543)
- Clean Water Act of 1977, as amended, Section 404 (33 USC 1344)
- Protection of threatened and endangered species and habitats [California Fish and Game Code (CFGC) Section 5650(a), (b), and (f); 3005; 2080; 3511; 3503; 3503.5; 3800]
- California Coastal Act of 1976 (California Public Resources Code Sections 30000 through 309000 and 14 CFR 13001 through 13666.4)
- McAteer-Petris Act and the San Francisco Bay Plan (California Government Code 66600 et seq.)
- Porter Cologne Water Quality Control Act, California Water Code Division 7, Sections 13241, 13243, 13263(a), 13269, and 13360
- Comprehensive Water Quality Control Plan for the San Francisco Bay Basin, Chapters 2 and 3 (California Water Code Section 13240)

4.0 PROJECT AND PERSONNEL REQUIREMENTS

TtEC personnel training requirements and inspection programs applicable to the MPPEH and radiological removal activities at IR Sites 1, 2, and 32. Protocols for inspections by regulatory agencies and third parties are also addressed.

4.1 PERSONNEL TRAINING/CERTIFICATION REQUIREMENTS

Personnel training and certification requirements include the following:

- Site personnel must have Occupational Safety and Health Administration (OSHA) 40-hour Health and Safety/Emergency Response Hazard Communication and RCRA training.
- Site personnel performing Department of Transportation (DOT) functions (including selecting, packaging, marking, labeling, preparing shipping papers, and loading) must be trained in accordance with the requirements of HM-126F. Subcontractors performing DOT functions must supply proof of training.
- All personnel involved with the ongoing monitoring and maintenance of the storm water management system will attend a training class held by the Site Superintendent, or his designee, before excavation activities commence.
- All project personnel (subcontractors and TtEC) will be trained according to TtEC compliance policies and procedures, including TtEC's Radiological Protection Program (RP-1).
- All project personnel performing fieldwork activities will receive general awareness training for radiation.
- All project personnel performing waste management will be certified under TtEC waste management training in accordance with 40 CFR, Part 265.16.
- All project personnel will attend a briefing on MPPEH. The briefing will address what MPPEH may look like and the procedures to follow if encountered.
- The TtEC Project Biologist will brief all field personnel on the protection of natural resources prior to commencement of fieldwork.
- TtEC and subcontractor training records will be verified prior to project activities commencement.

4.2 INSPECTION AND AUDIT PROCEDURES

Site inspections and audits may occur during the removal activities to ensure compliance with the applicable state and federal regulations and this TCRA Work Plan and its associated appendices.

Inspections by TtEC Personnel

TtEC inspections will be conducted regularly to document compliance with environmental health and safety regulations and TtEC procedures. These inspection requirements are documented within this TCRA Work Plan, as well as the SHSP (Appendix A) and Site-specific CQC Plan (Appendix C).

Inspections by Regulatory Agencies

Regulatory inspections will be handled (by TtEC) in accordance with the TtEC compliance procedure for environmental inspections by regulatory agencies. These procedures require that in addition to contacting the Remedial Project Manager (RPM) and Caretaker Site Office (CSO), site personnel or the Project Manager (PjM) must notify the Program Environmental Health and Safety Manager, Mr. Roger Margotto.

Designated Representative for Inspections by Regulatory Agencies

The PjM has designated Mr. Bob Wells (Site Superintendent) as the TtEC on-site representative. In the event of site visits by regulatory agencies, Mr. Wells will notify and be accompanied by the CSO representative, Resident Officer in Charge of Construction (ROICC) or other DON representative when conducting an inspection.

Inspections by Non-regulatory Third Parties

Any non-regulatory third party requesting access to inspect the site must be referred to the client for access. TtEC personnel or their subcontractors must not grant site access or answer questions for unauthorized personnel. The PjM will notify the RPM and CSO of any attempts to gain site access by third parties.

Members of the media asking questions or attempting to access the site should be referred to the RPM and the CSO representative.

5.0 RADIOLOGICAL CONTROLS

This section details specific activities and procedures that are necessary in the preparation for, and field implementation of, radiological practices for the planned removal action at IR Sites 1, 2, and 32.

All necessary controls for radiologically safe operations will be implemented in accordance with the SHSP, TtEC's Standard Operating Procedures (SOP), and current health physics practices.

Dose rate, contamination, and air monitoring, including initial baseline sampling to determine radiological background conditions, will be performed in accordance with the requirements specified in the Radiation Work Permit (RWP) and based on judgment of the Radiological Control Technician (RCT). Personal protective equipment (PPE) levels, dictated by radiological considerations and physical and chemical safety issues identified at each work location, will be assigned or modified, according to the approved RWP and SHSP.

5.1 ALARA CONSIDERATIONS

The basic concept in radiation protection specifies that exposures to ionizing radiation and releases of radioactive material should be managed to reduce collective doses to workers and the general public. ALARA will be implemented during the course of the work specified in this Work Plan.

5.2 TRAINING

The minimum training requirements for personnel working in the field include the following:

- OSHA 40-Hour and Annual 8-Hour Refresher
- Radiation awareness training
- RWP and Work Plan training for the specific site or task
- AHA training for the specific site or task
- SHSP training, as required by the plans

Additional training and experience are required for personnel responsible for radiological activities.

5.3 WHOLE-BODY EXTERNAL DOSE MONITORING

To support the monitoring, tracking, and recording of occupational whole-body radiation exposure, any personnel working directly with impacted material, including equipment operators, under this Work Plan will be issued and required to wear dosimeters. Only National

Voluntary Laboratory Accreditation Program (NVLAP)-approved dosimeters from a NVLAP-certified provider will be used. Personnel issued dosimetry must complete an NRC Form 4. The original Form 4 will be maintained by the organization issuing the dosimetry with a copy or the original kept at the project field office.

5.4 RADIATION WORK PERMITS

A RWP will be prepared that will specify the radiological safety requirements for activities performed under this Work Plan. Personnel assigned to site work will be required to understand the requirements and sign the RWP prior to beginning work.

5.4.1 Purpose of the Radiation Work Permit

RWPs specify the appropriate personnel protective measures within the scope of the work based upon the radiological conditions in the area. The RWP will also address radiological conditions, work scope and limitations, radiological limitations, PPE requirements, dosimetry requirements, ALARA considerations, and specific instructions to personnel. A RWP should not be used unless a radiological survey has been performed in the work area within the last 24 hours or there is reasonable assurance that conditions have not changed as determined by the Project Health Physicist (PHP) or his/her designee. Changes to a RWP will be noted during the daily safety briefing. The absence of any changes will also be communicated during the briefing.

5.4.2 Development of the Radiation Work Permit

The PHP, or designee, will perform or assign a RCT to perform an assessment of the work area. Prior to performing a work area survey, the RCT will be as knowledgeable as possible about the nature of the work to be performed. In addition, consideration will be given to the specific component or equipment to be worked on, the positions the workers may take to perform the work (i.e., kneeling on the ground, leaning against one component to work on another), and the possibility of the presence of radioactive material.

Assessments will clearly identify the radiological hazards present in the work area. The following guidelines will be considered when performing an assessment:

- What are the contamination, radiation, and airborne radioactivity levels at the position(s) where the individual is to work?
- Where is the designated radiation and or contaminated area boundaries?
- Are there special radiological hazards or hot spots?
- If work on a specific component is required, what are the contact and 30-centimeter (cm) dose rates for the component?
- Is there or could there be any material and equipment present?
- What additional safety hazards may be encountered at the job site?

Upon completion of the assessment, the RCT will complete a draft of the RWP, entering all existing radiological conditions, source of survey information, and the RWP number.

5.4.3 Review and Approval of the Radiation Work Permit

The PHP or a designee will review the RWP for accuracy and correctness. A copy of the draft RWP will also be provided to the SHSS for review. Upon completion of their respective reviews, the PHP, or designee, and SHSS will discuss the draft RWP. After ensuring that the RWP is complete and addresses relevant non-radiological safety considerations identified by the SHSS, the PHP, or designee, will approve the RWP.

5.4.4 Implementation of the Radiation Work Permit

Before beginning work governed by the RWP, the PHP or SHSS will conduct a pre-job briefing with the work crew. Pre-job briefings will be documented. The PHP or SHSS or a designee will answer questions resulting from RWP reviews. Prior to working under an RWP, the user will sign the RWP indicating that he/she understands the requirements of the RWP. A copy of the RWP will be kept at the work location.

5.4.5 Changes to the Radiation Work Permit

In the event of changes to conditions or scope of work that do not justify the generation of a new RWP, two modifications of the RWP may be made. Upon completion of the modification or extension of the RWP, the PHP or SHSS will communicate all changes made to the RWP to the affected work crew and work crew supervisors prior to the commencement of work covered under the revised RWP. Upon termination of an RWP, the original RWP will be retained in the project file.

5.5 INVESTIGATION LEVELS

Investigation levels are specific levels of radioactivity used to indicate when additional investigation may be necessary. Investigation levels also serve as a quality control (QC) check. For example, in addition to indicating potential contamination, a measurement that exceeds the investigation level may indicate a failing instrument.

When determining an investigation level using a statistical-based parameter (for example, standard deviation), the following may be considered: underlying radionuclide distributions (for example, normal, log normal, non-parametric), data population descriptors (for example, standard deviation, mean, median), and prior survey and historical information.

5.5.1 Investigation Levels for Gamma Radiation Surveys

For gamma surveys, the investigation level will normally be established at the reference area mean plus 3-sigma, where sigma is the standard deviation of the gamma readings in the reference area.

5.5.2 Investigation Levels for Alpha and Beta Radiation Surveys

For alpha and beta surveys, the investigation level will be the derived concentration guideline level (DCGL) or a statistical-based parameter (for example, reference area mean plus 3-sigma), if used.

5.5.3 Action Responses

When locating a previously identified hot spot, a measurement will be collected to confirm that the investigation level is exceeded prior to removing the anomaly. When an elevated area/device is identified that exceeds the release criteria, the area/device along with the surrounding 12 inches of soil will be removed and managed as radiologically impacted. For the excavation of the former Firing-range Berm, debris pits, and disposal trench, each area will be surveyed to see if the investigation level is exceeded, anomalies will be removed; and then a 6- to 10-inch lift will be excavated. The excavated material will then be spread approximately 6 to 10 inches thick on a pad. The material on the pad will be surveyed again to see if investigation levels are exceeded. This process will continue until the bottom of the berm, pit or trench is reached.

5.6 RADIATION DETECTION INSTRUMENTATION

The survey methods to be used during the TCRA are described in the following sub-sections and Appendix D-1, Radiation and Contamination Surveys. A Laser-assisted Ranging and Data System (LARADS) will be the primary field survey systems used to support the removal activities. Several types of other portable field survey instruments may be used to support the removal activities, provide analytical data, and monitor radiation control practice. Additional information on LARADS procedures is included in Appendix D-2, LARADS procedures.

5.6.1 Measuring Equipment

During the performance of the survey, different instrumentation will have to be used to detect the various forms of radioactive material that may be present. Table 5-1 identifies the instrumentation that may be used. Each instrument is explained in further detail in the following sections.

5.6.1.1 Instrument for Alpha/Beta Surveys

Surveys for alpha/beta radiation will be performed using an Eberline E-600 with a SHP380AB scintillation probe. The instrument measures alpha and beta radiation levels and presents data in a digital display. Static measurements for particulate radiations are displayed and recorded by the rate meter after positioning the detector, a scintillation probe, directly over a designated surveillance surface.

5.6.1.2 Instrument for Gamma Surveys

Surveys for gamma (photon) radiation will be performed using an Eberline E-600 using a 2-inch by 2-inch NaI crystal. The instrument is programmed to respond to the full spectrum of gamma photon energies since it is capable of detecting gamma photon energies ranging from 60 kiloelectron volts to 3 million electron volts. These measurements are always made with the instrument audio "on" to facilitate rapid detection of changes in instrument count rate. Static photon measurements require positioning the detector assembly approximately 4 inches (10 centimeters [cm]) above the designated surveillance surface and completing a stationary 10-second survey. Scan measurements are obtained by traversing a path at a maximum speed (scan rate) of approximately 0.5 meters per second and slowly sweeping the detector assembly in a serpentine (snakelike, S-shaped) pattern, while maintaining the detector 2.5 to 4 inches (6 to 10 cm) above the area surveyed. These measurements are always made with the instrument audio "on" to facilitate rapid detection of changes in the instrument count rate.

5.6.1.3 Gamma Spectroscopy Instrumentation

In situ or field sample gamma energy analysis will be performed using a portable HPGe system when the need for radionuclide speciation arises. Typically, this will be when verification of the radioculide species of a subsurface point source is required. The gamma energy analysis will be performed using a HPGe scintillator detector system. The HPGe detector system will be a 40 percent to 73 percent efficient coaxial HPGe detector coupled to a 7-liter portable liquid nitrogen dewar. An adjustable Putnam cart will be available with a 2-inch-thick circular lead collar for shielding unwanted background gamma rays from the sides and behind. The detector will be operated using a portable ORTEC DigiDART module connected to a laptop computer running ORTEC's GammaVision® or Maestro acquisition software. Data analysis may be performed using spectral nondestructive assay platform analysis software. Additional information about the portable HPGe system is provided in Appendix D-3, Gamma Spectroscopy System.

5.6.1.4 Instrumentation for Swipe Samples

Swipe samples will be processed using an Eberline HandEcount portable alpha and beta/gamma radiation counter (or equivalent). A microprocessor allows for data processing, and the unit provides a full range of simultaneous alpha and beta/gamma analysis at levels required for environmental release surveillance. Data is reported in units of disintegrations per minute (dpm) per 100 square centimeters (cm^2).

5.6.1.5 Instrument for Exposure Rate Surveys

Exposure rate surveys will be performed when it is desired to measure the ambient exposure rate at a given location on the site. One example of this is to measure the surface exposure rate produced by a subsurface point source to determine if additional radiological controls are needed to ensure worker safety.

Exposure rate surveys, obtained approximately 1 meter from contact with area surfaces, are conducted using a MicroREM meter (or equivalent). The MicroREM meter is equipped with an internally mounted, tissue-equivalent organic scintillation detector.

Exposure rate will also be collected using a pressurized ion chamber (PIC). A PIC typically is an argon-filled ionization chamber with a diameter of 7.32 cm (2.88 inches) and a volume of 220 cubic centimeters (cm^3) (13.4 cubic inches).

5.6.1.6 Instrument for Surface Scan Surveys

LARADS surface scan surveys will be performed to support removal activities. LARADS uses a commercially available count rate meter (CRM), the Eberline E-600. This CRM contains circuitry that may be configured to support a wide variety of detector types. NaI (2-inch by 2-inch) detectors will be used for scan surveys. The LARADS systems will use four NaI (2-inch by 2-inch) detectors positioned in a linear array spaced approximately 1 foot apart and 6 inches above the ground. A single detector backpack-based LARADS system may also be used when the use of the towed array is not practical or presents a safety concern.

Areas that exceed a user-set radiological trigger point activate an audio cue and are visually highlighted, providing instant notification. Additional information about the LARADS (vehicle and hand-held equipment) is provided in Appendix D-2.

5.6.2 Instrument Calibration and Efficiency

TtEC will use the services of a radiological instrumentation supplier for the radiological instruments and check sources used during the survey. The equipment supplier is required to provide calibration documentation for each radiological instrument supplied. The Project Quality Control Manager (PQCM) or his designee will review the calibration documentation prior to the instrument being used.

The supplier will perform the necessary calibration of their radiological instrumentation annually. The instruments will not be accepted from the supplier, unless they have been calibrated prior to shipment to TtEC. The supplier will include certificates of calibration and calibration data with each instrument. TtEC will not perform calibrations in the field for these instruments; therefore, the SOPs for the calibration of these instruments are not being provided. Operational checks will be performed daily to verify that the instruments are functioning properly. These checks are discussed in Section 5.4.3.

The supplier of the HPGe will provide the calibration service and procedure for the HPGe system. The system will be calibrated using a National Institute of Standards and Technology (NIST) traceable source. The supplier of the HPGe system will provide a copy of the "Certificate of Certification" for the calibration source. The SOP used by the HPGe supplier is included in Appendix D-3, Gamma Spectroscopy System.

5.6.3 Instrument Operational Checks

Prior to use of the radiological instruments, calibration verification, physical inspection, battery check, and source response check will be performed. All portable radiological instruments will have a current calibration label. Calibration verification will be performed daily prior to use of the instrument.

Physical inspection of the instrument will include:

- Inspect the general physical condition of the instrument and detector prior to each use.
- Inspect for loose, damaged knobs, buttons, cables, connectors, broken/damaged meter movements/displays, dented or corroded instrument cases, punctured/deformed probe/probe window(s), cables, and any other physical impairments that may affect the proper operation of the instrument or detector.

Any instrument or detector having a questionable physical condition will not be used until corrected.

A battery check will be performed to ensure that there is sufficient voltage being supplied to the detector and instrument circuitry for proper operation. This check will be performed in accordance with the instrument's operations manual; although, it is generally performed as follows:

- Position the appropriate selector switch to the "Batt" position or depress the "Batt Check" button with the instrument on.
- Observe the indication for the current battery condition. Typically, the current battery condition will be indicated by a meter deflection into the "Batt OK" region or "Batt OK" on the display.

If unsatisfactory results are obtained, refer to the operations manual for replacement of the batteries and repeat the check. The instrument will display a satisfactory battery check prior to use.

Upon receipt of the instruments, a response check range will be established. On a daily basis, the instrument will be exposed to the check source to verify that the instrument response is within the ± 20 percent range determined during the initial response check.

The results of the daily operation checks discussed above will be entered into the field logbook. The PQCM will review the entries daily for completeness and conformance with acceptance criteria (response within ± 20 percent). These reviews will also facilitate identifying trends that could indicate possible deterioration of the instruments. Instruments that do not pass the daily operation checks will be removed from service and returned to the supplier for maintenance. Details regarding operation procedures are provided in Appendix D-4, Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use.

5.6.4 Minimum Detectable Activity/Minimum Detectable Concentration Determination

Determining the minimum detectable activity (MDA)/minimum detectable concentration (MDC) for the measurements and the scans involves many variables that include: area of contamination, depth of contamination, attenuation of radiation, surveyor efficiency, time interval the probe is over the contaminated area, and desired rates of true positives and acceptable rates of false positives. The methodology presented in the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (DoD et al., 2000) will be followed to establish the MDA/MDC for each survey instrument.

5.6.4.1 Instrument Efficiency

The instrument efficiency (ε_i) is defined as the ratio between the net count rate, in cpm, of the instrument and the surface emission rate of the calibration source for a specified geometry. The surface emission rate is the 2π particle fluence that is affected by both the attenuation and backscatter of the radiation emitted from the calibration source.

Equation 5-1 will be used to calculate the instrument efficiency in counts per particle, although efficiency is typically reported as having no units or unitless.

Equation 5-1

$$\varepsilon_i = \frac{R_{S+B} - R_B}{q_{2\pi}\left(\frac{W_A}{S_A}\right)}$$

Where:

ϵ_i	=	instrument efficiency (count per particle)
R_{S+B}	=	the gross count rate of the calibration measurement (cpm)
R_B	=	the background count rate in cpm
$q_{2\pi}$	=	surface emission rate of the calibration source (NIST traceable) (particles per minute)
W_A	=	active area of the detector window (cm^2)
S_A	=	area of the source (cm^2)

The instrument efficiency is determined by obtaining static counts with the detector over a calibration source that has a NIST traceable surface emission rate. The 2π particle fluence rate is corrected for decay, attenuation and scatter. Then the surface emission rate of the source must be corrected for the area subtended by the probe. Factors that can also affect the instrument's efficiency are discussed below:

- Efficiency Check Sources. Efficiency check sources that emit alpha or beta radiation with energies similar to those expected from the contaminant in the field [similar to the expected radionuclide(s) of concern] will be selected.
- Source Geometry Factors. Instrument efficiency will usually be determined with an efficiency check source equal to or greater than the area of the probe. If a source that

is smaller than the probe is used, a conversion factor is applied to the MDC to account for the active region of the probe.

- Source-to-detector Distance. The detector efficiency will be calculated at a source-to-detector distance that is the same as the detector-to-surface distance used in the field.

5.6.4.2 Count Detection Probability for Alpha Scans

Scanning for alpha emitters differs significantly from scanning for beta and gamma emitters in that the expected background response of most alpha detectors is very close to zero. The following sections cover scanning for alpha emitters.

Since the time a contaminated area is under the probe varies and the background count rate of some alpha instruments is less than 1 cpm, it is not reasonable to determine a fixed MDC for scanning. Instead, it is more practical to determine the probability of detecting an area of contamination at a predetermined DCGL for given scan rates.

For alpha survey instrumentation with backgrounds ranging from less than 1 to 3 cpm, a single count provides a surveyor sufficient cause to stop and investigate further. Assuming this to be true, the probability of detecting given levels of alpha surface contamination can be calculated by use of Poisson summation statistics.

Given a known scan rate and a surface contamination release limit, the probability of detecting a single count while passing over the contaminated area is given by Equation 5-2:

Equation 5-2

$$P(n \geq 1) = 1 - e^{-\frac{GEd}{60v}}$$

Where:

$P(n \geq 1)$ = probability of observing a single count
G = contamination activity (dpm)
E = detector efficiency (4π)
d = width of detector in direction of scan (cm)
v = scan speed (centimeters per second)

For alpha scans using a SHP380AB detector $P(n \geq 1)$ is calculated as follows.

$$P(n \geq 1) = 1 - e^{-\frac{100 \times 0.18 \times 8.3}{60 x 1}} = 0.92$$

Where:

$P(n \geq 1)$ = probability of observing a single count
G = 100 (dpm)

E	=	18% (4π)
d	=	8.3 (cm)
v	=	1 (centimeters per second)

Once a count is recorded and the guideline level of contamination is present, the surveyor should stop and wait until the probability of getting another count is at least 90 percent. This time interval can be calculated by Equation 5-3:

Equation 5-3

$$t = \frac{13{,}800}{CAE}$$

Where:

t	=	time period for static count(s)
C	=	contamination guideline (dpm/100 cm^2)
A	=	physical probe area (cm^2)
E	=	detector efficiency (4π)

For alpha scans using a SHP380AB detector t is calculated as follows.

$$t = \frac{13{,}800}{100 \times 100 \times .018} = 7.7$$

Where:

t	=	time period for static count(s)
C	=	100 (dpm/100 cm^2)
A	=	100 (cm^2)
E	=	18% (4π)

5.6.4.3 Minimal Detectable Count Rate and Minimum Detectable Concentration for Beta Scans

The minimum detectable number of net source counts in the scan interval can be arrived at by multiplying the square root of the number of background counts (in the scan interval) by the detectability value associated with the desired performance (as reflected in d') as shown in Equation 5-4.

Equation 5-4

$$MDCR = \mathrm{d'}\sqrt{\mathrm{b_i}}\left(\frac{60}{i}\right)$$

Where:

d' = index of sensitivity (α and β errors [performance criteria])
b_i = number of background counts in scan time interval (count)
i = scan or observation interval (s)

The required rate of true positives will be 95 percent, and the false positives will be 5 percent. From Table 6.5 of MARSSIM, the value of d', representing this performance goal, is 3.28.

For beta scans using a SHP380AB and a measured background beta count rate of 124 cpm the *MDCR* is calculated as follows.

$$MDCR = 3.28\sqrt{2.61} \times \left(\frac{60}{3.3}\right) = 96.4\ cpm$$

Where:

d' = 3.28
b_i = (124 x 3.3)/60 = 2.61 (count)
i = 3.3 (s)

The scan MDC is determined from the minimum detectable count rate (MDCR) by applying conversion factors that account for detector and surface characteristics and surveyor efficiency. As discussed below, the MDCR accounts for the background level, performance criteria (d'), and observation interval. The observation interval during scanning is the actual time that the detector can respond to the contamination source. This interval depends on the scan speed, detector size in the direction of the scan, and area of elevated activity.

The scan MDC for structure surfaces is calculated using Equation 5-5.

Equation 5-5

$$Scan\,MDC = \frac{MDCR}{\sqrt{p}\,\varepsilon_i\,\varepsilon_s\,\frac{W_A}{100\,cm^2}}$$

Where:

MDCR is discussed above

p = surveyor efficiency factor

ε_i = instrument efficiency (count per particle)

ε_s = contaminated surface efficiency (particle per disintegration)

W_A = area of the detector window (cm^2)

For beta scans using a SHP380AB and using the *MDCR* calculated above the *Scan MCD* is calculated as follows.

$$Scan\,MDC = \frac{96.4}{\sqrt{0.5} \times 0.44 \times 0.25 \times \frac{100}{100}} = 1{,}240\,dpm/100cm^2\,\beta/\gamma$$

Where:

MDCR is discussed above

p = 0.5

ε_i = 0.44 (count per particle)

ε_s = 0.25 (particle per disintegration)

W_A = 100 (cm^2)

5.6.4.4 MDC for Static Alpha and Beta Counts

The static MDC will be determined prior to the start of the removal activities and will be used to estimate the level of activity that can be detected by the proposed survey method. The RASO's concurrence of static MDC and scan MDC shall be obtained prior to commencing the removal activities.

The static MDC is the level of radioactivity that is practically achievable by the overall measurement process. Equation 5-6 is used to calculate instrument MDC in dpm per 100 cm^2 when the background and sample are counted for the same time intervals.

Equation 5-6

$$MDC = \frac{3 + 4.65\sqrt{R_B T_B}}{\varepsilon_s \varepsilon_i \frac{W_A}{100} T_B}$$

Where:

R_B = background count rate (cpm)
T_B = background counting time (minute [min])
ε_i = instrument efficiency (count per particle)
ε_s = contaminated surface efficiency (particle per disintegration)
W_A = active area of the detector window (cm^2)
3 + 4.65 = constant factor provided in MARSSIM

In Equation 5-6, W_A is the size of the "active" area of the detector window. If the area of the detector window (cm^2) does not equal 100 cm^2, it is necessary to convert the detector response to units of dpm per 100 cm^2.

If the background and sample are counted for different time intervals, Equation 5-7 is used to calculate the MDC in dpm per 100 cm^2.

Equation 5-7

$$MDC = \frac{3 + 3.29\sqrt{R_B T_{S+B}\left(1 + \frac{T_{S+B}}{T_B}\right)}}{\varepsilon_i \varepsilon_s \frac{W_A}{100\ cm^2} T_{S+B}}$$

Where:

R_B = background count rate (cpm)
T_B = background counting time (min)
T_{S+B} = sample counting time (min)
ε_i = instrument efficiency (count per particle)
ε_s = contaminated surface efficiency (particle per disintegration)
W_A = active area of the detector window (cm^2)
3 + 3.29 = constant factor provided in MARSSIM

For static alpha measurements using a SHP380AB and a measured background count rate of 0.325 cpm using the same background and sample times, the static MDC for alpha measurement is calculated as follows.

$$MDC = \frac{3 + 4.65\sqrt{0.325 \times 1}}{0.36 \times 0.25 \times \frac{100}{100} \times 1} = 62.8\, dpm/100\, cm^2$$

Where:

R_B	=	0.325 (cpm)
T_B	=	1 (minute [min])
ε_i	=	0.36 (count per particle)
ε_s	=	0.25 (particle per disintegration)
W_A	=	100 (cm^2
3+4.65	=	constant factor provided in MARSSIM

For static beta measurements using a SHP380AB and a measured background count rate of 124 cpm using the same background and sample times, the static MDC for alpha measurement is calculated as follows.

$$MDC = \frac{3 + 4.65\sqrt{124 \times 1}}{0.36 \times 0.25 \times \frac{100}{100} \times 1} = 608\, dpm/100\, cm^2$$

Where:

R_B	=	0.325 (cpm)
T_B	=	1 (minute [min])
ε_i	=	0.36 (count per particle)
ε_s	=	0.25 (particle per disintegration)
W_A	=	100 (cm^2)
3 + 4.65	=	constant factor provided in MARSSIM

5.6.4.5 MDC for Gamma Scans of Surface Areas

The scan MDC (in pCi/g) is based on the area of elevated activity, depth of contamination, and the radionuclide (energy and yield of gamma emissions.) To establish the scan MDC, the relationship between the detector's net count rate to net exposure rate must be established first. This is accomplished by determining the MDCR using Equation 5-4, then applying a surveyor efficiency factor p to get the $MDCR_{Surveyor}$ as show below in Equation 5-8 below:

Equation 5-8

$$MDCR_{Surveyor} = MDCR / \sqrt{p}$$

The $MDCR_{Surveyor}$ is then converted into the corresponding minimum detectable exposure rate (MDER) by use of the manufacturer-provided count rate to exposure rate ratio for the detector. For example, the manufacture-provided count rate to exposure rate ratio for the Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector is 900 cpm/μR/hr (5.4×10^{10} counts/R). This value can be used to determine the ratio of cpm to μR/hr, as shown in Equation 5-9 below:

Equation 5-9

$$MDER\,(\mu R/hr) = \frac{MDCR_{Surveyor} * 6\times10^{7}}{cc}$$

Where:

$MDCR_{Surveyor}$ = as calculated in Equation 5-8
6x10^7 = a conversion factor accounting for differences in time and activity units [(μR-min)/(R-hr)]
cc = 5.4 x 10^{10} [(counts)/(R)], calibration constant

Next, the relationship between the radionuclide concentration and exposure rate is established. This is accomplished by modeling (using Microshield) to determine the net exposure rate produced by the radionuclide at a distance above the ground. The factors considered in modeling include:

- The dose point above the surface
- The density of material in grams per cubic centimeter (g/cm^3)
- DCGL of the radionuclide of concern in pCi/g
- The depth of detection for the DCGL
- The circular dimension of the cylindrical area of detector capability (square meters [m^2])

The concentration of the radionuclide of concern (scan MDC) necessary to yield the MDER may be calculated by taking the ratio of the MDER to the exposure rate calculated by Microshield, as shown in Equation 5-10 below:

Equation 5-10

$$Scan\ MDC\,(pCi/g) = \frac{DCGL\ pCi/g * MDER\,\mu R/hr}{Microshield\ Exposure\ Rate\,\mu R/hr}$$

For gamma scans using a NaI 2"x2" detector and a measured background of 4,433 cpm the *MDCR* is calculated as follows.

$$MDCR = 3.28\sqrt{73.9}\times\left(\frac{60}{1}\right) = 1{,}692\ cpm$$

Where:

d' = 3.28
b_i = 4,433/60 = 73.9 (count)
i = 1 (s)

Using the calculated value of the MDCR the $MDCR_{surveyor}$ is calculated as follows.

$$MDCR_{Surveyor} = \frac{1,692}{\sqrt{0.7}} = 2,022\,cpm$$

The corresponding MDER is calculated using the $MDCR_{surveyor}$ as follows.

$$MDER\ (\mu R / hr) \quad = \quad \frac{2,022 \times 6 \times 10^{7}}{5.4 \times 10^{10}} = 2.25$$

Where:

$MDCR_{Surveyor}$ = 2,393 cpm

$6x10^7$ = a conversion factor accounting for differences in time and activity units [(µR-min)/(R-hr)]

cc = 5.4 x 10^{10} [(counts)/(R)] a calibration constant

Using Equation 5-10 from above, the concentration of the radionuclide of concern (scan MDC) necessary to yield the MDER may be calculated by taking the ratio of the MDER to the exposure rate calculated by Microshield. The scan MDC for ^{226}Ra is calculated below:

$$Scan\ MDC(pCi/g) = \frac{1 \times 2.25}{0.7043} = 3.19\,pCi/g$$

5.6.4.6 Minimum Detectable Count Rate for Static Gamma Counts

For gamma surveys, MDCR, rather than MDC, is calculated in cpm. If the background and sample are counted for the time intervals, Equation 5-11 is used to calculate the MDCR.

Equation 5-11

$$MDCR = \frac{3 + 4.65\sqrt{R_B T_B}}{T_B}$$

Where:

3 + 4.65 = constant factor provided by MARSSIM

R_B = background count rate (cpm)

T_B = background counting time (min)

If the background and sample are counted for different time intervals, Equation 5-12 is used to calculate the MDC.

Equation 5-12

$$MDCR = \frac{3 + 3.29\sqrt{R_B T_B \left(1 + \frac{T_{S+B}}{T_B}\right)}}{T_{S+B}}$$

Where:

3 + 3.29	=	constant factor provided by MARSSIM
R_B	=	background count rate (cpm)
T_{S+B}	=	sample counting time (min)
T_B	=	background counting time (min)

The static MDCR for gamma measurements using a NaI 2-inch by 2-inch detector and a measured background of 4,433 cpm with a background count time of 1-min and a sample count time of 10-sec is calculated below.

$$MDCR = \frac{3 + 3.29\sqrt{4{,}433 \times 1 \times \left(1 + \frac{0.167}{1}\right)}}{T_{S+B}} = 1{,}438\, cpm$$

Where:

3 + 3.29	=	constant factor provided by MARSSIM
R_B	=	4,433 (cpm)
T_{S+B}	=	0.167 (min)
T_B	=	1 (min)

5.6.5 Documentation of Radiological Measurements

Radiological surveys performed will be documented and contain sufficient detail to be meaningful even after the originator is no longer available. These radiological surveys will be recorded on a standard radiological survey form (Appendix D-5, Release of Materials and Equipment from Radiologically Controlled Areas) and will include the following information:

- Site or facility name, specific location(s), purpose, and process being documented
- Signature of the surveyor(s) and the date of preparation
- Instrument(s) used, model and serial number
- Instrument efficiency and calibration date
- Instrument reading(s) at each measurement location and background reading(s) from background reference areas

- Specific locations of each measurement and sample collected, such that these locations can be accurately relocated
- Instrument settings—voltage, threshold, window thickness, and so forth (or reference to a specific operating procedure on the survey form)
- Check source used and identification number
- Notes on the survey findings, including the location of areas found to contain high concentrations of localized contamination
- All blanks completed or lined out as "not applicable"
- Supervisory signatures to ensure review and proper completion of forms

Standards for the maintenance and retention of radiological records, including personal protection, are included in Appendix D-6, Radiological Records.

5.6.6 Exposure Rate Survey Instrumentation

Exposure rate surveys will be performed when it is desired to measure the ambient exposure rate at a given location on the site. One example of this is to measure the surface exposure rate produced by a subsurface point source to determine if additional radiological controls are needed to ensure worker safety.

Exposure rate surveys, obtained approximately 1 meter from contact with area surfaces, are conducted using a MicroREM meter (or equivalent). The MicroREM meter is equipped with an internally mounted, tissue-equivalent organic scintillation detector.

5.7 SURVEY IMPLEMENTATION

This section discusses the types of surveys and their implementation in the field with a focus on the methods for conducting each type of survey.

5.7.1 Reference (Background) Areas

An average background level will be determined by performing measurements at systematic or random locations within the designated background area. Figure 5-1 shows the locations of the background references areas. The background reference areas identified in Figure 5-1 were selected with concurrence from the RASO. Only areas that the Navy has concluded were not impacted by historical activities at Alameda NAS have been selected for background reference areas.

The detector probe will be held approximately 10 cm (4 inches) from the surface area for gamma and 0.25 inch from the surface area for alpha/beta radiation. Instrumentation will be allowed to stabilize before background readings are taken. The average of all of the readings taken will determine the background. Background scan ranges and exposure rates will also be collected for reference data.

5.7.2 Scan Surveys

Scan surveys will be performed at each location a removal activity will be performed. Scan surveys are an integral part of survey programs conducted to determine contamination levels. The surveys are an evaluation technique performed by moving a detection device over a surface at a specified speed and distance above the surface to detect radiation. It will be used to identify areas that may require additional survey measurements.

5.7.2.1 Scan Surveys for Alpha/Beta Radiation

Scan surveys for alpha/beta radiation will be performed at each location a removal activity will be performed and on equipment and material. Surface scan surveys for alpha and beta radiation will be performed by moving the detector over the surface being surveyed at a rate of approximately 1 inch per second. The detector will be held approximately 0.25 inches over the surface being surveyed.

5.7.2.2 Scan Surveys for Gamma Radiation

Scan surveys for gamma radiation will be performed at each location a removal activity will be performed. Scan measurements are obtained by traversing a path at a maximum speed (scan rate) of approximately 0.5 meter per second (m/s) and slowly moving the detector assembly in a serpentine (S-shaped) pattern, while maintaining the detector approximately 10 cm (4 inches) above the area being surveyed.

5.7.3 Static Surveys

Static surveys will be performed at each location a removal activity will be performed. Static contamination surveys are used to determine contamination levels on surface areas for scoping, characterization, and/or release surveys. The surveys are an evaluation technique performed by holding a detection device over a surface for a specified time at a set distance to detect radiation.

5.7.3.1 Static Surveys for Alpha and Beta Surface Activity

These surveys will be performed at each location a removal activity will be performed and on equipment and material. Direct measurements will be conducted with the detector approximately 0.25 inches above the surface. Count time for conducting the measurement will be dependent upon the isotope of concern.

5.7.3.2 Static Surveys for Gamma Radiation

Static surveys for gamma radiation will be performed at each location a removal activity will be performed. Static gamma measurements require positioning the detector assembly approximately 10 cm (4 inches) above the surface and completing a stationary 60-second survey.

5.7.4 Exposure Rate Measurements

Exposure rate measurements will be performed at each location a removal activity will be performed. These surveys are performed to measure ambient gamma radiation levels. Exposure rate measurements are obtained by holding the detection device approximately 1 meter from the surface being surveyed. Instrumentation will be allowed to stabilize before taking the measurement. Instrument stabilization time will vary depending on the instruments used and site conditions.

5.7.5 Swipe Sample Measurements

Swipe sample measurements will be performed on equipment and material. Smear sampling will be performed to assess the presence of radioactive contamination that is readily removed from a surface. Smear samples will be taken to evaluate the presence of alpha and beta surface activity.

5.7.6 Equipment and Material Surveys

A radiological release survey will be performed on equipment used inside the controlled areas to verify that radiological release limits are not exceeded.

The amount of removable radioactive material per 100 cm^2 of surface area will be determined by wiping the area with dry filter or soft absorbent paper and evaluating the wipe for alpha and beta-gamma activity using the sample in a low-background scaler.

SOP 5, Release of Materials and Equipment from Radiologically Controlled Areas, will be followed for the unconditional release of equipment, and is provided in Appendix D-5.

The following applies to the release of equipment and material:

1. Removable alpha contamination, determined by smearing with a dry filter: 20 dpm/100 cm^2
2. Fixed alpha contamination based on an area of not more than 100 cm^2: 100 dpm/100 cm^2
3. Removable beta/gamma contamination, determined by smearing with a dry filter: 200 dpm/100 cm^2
4. Fixed beta/gamma contamination based on an area of not more than 100 cm^2: 1,000 dpm/100 cm^2

The release criteria for materials and equipment can also be found in Table 5-2.

5.7.7 Personnel Surveys

Personnel exiting the controlled area will undergo a personnel survey prior to exiting the controlled area.

If a worker finds contamination while surveying out of the controlled area, they are to stop and notify the PHP or designee. The potentially contaminated worker will stay at the controlled area entrance to minimize potentially spreading contamination. The PHP or designee will assist the worker in decontaminating the affected areas using standard decontamination techniques. A stop work order will be issued while the potential causes are evaluated and the DON (RASO) is notified of the personnel contamination. Personnel surveys and decontamination will be performed in accordance with Appendix D-7, Radiological Protective Clothing Selection, Monitoring, and Decontamination.

5.7.8 Media Sampling

Various samples may be collected for radiological analysis, including soil and swipe samples. The SAP is provided in Appendix B and describes the methods for collecting samples, sample numbering, sample labeling, sample shipment, and completion of the associated chain-of-custody and other required documentation. Media samples for gamma spectroscopy and removable surface contamination (swipes) will be analyzed on site using instrumentation described in Sections 5.4.1.3 and 5.4.1.4.

5.7.9 Gamma Spectroscopy Measurement Techniques

Gamma energy analysis using a portable HPGe system will be performed to characterize subsurface point sources and to quantitatively identify the presence of ^{226}Ra in collected soil samples. Specific locations for in situ gamma energy analysis will be determined by the PHP with concurrence from the RASO based on a review of the radiological survey data collected. Soil samples collected will have a gamma energy analysis preformed on them prior to being released and shipped to the contract laboratory for ^{226}Ra analysis.

The field gamma spectroscopy instrumentation will be used only to verify the radionuclide present in the soil samples. Actual quantification will be performed by the off site laboratory.

5.7.10 Air Sampling

Airborne activity monitoring (continuous or grab samples) will be used during the course of work in accordance with SOP 12, provided in Appendix D. In order to control occupational exposures, establish personal protection equipment (PPE), and determine respiratory protection requirements, monitoring and trending for airborne radioactive material will be performed as necessary. Engineered controls, with concurrence from RASO, will be implemented if required to maintain airborne concentrations below 10 percent of the applicable DAC value for ^{226}Ra (3.0E-11 microcurie per milliliter).

If, during the course of work, an airborne concentration exceeds 10 percent of the DAC, ongoing activities will cease and the affected location will be posted until the source of the airborne concentration is eliminated and levels are confirmed to be below 10 percent of the DAC.

5.8 SAMPLING PROTOCOL

Soil samples will be collected to establish the residual ^{226}Ra activity in the soil to support the removal activities. Soil sampling activities will be carefully controlled, with personnel collecting the sample, at a minimum, wearing gloves. Samples will be surveyed before they are removed from the area to ensure that the radiation levels of the sample are acceptable to permit release. The soil samples will be packaged in containers specified by the analytical laboratory. Prior to release for shipment to the laboratory, each container will be tightly capped, securely sealed, and clearly labeled. Prior to packaging for shipment, all sample containers are to be checked for beta/gamma and alpha contamination. All samples are to be direct frisked for beta/gamma prior to packaging for shipment. Procedures for sample collection and shipment are provided in the SAP (Appendix B) and Appendix D-8, Sampling Procedures for Radiological Surveys.

5.9 POST-WORK AREA SURVEILLANCE

At the daily conclusion of all work, the assigned radiological control technicians(s) will complete all necessary paperwork associated with the daily surveys. Air samples will be collected and analyzed to ensure that exposure is maintained below the designated levels.

5.10 DECONTAMINATION PROCEDURES

Prior to removal from the site, equipment and material that had the potential to become radiologically contaminated will be decontaminated in accordance with Appendix D-9, Decontamination of Equipment and Tools. Heavy equipment will be decontaminated using heavy brushes to remove soil and dirt attached to the equipment surfaces. Special attention will be paid to remove material on the undercarriage of excavation equipment. Items for which decontamination is difficult or impossible to verify, such as plastic liners, will remain on site until completion of the work for subsequent packing and off-site disposal at an approved disposal facility. Decontamination of temporary facilities located within the support zone will be limited to exterior cleaning. Hand tools used for the removal activities will be decontaminated per the procedures presented in the SAP (Appendix B). An unconditional release survey will be performed on equipment and material decontaminated as summarized in the section below and detailed in Appendix D-5, Release of Materials and Equipment from Radiologically Controlled Areas, which will be followed for the unconditional release of equipment.

6.0 PLANNED REMOVAL ACTIVITIES

This section describes the specific activities and procedures involved in preparation for, and field implementation of, the TCRA at IR Sites 1, 2, and 32. The planned activities include:

- Permitting and notifications
- Preparatory activities and meetings
- Environmental resources surveying
- Mobilization
- Clearing of vegetation
- Topographical surveying
- Geophysical surveying
- Radiological surface screening of previously identified LLRW
- Identification and removal of LLRW
- Soil excavation and removal of radioactive material and MPPEH
- Secondary radiological screening of excavated material
- Segregation and stockpiling of the screened material (soil, radioactive material, MPPEH, construction debris)
- Post-excavation sampling
- Backfill placement and compaction
- Waste classification, storage and disposal
- Free-release survey and decontamination of equipment and tools
- Demobilization

6.1 PERMITTING AND NOTIFICATIONS

TtEC will obtain all necessary authorizations from the Alameda CSO and the city of Alameda for completing the TCRA at IR Sites 1, 2, and 32. Prior to field activities, TtEC will notify the DON RPM, CSO, and appropriate city of Alameda personnel about the nature of the anticipated work.

TtEC maintains a current annual excavation permit from the California Occupational Safety and Health Administration (Cal-OSHA) (No. 2004-573713). The required 5-day notification will be provided before excavation activities begin. Underground Service Alert (1-800-227-2600) will also be notified to obtain utility clearance a minimum of 72 hours prior excavation activities. All excavations will be conducted in accordance with tit. 8, Cal. Code Regs. Section 1539 through

1543, and 29 CFR, Part 1910 and 1926 requirements. Daily inspections of excavations will be performed by a competent person to assess the stability of slopes and excavated areas.

Additional permits and/or notifications, which may be required by regulatory agencies for specific activities conducted under this Work Plan, will be addressed in the corresponding subsections or appendices of the Work Plan.

6.2 PREPARATORY ACTIVITIES AND MEETINGS

At least 2 weeks prior to the start of field activities, a kickoff meeting will be held between the DON and TtEC. The purpose of this meeting will be to develop a mutual understanding of the removal activities and CQC details, including forms to be used, administration of on-site work, and coordination of the construction management and production. TtEC will prepare minutes of the meeting for submittal to the DON. The following people will be requested to attend the kickoff meeting: the RPM, the ROICC, a CSO representative, a RASO representative, and a representative from the city of Alameda. TtEC representatives will include the TtEC PjM, Site Superintendent, PQCM, PHP, and the Site Health and Safety Specialist (SHSS).

6.3 ENVIRONMENTAL RESOURCES SURVEY

To prevent direct impacts to any special-status species, an environmental survey will be conducted by a qualified wildlife biologist not more than 48 hours prior to the start of field activities to confirm that no federally listed or state listed species are residing within the limits of the project activity areas. Areas such as pickleweed or functional wetlands that could potentially serve as habitat for special-status species will be monitored during site activities to prevent unwarranted entry and disturbance to the maximum extent practical.

Previous investigations have been performed during IR Sites 1, 2, and 32 radiological surveys to evaluate the presence of habitat for plant and wildlife species protected under the MBTA, California Fish and Game Code and state and federal Endangered Species Acts (ESAs). The initial findings concluded that IR Sites 1, 2, and 32 contained no direct evidence of species or habitat features likely protected under ESAs or other ARARs. Additionally, prior to the start of field activities at IR Sites 1, 2, and 32, all on-site personnel will be briefed on the project-specific avoidance and minimization measures. The following project-specific avoidance and minimization measures will be implemented to minimize adverse impacts to local biological resources, including methods for avoiding and minimizing potential effects on special-status species and communities of concern:

- To avoid disturbances from construction activities and noise, the heavy excavation work will be completed outside of the breeding season for California least tern. The breeding season begins in late April and lasts through the end of August.
- Erosion and siltation will be controlled and minimized during site activities. Best Management Practices (BMPs) will be required of the contractor. BMPs will include

the following measures: use of silt fences, gravel/sandbags, or other controls necessary to stabilize the soil in denuded, graded, or otherwise disturbed areas during site activities.

- Temporary access routes will be flagged/delineated prior to initiation of site activities. A biological monitor will be on site at the start of mobilization activities, guiding vehicles during site activities to avoid impacts to sensitive habitat features (salt marsh vegetation, wetlands, etc.).
- Fueling of equipment will take place within existing paved areas or identified laydown areas greater than 30 meters from sensitive habitat features (salt marsh vegetation, wetlands, etc.). Construction equipment will be checked for leaks prior to operation and will be repaired as necessary. "No-fueling zones" will be designated on site activity maps.
- Staging will be located in disturbed habitat or on paved areas. Staging areas will be delineated on the project maps, which will be reviewed by a qualified biologist prior to the onset of activities within IR Sites 1, 2, and 32.
- A contractor education program will be implemented to ensure that the contractors and all construction personnel are fully informed of the biological resources associated with this project. This program will focus on (a) the purpose for resource protection, (b) contractor identification of sensitive resource areas in the field (e.g., areas delineated on maps and by flags/fencing, etc.), (c) environmentally responsible construction practices, (d) protocol to resolve conflicts that may arise at any time, and (e) ramifications of noncompliance. This program will be conducted by a qualified biologist and will be a requirement for all construction personnel.
- All areas to be avoided will be clearly marked on project maps provided to the contractor. These areas will be designated as "no activity" zones. These areas will be flagged/delineated by a qualified biologist prior to the onset of construction activities. In some cases, resources may need to be fenced or otherwise protected from direct or indirect impacts.

These measures, designed to avoid, minimize, and/or mitigate for project-related effects, will be employed to comply with the Fish and Wildlife Coordination Act (16 USC, Sections 661 through 666c), California Department of Fish and Game (CDFG) Code Sections, ESA of 1973 (16 USC, Sections 1531 through 1543), MBTA (16 USC, Sections 703 through 712), and other applicable and relevant regulatory requirements.

Biological monitoring is a tool that will be used within IR Site 2 during the pruning and survey of the former Radiological Shack to ensure minimization or complete avoidance of impacts to local sensitive communities and special-status species. Section 6.3.1 describes biological monitoring qualifications and protocols (Q&Ps). Biological monitors will conduct a tree survey in the vicinity of the former Radiological Shack and in areas to be excavated to identify trees that will require pruning in order to facilitate removal activities.

The Project Biologist will inspect the site prior to beginning vegetation clearance activities; jurisdictional seasonal wetlands in the vicinity of the work areas will be identified, delineated, and marked with pin flags. The areas inside the pin flags will be avoided. The Project Biologist will also brief the workers on actions to take if nests were encountered while cutting the vegetation.

6.3.1 Biological Monitoring

Biological monitoring will be used prior to mobilization and during the removal activities of the former Radiological Shack at IR Site 2 to ensure minimization or complete avoidance of impacts to local sensitive communities and special-status species. The Q&Ps are derived from previously field-implemented protocols that received regulatory approval for similar types of disturbances, such as the California State Lands Commission, CDFG, Federal Energy Regulatory Commission, Bureau of Land Management, and USFWS.

Qualifications of Monitors

All biological monitors will have a Bachelor of Science in Biology or related field and a minimum 2 years field experience in northern California ecology and biology and will have received site-specific field training to be able to identify likely local species and to understand northern California wildlife behavior. Where natural resource specialists with specific qualifications, permits, or approvals will be required, only biological monitors with the appropriate qualifications (Least Tern Specialist, Certified Arborist, and so forth) will be used.

Biological Survey Protocols and Avoidance Measures

Biological clearance surveys will be conducted prior to vegetation clearance and radiological and MPPEH removal activities to ascertain the presence or absence of nesting birds and special-status species, including their habitats. Survey techniques included the following:

1. Biologists will examine ground cover proposed for pruning, mowing, and inclusion in the removal activities, prior to the onset of any intrusive activities.
2. Potential habitat areas that will need to be included in the removal-related activities will be field identified and verified.
3. Before the mowing/pruning or removal activities are permitted, a biological monitor will verify that no sensitive/special-status species, nesting birds, and so forth are present within the work area.
4. If occupied nests, special-status species or their unique habitats are identified during biological surveys, they will be temporarily avoided until nesting status/complete species identification can be determined. The loss or destruction of eggs, nests, nestlings, or adults of the California least tern or any other bird species protected by the MBTA will be prohibited in substantive compliance with Sections 3503 and 3503.5 of the CFGC.

5. If an active nesting status/special-status species presence is verified during biological surveys, field-related activities will not be conducted within 10 meters of nests or 1,000 feet from ESA-protected species, and the DON RPM will be immediately notified. Additionally, a minimum 1,000-foot setback between field-related construction activities and active California least tern nest, if any, will be maintained. Appropriate distances will be established between all known work areas and nests of any other bird species protected under the MBTA. If the Burrowing Owl is observed on site, field-related activities will not occur within 75 meters of nests between February 1 and August 31 (breeding season), or within 50 meters of nests between September 1 and January 31 (non-breeding season).
6. If the nesting status/special-status species cannot otherwise be avoided, the DON will be consulted to ensure that field-related activities will not cause harassment or harm of the wildlife in question.
7. Prior to the beginning of any vegetation clearance or pruning activities, the biological monitor will check the access roads and under and around all equipment for wildlife species that could enter the work area after the initial biological survey.

6.4 MOBILIZATION

Mobilization activities will include site preparation, movement of equipment and material to the site, and orientation and training of field personnel. At least 2 weeks prior to mobilization, the appropriate DON personnel, including the RPM, RASO, and CSO, will be notified regarding the planned schedule for mobilization and soil excavation activities. To arrange for authorized entry badges following the new security measures implemented by the city of Alameda, a list of field personnel will be delivered to the city to obtain required vehicle decals, a list of personally owned vehicles, along with the required insurance and registration documentation, will also be provided to the City of Alameda Police Department.

Upon receipt of the appropriate records and authorizations, field personnel, temporary facilities, and required construction material will be mobilized to the site. The temporary facilities will include portable toilets, security fencing, runoff controls, and one or more secure storage (Conex) boxes for short- and long-term storage of material, if needed. Construction material, which will be initially mobilized to the site, will allow for building of the equipment decontamination pad; MPPEH, soil, and debris screening system; and waste stockpile area (Figure 6-1).

Equipment mobilization will be initiated with site preparation activities. IR Sites 1, 2, and 32 are currently fenced and all removal activities will be conducted within the fenced area. All temporary structures and field personnel will be mobilized and stationed within the fenced area. To minimize storage requirements and to prevent the spread of contamination via the project equipment, the majority of the equipment and material will be mobilized to the site on an as-needed basis. A dedicated laydown area, to be established in the field during mobilization, will be used for short-term storage of equipment and material.

TtEC will use the existing water supply at Alameda Point during field activities. The water for all dust abatement activities will be obtained from a fire hydrant within proximity of the planned operations. These activities will be coordinated through the City of Alameda Fire Department. Back-flow prevention devices will be used as necessary.

The equipment decontamination area will be located adjacent to the staging area and will include a temporary decontamination asphalt concrete pad and a rinsate collection system. The exact location and orientation of the decontamination pad will be determined in the field prior to its construction. The pad will be approximately 20 feet wide by 40 feet long. The decontamination pad will be constructed of asphalt or two 20-mil layers of high-density polyethylene (HDPE) or polyvinyl chloride (PVC) liner. Prior to constructing the pad, the area will be cleared of rocks, debris, and other items that could puncture the liner. The first layer of the liner will then be placed directly on the ground surface. A 6-inch layer usually of coarse soil will be placed over the first layer of 20-mil liner and sloped such that all runoff is conveyed to a sump. A second layer of 20-mil liner will be placed over the coarse soil layer. A final top 6-inch layer of coarse soil will be placed on top of the liner. Equipment to be decontaminated will, therefore, drive over the soil layer, and not the liner. The purpose of this design is to prevent puncture of the HDPE or PVC liner, thereby preventing any contaminated soil or runoff from coming into contact with the native soil. The decontamination pad will be bermed with sandbags, and collected runoff will be pumped from the sump into a container for sampling, characterization, and disposal as described in the SAP (Appendix B).

A 6,500-gallon poly tank equipped with a secondary containment system capable of retaining 110 percent of the holding tank volume will be staged at the support area. Alternatively, a lined drum storage area will also be provided for storage of used PPE or soils impacted by minor spills or releases from equipment.

In addition to the radiological controls set forth in Section 5.0, incoming equipment and material will be subject to the following:

- Equipment and material will be surveyed for existing contamination levels prior to being placed into service.
- Surveys will consist of a 100 percent scan of accessible areas for alpha/beta contaminants. Swipes will be taken to ensure that no removable contaminants are present. Should any survey results exceed the contamination limits of 20 dpm/100 cm^2 removable (alpha), 200 dpm/100 cm^2 removable (beta/gamma), 100 dpm/100 cm^2 fixed (alpha), and 1,000 dpm/100 cm^2 fixed (beta/gamma), the equipment will not be permitted for placement into service and will be returned to the shipment point of origin.

6.5 CLEARING OF VEGETATION

Prior to any intrusive activities, the vegetation will be cleared from the work areas within IR Sites 1, 2, and 32.

Prior to initiation of vegetation mowing or tree-pruning activities, the Project Biologist will examine all areas proposed for mowing and pruning. No active nests will be directly affected during these activities. If potentially active nests are discovered, then these specimens will be temporarily avoided until nesting status can be determined. For the potentially active nests, two survey events (separated by a 24-hour interval) will be initiated to determine nesting status that will document animal behavior (nest building, eggs or young present, and so forth). If active nesting status is determined to exist during vegetation removal actives, TtEC will not conduct any vegetation removal activity within 3 meters of nests and will immediately notify the DON's RPM who will in turn notify the appropriate regulatory agency (USFWS). Inactive nests are those nests discovered from last season that are unoccupied and show no physical signs of recent activity (no whitewash, feathers, and so forth discovered). Inactive nests are void of fresh sign and typically contain cobwebs. These nest will be included as part of the vegetation clearance.

TtEC will clear the vegetation in the work area, as defined by the scope of work presented by the DON. For the purpose of this plan "clearing and grubbing" is defined as the cutting of grasses and brush to a height of 2 inches above the existing ground surface. Field crews will use a variety of equipment (e.g. Kubota skip loader with mower, brush chipper, brush trimmer, 500-gallon vehicle-mounted water tank or 2,000-gallon water truck, etc.), as needed, to meet the work objectives. Equipment mobilized to the site will be inspected by TtEC field personnel for work suitability in accordance with established health and safety procedures. Open field areas may be cut with power mowers. All cut vegetation will remain in place or hauled to bare ground areas within the site limits. Mature trees (dominant and codominant crown class), as identified by the Project Biologist, will not be removed and some hand-clearing may be required around them. Large brush/woody multi-stemmed shrubs (stems 2 inches to 10 inches in diameter at breast height) will be evaluated by the Project Biologist prior to removal. Large material (if required) will be mulched and cuttings broadcasted across the site. No off-site disposal of vegetation is planned.

6.6 TOPOGRAPHICAL SURVEYING

A pre-excavation topographical survey will be conducted following vegetation clearing activities to establish horizontal and vertical controls, and to assess the pre-removal site topographic features, such as high and low points and the limits of the excavation area, which will provide the basis for calculating the excavation quantities.

Following completion of excavation activities, all confirmation sample locations will be surveyed, as well and the limits of excavation of the disposal trench, anomaly locations, debris pits and the former Firing-range Berm (if the excavation of the berm extended below existing surface grade).

6.7 MPPEH SURVEY/GEOPHYSICAL SURVEY

A geophysical survey will be performed following a review of any existing as-built drawings and other geophysical investigations that may have taken place in the project area. The geophysical survey will be conducted over the known or suspect areas (e.g., debris pits, disposal trench) where subsurface anomalies may exist at the site and will consist of digital geophysical mapping using state-of-art time domain electromagnetics (TDEM). The survey will be implemented to locate potential buried contamination sources or obstructions (e.g., containers, drums, MPPEH, etc.), to provide information to complete the removal action of potential point source locations, and to provide the maximum protection possible for site workers against exposure to potential sub-surface hazards.

The results of the geophysical survey will be compared to the available as-built drawings to evaluate whether undocumented utilities or other features exist in the work area. Appropriately colored paints (and/or stakes and flags) will be used to mark the identified utilities within the vicinity of the proposed excavation area, and the locations of these utilities will be surveyed so that they can be relocated after the start of excavation.

Initially, several geophysical methods will be tested and the sensor-specific interpretation will be compared with the preliminary excavation results to determine the most appropriate method(s) to use for each subsequent geophysical survey. Methodologies to be tested include magnetometry, frequency and TDEM, and resistivity. These methodologies will be tested to determine and evaluate their effectiveness at locating the targets of interest for the survey, as well as their ability to minimize adverse effects from aboveground cultural features, radio frequency interference, harbor traffic, etc.

6.7.1 Evaluation of Geophysical Methods

The survey area consists of the firing range and the area surrounding it, the potential location of the disposal trench and the potential locations of all the point sources scheduled for removal under this TCRA. The survey areas differ in size and will be marked with appropriate survey markers (e.g., wood lathe, non-metallic pin flags, non-leaded spray paint). The following geophysical equipment will be used for the test program:

- EM61 TDEM instrument
- Geometrics G-858 magnetometer/gradiometer
- GEM 300 frequency domain electromagnetic instrument
- ABEM or Sting resistivity instrumentation

These instruments will be used to acquire data over the area of interest at a line spacing of approximately 3 to 5 feet and a station spacing of 0.1 to 0.75 feet to assess their effectiveness at defining the lateral extent of different types of waste materials. The GEM 300 and resistivity instrumentation will primarily be used to determine the characteristics of the waste materials in the vertical dimension beneath the area of interest. The lateral spacing of resistivity measurements (i.e., soundings) will be consistent with the anticipated depth of waste materials. The EM61 and G-858 will primarily be used to provide information on the lateral changes in waste characteristics.

Each measurement location within the survey areas will have a unique x-y coordinate. A high-resolution, dual-frequency differential global positioning system (DGPS) setup will be used to locate each data acquisition sensor to an accuracy of less than 10 centimeters. Data collected in this manner may be presented as color-coded contour maps, which enables spatial trends and localized anomalies to become more apparent.

In conjunction with the test program, a site features map will be generated using the DGPS system to relate pertinent cultural information (i.e., debris, fences, utilities, etc.) to the geophysical data. This process ensures that these features can be properly accounted for during the data analysis and interpretation phase.

The objective of the data analysis and interpretation phase will be to evaluate the strengths and limitations (i.e., overall effectiveness) of each methodology in determining the following:

- Locating individual and aggregate concentrations of metallic waste
- Locating areas of non-metallic waste
- Providing information on depth characteristics of buried waste
- Susceptibility to site interferences

Data analysis procedures will be used, if necessary, and representative displays of the data generated to substantiate the interpretation process and TtEC recommendation for the geophysical method(s) to be used for the subsequent field program. The electromagnetic instrument (EMI) and magnetic data will be processed and analyzed with appropriate software.

The test program, as described above, provides the best opportunity for success in delineating the subsurface features of interest at IR Sites 1, 2, and 32. If remediation personnel require additional information on the large-scale depth characteristics of waste materials, using the GEM3 or resistivity instrumentation may be warranted. However, these data may not provide useful information depending upon the degree of complexity of the soil and waste characteristics, and the cultural interferences at or near the site.

6.7.2 Geophysical Field Program

It is anticipated that approximately 2 weeks will be necessary to survey the areas of concern with the appropriate instrumentation and provide an integrated interpretation to remediation personnel. Geophysical survey personnel will remain on site after each 2-foot layer of soil is removed to resurvey the area, if needed.

6.7.2.1 Data Acquisition

Approximately three to five locations outside the area of interest at the site will be used as control points for DGPS locations. These locations will be away from any ongoing remediation work and a qualified surveyor will verify the coordinates.

A maximum of two data acquisition teams will be used to perform the geophysical survey over the area of interest using the specific geophysical instrumentation selected. The sample density for most of the instrumentation proposed would be approximately one to three readings per square feet, which is consistent with a line spacing of approximately 3 feet and a station spacing of approximately 0.1 to 0.75 feet. Areas within the site boundaries that may not be surveyed include those characterized by dense/thick vegetation, aboveground man-made obstructions, highly variable localized topography, and slopes in excess of 30 to 35 degrees.

The primary method that will be used to provide navigation and coordinate control for the geophysical instrumentation will be an integrated dual-frequency GPS system used in DGPS mode. This system has the potential to achieve cm-level accuracy in kinematic mode. A GPS base station will be used to provide differential corrections and will be positioned at a site to be determined with the client during mobilization activities. If necessary, simplistic site feature maps will be completed based on information obtained from the DGPS to achieve a more complete understanding of the relationships between the site characteristics and the geophysical data.

Depending upon the specific needs of remediation personnel, areas within each lift that exhibit characteristic geophysical signatures (i.e., regions of high metal content, large isolated objects, etc.) can be relocated and marked with red pin flags or spray paint in order to increase the effectiveness of the excavation program. A DGPS rover unit in real-time kinematic mode will be used to perform this type of relocation. If necessary, an EM61 hand-held will be used in conjunction with the location provided by the DGPS system to further refine and increase the accuracy of some target locations and boundaries. This procedure will ensure that the targets can be relocated.

6.7.2.2 Data Processing

A preliminary geophysical data processing center will be established at the project site. Field data acquired during the geophysical survey will be processed on a daily basis in order to verify that the survey objectives are being met and to allow for quick and cost-effective program modifications to be made in conjunction with the client or remediation personnel, if necessary.

The geophysical data require computer reduction prior to interpretation. The basic processes for reduction of the digitally recorded data are summarized as follows:

1. Data files are output to a computer for checking and editing of proper spatial location, recording interval, and measurement statistics.
2. The data are input into software that merges the DGPS location data with the geophysical measurements. The software assigns an x-y coordinate location to each measurement location.
3. Data are formatted for input into mapping software for analysis and interpretation.

The geophysical survey data will be stored during the project on field laptop computers and a desktop computer at the site-processing center, as well as at the data analysis center. Data will be backed up daily, in the field and at the analysis center on a CDROM. At the end of the project, these digital data will be transferred to the DON.

6.7.2.3 Data Analysis and Interpretation

After the data have been processed and interpreted, targets and features of interest will be identified and transcribed onto a plan map of the site prior to excavation activities for lift. It is anticipated that the data portrayed on the geophysical interpretation map will primarily consist of the accurate delineation of isolated and/or more expansive regions that share similar waste characteristics. Other pertinent information that may be included is locations and trends of subsurface metallic utilities, and the presence of isolated near-surface targets.

If multiple geophysical methods are used at the site, an integrated approach to the analysis and interpretation phase will be implemented, in which targets and features detected by the different methods will be collectively interpreted. This strategy may allow specific targets and regions within the site to be more accurately characterized in terms of the characteristics of the buried wastes, as well as their depth distribution. The geophysical data will also be analyzed and interpreted in conjunction with the lithologic and chemical sampling data existing at the site.

6.7.2.4 Data Reporting

Upon completion of the tasks described above, a short report will be generated and included in the post-removal report to document the activities that were conducted. Specifically, targets and features detected with the geophysical methods will be transcribed onto a master plan map of the site that will be used by the remediation team to excavate individual items or aggregates of materials in a more cost-effective and safe manner.

6.8 EXCAVATION ACTIVITIES

Excavation activities include the removal of previously identified radiological anomalies from IR Sites 1, 2, and 32. Additional excavation activities will be performed in IR Site 1, including the removal of the former Firing-range Berm, debris pits and disposal trench. Excavations in these additional areas will include MPPEH identification and removal in conjunction with the removal of identified radiological anomalies. The approximate areas of excavation are identified on Figures 2-1 and 2-2.

Radiological anomalies will be excavated to remove all radium-impacted waste above background levels, in accordance with the RAOs, or until groundwater is reached, whichever comes first. Excavations that extend beyond 5 feet bgs, for example, the disposal trench, will have sloped sidewalls with a ratio of 1.5 horizontal to 1 vertical (1.5H:1V). Large-size debris will be segregated from the soil during excavation for ex situ radiological surveillance. If necessary to minimize the potential for dust, a water truck equipped with a hose will be used to mist the soil and debris during excavation and segregation. The total in-place volume of soil anticipated to be excavated is approximately 250 cubic yards or 313 loose cubic yards of soil (assuming a 25 percent swell factor) from the disposal trench area, and 5,100 loose cubic yards from the former firing range area. Monitoring for landfill gases and methane will be required during excavation activities and will be conducted in accordance with the SHSP (Appendix A).

This removal action is limited to removal of radium-impacted solid waste, including soils and radiological anomalies, and MPPEH in accordance with the RAOs. Remaining contamination, including groundwater contamination, will be addressed and resolved during the evaluation of further remedial actions at the site, if necessary.

To ensure that removal of all detectable MPPEH items is accomplished, a two-step, 100 percent MPPEH-screening process will be used during the excavation process. The first step in this process will be accomplished during the removal of soil in 6-inch lifts using armored earthmoving machinery (EMM). UXO technicians will manually screen the soil prior to the excavation of each 6-inch lift using common hand tools, ordnance locators, and radiological instrumentation to remove detected MPPEH and radiological point sources. The excavated material will then be transported to a screening pad, laid out in a 6-inch layer, and surveyed ex situ for MPPEH and radiological anomalies. The radiological survey will consist of a 100 percent surface scan survey scan using the LARADS survey system in accordance with SOP 2 (Appendix D-2). Following the removal of any anomalies, the excavated material will then be transported to the screening plant (Trommel) for the second step of the MPPEH screening process. Soils excavated from the disposal trench will not be processed by the Trommel screening plant.

The second step of the MPPEH screening process will consist of processing the surveyed excavated soil using an on-site Trommel-type screening plant. The plant will be located on a pad constructed for this purpose in the vicinity of the disposal trench, the former Firing-range Berm, and the debris pits, excavation areas adjacent to the stockpile area. The most likely location is the former skeet range located immediately south of the former small arms range. The screen plant pad will be located within an established exclusion zone. The Trommel will be fitted with a 6-inch vibrating Grizzly and at least one rotating screen drum, or two concentric drums, if a plant with such a configuration can be located locally. The inner drum (if the 2-drum configuration is employed) will be equipped with a 4-inch by 6-inch screen, the outer drum will have a ¾-inch by ¾-inch screen. The soil being processed through the screening plant will be segregated by size and stored in stockpiles pending chemical and radiological characterization for off-site disposal.

In areas not suspected to contain MPPEH items, RCTs will perform the radiological survey of the soil prior to and after its excavation. For areas known or suspected to contain MPPEH items (i.e., the disposal trench, the former Firing-range Berm, and the debris pits), UXO technicians will manually screen the soil prior to excavation of each 6-inch lift using common hand tools, ordnance locators, and radiological instrumentation to remove detected MPPEH and radiological point source items. The EMM will be equipped with blast shields to allow non-UXO equipment operators to operate the equipment. The construction type and thickness of the blast shield authorized by the U.S. Army Engineering and Support Center, Huntsville, for the specific munition with the greatest fragmentation distance (MGFD – the 20mm HE-filled projectile) will be one of three types shown in Table 6-1.

6.8.1 Removal of Radioactive Material

The area within a 5-foot radius (10-foot diameter) of the target anomalies, previously identified during site studies, will be surveyed in accordance with SOP 1 (Appendix D-1) using a 2-inch by 2-inch NaI scintillation probe coupled to a survey meter (or equivalent) to identify the specific location of each anomaly. Each location with an elevated radiation level will then be excavated with hand-digging tools, and radioactive contaminants will be removed as discussed in this section.

Typical removal actions for previously identified potential radioactive anomalies will involve an area within a radius of 1.5 meters (5 feet) (3-meter [10-foot] diameter) around the coordinates of the suspected radioactive material. Under RCT oversight, the location with an elevated radiation level will be excavated using a small backhoe fitted with a smooth blade bucket and/or hand-digging tools. Soil removal will continue until the source of the elevated gamma activity is removed or a depth of 12 inches is reached. Following removal of the source of elevated gamma activity, an additional 12 inches of soil in all directions from the source will also be removed. This soil will be considered radiologically impacted and segregated and packaged for eventual off-site disposal. After the radioactive material and surrounding soil is excavated, the resulting pit will be rescanned by the assigned RCT to the extent practicable using the LARADS to allow the scan data to be utilized to update the existing site survey data. If elevated gamma emitters persist, further examination of the soil will be made until the source of high gamma activity is found and removed in accordance with the RAOs.

Following the removal of the radiological anomaly, remaining soils within the 1.5-meter (5-foot) radius surrounding the anomaly will be excavated in 6-inch lifts and surveyed directly in the excavator bucket prior to being removed from the excavation location. The assigned RCT will perform a scan survey of the contents of each bucket of material. If a point source is present, it will be removed along with the remaining soil in the bucket and packaged for eventual off-site disposal by a certified waste broker consistent with the requirements specified in Section 7.4.5. If a bucket of soil is identified that exhibits elevated levels of radiation, but no specific point source can be identified, the soil in the bucket will be placed directly into a roll-off container for storage and subsequent disposal by a certified waste broker through the DON's LLRW Program. If a bucket of excavated material does not exhibit levels of radiation, it will be placed into a dump truck for subsequent screening at the screening pad.

At the screening pad, the soil will be spread across the pad in a 6-inch layer and a radiological screening survey of the material will be performed. The radiological survey will consist of a 100 percent surface scan survey scan using the LARADS survey system in accordance with SOP 2 (Appendix D-2). Any locations where a radioactive anomaly (greater than 3-sigma above background) is identified, will be investigated and associated point sources and/or contaminated soil/debris will be removed. The construction of the screening pad is discussed in Section 6.8.4.

Each 6-inch soil lift will be excavated, surveyed, and sampled to ensure that radioactive soil is properly disposed off site. Radiologically contaminated material identified during surveys or sample analysis will be placed in storage containers, pending disposal. Radioactive materials recovered during field activities will be controlled and managed under the TtEC NRC license. Once TtEC demobilizes from the site, radioactive material will be turned over to the DON and managed under the DON NRC license.

Large-sized debris will be segregated from the soil when encountered and screened separately for radioactivity and proper disposal. Debris may include small tree roots, vegetation, small pieces of asphalt, concrete, wood, lumber, metal objects, plastic, glass, or other similar waste material. The debris will be surveyed to preclude release of radioactive materials that may be affixed to the surface areas of the debris. Any alpha contamination in excess of the site free release limits of 20 dpm removable and 100 dpm fixed or beta/gamma contamination in excess of the site free release limits of 200 dpm/100 cm^2 removable and 1,000 dpm/100 cm^2 fixed will be recorded in a field logbook.

Excavated soil with a gamma radiation count exceeding 3-sigma above background will be placed in a B-25 container box for further testing, characterization, and disposal. Soil with gamma radiation counts equal to or less than 3-sigma above background will be placed in a soil stockpile constructed pending subsequent disposal. Large debris cleared of radioactive-containing material will be placed in roll-off bins that may be temporarily stored on site pending transport to a CERCLA Off-site Rule-approved landfill for disposal. The radiological point sources (such as radium-containing dials) will be packaged in metal drums in accordance with DOT regulations specified in 49 CFR, Subpart I, and will be stored in a designated and posted radioactive material storage area. Additional details on management of radiological point source wastes are also discussed below.

Radioactive waste, including any identified mixed waste, will be properly stored on site pending disposal by a certified waste broker through the DON LLRW Disposal Program. Excavated soils that are not radioactively impacted will be placed into stockpiles and characterized for proper disposal at CERCLA- approved landfills.

Soil stockpiles will be managed per Sections 6.8.4 and 7.4.1 and the SWMP (Appendix E) and sampled for laboratory analysis in accordance with the SAP (Appendix B). Following waste characterization, non-radiologically contaminated soil or debris that has been radiologically cleared will be placed in roll-off bins for transportation to and disposal at a CERCLA Off-site Rule-approved landfill in accordance with Appendix G, Transportation and Disposal Plan.

A spotter will be used at all times during excavation activities. The spotter will be a UXO technician trained in recognizing, point sources, buried drums, underground utilities, and unexploded ordnance. In the event that buried drums, containers, and/or jars are encountered during excavation activities, they will be removed, characterized, and packaged for off-site removal in accordance with Appendix D-10, Drum Handling Procedures.

Personnel, tools, materials, or equipment will be frisked prior to leaving the area and after sampling. Frisking will be performed in accordance with Appendix D-7, Radiological Protective Clothing Selection, Monitoring, and Decontamination, and Appendix D-5, Release of Materials and Equipment from Radiologically Controlled Areas. Release criteria will be consistent with those used for the release of equipment and materials: 20 dpm/100 cm^2 removable and 100 dpm/100 cm^2 fixed.

6.8.2 Excavation of Disposal Trench

The boundaries of the disposal trench are based on the location sited for the trench cited in the 1983 Initial Assessment Study. There is currently no direct evidence as to where the disposal trench is located at IR Site 1. However, based on the information in the 1983 Initial Assessment Study and the surface scan survey performed by TtEC in 2004 and the 1999 surface scan survey performed by the DON Supervisor of Shipbuilding, Conversion and Repair, Portsmouth, Virginia, Environmental Detachment, the unlined trench location is estimated to be approximately 250 feet north of the former Firing-range Berm. The radioactive material was disposed in an unlined trench 50 feet long, eight feet deep, and approximately 11 feet wide north of the rifle range, approximately 50 feet north of the aboveground water outlet.

The excavation will commence at the boundary of an excavation area and proceed inward. During the performance of the surface surveys, different radiological and geophysical instrumentation will be used to detect the radioactive material and various forms of MPPEH that may be present in the top 6 inches of soil that constitute the first lift to be excavated. Radiological material identified at greater than 3-sigma above background and any MPPEH detected in the first 6 inches of soil will be flagged. All flagged areas will be investigated to determine the source of the radiation and/or MPPEH to remove it. After each source of elevated activity reading is removed, an additional 12 inches of soil around the soil around the source will also be removed. If gamma radiation levels greater than 3-sigma above background levels persist after identifiable point source items are removed, additional soil excavation will be required in those areas to expose, locate, and remove the contamination.

When all detected MPPEH and radiological anomalies have been investigated and removed, an EMM will be used to excavate the top 6 inches of soil within the excavation area and place it in a dump truck. This process will continue in 6-inch lifts until a targeted depth of 8 feet bgs or groundwater is reached, whichever is encountered first. Soils located outside the excavation area boundary may be required to be removed during the excavation to maintain the appropriate sidewall slope. These soils will be handled and managed as potentially impacted soil.

When each dump truck has reached capacity, the excavated soil and debris will be transported to a screening pad located adjacent to the Trommel-type screening plant. The excavated material will then be placed in 6-inch lifts on the screening pad and will be surveyed again for both radiological anomalies and MPPEH. Once the second survey of the excavated material is completed on the screening pad and all anomalies have been extracted and removed, the screened soil will be turned over on the pad and spread again into a 6-inch lift. The soil will be surveyed ex situ a second time on the pad for MPPEH and radiological anomalies. Soils excavated from the disposal trench will not be processed through the Trommel screening plant. Once all anomalies have been removed, if any, the screened soil will be stockpiled, characterized, and disposed off site at a CERCLA-approved TSDF. Stockpile management is discussed in Section 6.8.6. Storage and disposal of point sources and MPPEH are discussed in Section 6.14.

When the targeted depth of the excavation is reached (8 feet bgs or groundwater, whichever is encountered first), a radiological survey will be conducted along the excavation bottom and sidewalls. If radiologically impacted materials are still present at 8 feet bgs or if groundwater is encountered, then excavation activities will stop and the DON (RASO/RPM) will be notified and TtEC will wait for further direction.

6.8.3 Excavation of Former Firing-range Berm and Debris Pits

The excavation effort at the former Firing-range Berm will begin at the top of the berm and proceed vertically downward, removing the soil in 6-inch lifts. Removal activities for the debris pits will commence after the completion of a geophysical survey of the area in the vicinity former Firing-range Berm for the debris pits. Interpreted results from the survey will be used to establish the approximate boundaries of the debris pits.

The excavation will begin at one terminus of the debris pit, removing the soil in 6-inch lifts. Radiological and MPPEH scans of the debris pits will be completed on the ground surface before the removal of each lift. Following that process, EMM will remove the top 6 inches from the top of the berm or debris pit and place it in a dump truck or in a loader bucket. The next layer of the berm or debris pit will be surveyed with radiation detecting instruments again, and the next 6 inches of soil will be removed. This process will be repeated until the entire berm or debris pit has been removed.

A 200-foot exclusion zone will be established while an armored excavator removes the soil and places it into a dump truck. The cab of the truck will be completely shielded from the excavation by the dump bed. When full, the truck will transport the soil and deposit it in 6-inch lifts on a screening pad. Following soil screening, the radiological screened soil will be transported to a feeder stockpile adjacent to the Trommel-type screening plant that will be used for this project, and an armored front-end loader will then be used to relocate the soil from the screening pad to the stockpile and then to the feed hopper of the Trommel. Details of the soil screening are outlined in Section 6.8.5. Figure 2-1 shows the location of the stockpile area and the approximate location of the screening plant. Stockpile management and screening are discussed in Sections 6.8.4 and 6.8.5, respectively. Storage and disposal of point sources and MPPEH are discussed in Section 6.9. Additional details regarding the recovery, processing and disposition of MPPEH is provided in Appendix D-11, MPPEH Removal.

6.8.4 Screening Pad

A 75-foot by 75-foot pad (or pads) for spreading excavated soils and debris will be constructed on the project site. The location of the screening pad will be in the vicinity of the firing range. The pad will be used to examine the soil/debris for MPPEH items and radiological sources. The soil and debris screening pad will be constructed of two 20-mil layers of polyethylene (PE) liner or PVC liner separated by a layer of course sand. Prior to constructing the screening pad, the pad area will be cleared of rocks, debris and other items that could potentially puncture the lower PE liner. The first layer of the PE liner will be placed directly on the ground surface followed by a 6-inch layer of sand or clean imported fill spread evenly over the liner. A second layer of 20-mil PE liner will then be placed over the sand layer. The purpose of this design is to prevent puncture of the layers, thereby preventing any contaminated soil or leachate from coming in contact with the native soil. The screening pad will be bermed with sandbags or dirt berm. Sumps will be installed to collect any water that may leach out from the contaminated soil spread over the pad. A temporary storage tank with appropriate secondary containment or double-walled on-site tank will be used to collect any leachate that accumulates in the screening pad sump. Any soil and debris that is staged on the pad overnight will be covered to minimize the spread of contamination.

6.8.5 Soil Screening

Once the soil has been surveyed for radiological material and MPPEH, and excavated from the former Firing-range Berm and debris pits, it will be mechanically processed through a Trommel screening plant. The Trommel will be fitted with a 6-inch vibrating Grizzly and at least one rotating screen drum. Two concentrical drums may be used if a plant with that configuration can be located. The inner drum (if the 2-drum configuration is employed) will equipped with a 4-inch by 6-inch screen, the outer drum will have a ¾-inch by ¾-inch screen.

The second step in the MPPEH screening process will occur when the soil is mechanically processed through the screen plant as follows:

An armored loader will be used to place the soil onto a Grizzly with 6-inch bars situated atop the Trommel screen plant feed hopper. All soil clumps and objects larger than 6 inches will drop off the back of the Grizzly onto a small stockpile, while soil and debris smaller than 6 inches in size will pass through the Grizzly and be transported on a conveyor to the feed hopper of the inclined, rotating screen drum(s). Figure 6-2 provides a drawing of the screening plant configuration.

- In a Trommel with a two-screen configuration, objects larger (oversized) than 4 inches by 6 inches (screen size) will pass directly through the Trommel on the inside drum screen and deposited on stockpile there. Objects smaller than the inside screen (4 inches by 6-inches) will pass through it, and land on the outside drum screen which has screen mesh ¾ by ¾ inches in size. Soil that is ¾-inch and smaller (fines) will pass through the outside drum screen, drop onto an internal conveyor at the bottom of the Trommel and be sent to a separate stockpile. Objects larger than ¾-inch will be conveyed from the side of the Trommel by a third conveyor, into the back of a dump truck. UXO technicians will monitor the > ¾-inch oversized material conveyor from an armored observation point.
- All of the oversized material rejected from the screen plant (greater than 6 inches, greater than 4 inches by 6 inches, greater than ¾-inch) will be stockpiled for later sampling and transportation. UXO technicians with metal detectors and radiological instruments will inspect all of the oversized material for MPPEH items and radiological sources, and the PQCM will visually observe this effort on a random basis, The quantity of oversized materials will be tracked as it accumulates, and when each stockpile is approximately 0 cubic yards in size, a QC check of the screened materials will be performed. Four dump trucks (each with 20-cubic-yard boxes) will make a lot, or an 80-cubic-yard stockpile. For the purposes of the QC check, each 80-cubic-yard stockpile of oversized materials will be

considered a lot. An armored front-end loader will remove 2 buckets (4 cubic yards, 10 percent of the accumulated soil and debris) from random locations in each stockpile and spread it in a 6-inch layer on the lay-down pad. UXO technicians and RCT(s) will manually screen the layer for radiological sources and MEC/MPPEH. If neither are found, the lot is accepted and the entire stockpile may be relocated from the lay-down pad to "clean" stockpiles. If a MEC/MPPEH item is found, the lot is rejected and the entire stockpile must be re-processed through the Trommel. If a radiological source is found, the lot is also rejected, and the entire stockpile must be placed in a 6-inch layer on the lay-down pad, manually surveyed with radiological instruments, and sampled again.

The UXO technician(s) monitoring the oversized materials from the Trommel will be stationed next to the conveyors that transport the oversized materials. Plexiglas/Lexan/Glass armor will be mounted in a manner that will shield the UXO technician observing the conveyors, and kill switches to halt the screen plant if MPPEH items are observed will be mounted on the screen plant, the conveyors and on the deck of the observation platform. The UXO technician will continuously check the oversized materials from the screen plant for MPPEH items. A loader may be used to transport soil clumps and other debris that do not break down after passing through the screen plant to the feed hopper for reprocessing. Items that do not break down after several passes through the screen plant will be inspected with radiological instruments and metals detectors to determine if MPPEH or radiological items might be present inside the clumps. Those clumps that test positive for containing metal and/or radiological contamination will be stockpiled for later manual disassembly.

The process of pre-scanning and excavating the soil in 6-inch lifts, processing it through the screen plant, monitoring the oversized materials (greater than ¾-inch), and manually screening the large oversized materials will be repeated until the depth of the excavation is reached.

A 200-foot exclusion zone will be established around the screening plant, and all personnel not involved in processing the soil will remain outside exclusion zone perimeters while the processing is taking place. UXO technicians and equipment operators in armored EMM involved in the processing will be the only personnel permitted within the exclusion zone. If visitors or nonessential personnel are required to enter the exclusion zone, the SUXOS or SHSS will direct the processing operation to cease until the processing area is free from nonessential personnel.

6.8.6 Soil Stockpiles

Excavated soil not impacted by radioactive material, as supported by surveying and sampling, will be placed in a soil stockpile containment area constructed at within IR Site 1 (Figure 2-1). The stockpile containment pad will be constructed of two layers of 20-mil HDPE or PVC liner. The purpose of the design is to prevent puncture of the liner, thereby preventing any contaminated soil or leachate from coming into contact with the native soil.

Prior to construction of the stockpile containment area, the ground surface will be cleared of rocks, debris, and other items that could puncture the lower liner. The ground surface will then be surveyed by a qualified RCT for the presence of radioactive materials. In accordance with the SWMP (Appendix E), the stockpile area will be bermed to prevent surface water runoff from coming into contact with the stockpiled material in accordance with the RCRA staging pile regulations of 40 CFR, Part 264.554, and Section 25123.3 of the California Health and Safety Code provision for stockpiling of non-RCRA hazardous soil. A 6- to 8-inch-high berm will be constructed surrounding the stockpile area. The 20-mil HDPE or PVC liner will be extended over the berms surrounding the stockpile pad. In addition, to prevent rainwater from coming into contact with the stockpiled soil and to minimize wind dispersion of particulate matter, the stockpile will be covered with a 10-mil liner and secured with sandbags at the end of each workday.

Excavated soil from each of the individual 6-inch lifts may be segregated into separate stockpile segments. As necessary, liners will be used to isolate soil from the different lifts that are placed in adjacent portions of the stockpile area. Metal debris and associated high-metal concentrations will be removed and disposed. Soil visually stained with hydrocarbons will be segregated and disposed. Radioactive and mixed wastes will be staged separately and the area clearly demarcated as a radiologically controlled area.

Four types of material will be stored in stockpiles pending characterization sampling results, as follows:

- The "fines" – soil smaller than ¾-inch in size
- The "overs" – soil and debris greater than 4 inches by 6 inches in size (if a double screened Trommel is used)
- The "overs" – soil and debris larger than ¾-inch in size
- Large debris greater than 6 inches in size

The material/soil from each excavation will be stockpiled separately and later individually characterized for waste characterization purposes. Initially, these stockpiles will be allowed to increase in size to approximately 100 cubic yards on laydown pads. When that size is reached, a bulldozer or loader (or other EMM) will be used to spread the soil into an approximately

6-inch-thick layer. RCTs will then survey the layered soil with the towed array or hand instruments. When the soil has been completely screened, it will be loaded and transported to the stockpile area for later characterization sampling. BMPs used for stockpile maintenance are discussed in the SWMP (Appendix E).

6.9 MPPEH MANAGEMENT

All munitions-related materials are considered MPPEH until they undergo a dual inspection process where they are certified and verified to contain or not contain explosives or energetic materials, and are assigned an explosives safety status of either *safe* or *hazardous*. Items that do not contain explosives or energetic materials (*safe)* are re-designated as munitions debris (MD) or munitions constituents (MC). Items that contain explosives are re-designated as munitions and explosives of concern (MEC) in the form of UXO, discarded military munitions or MC. In addition to the explosives safety status, MPPEH explosion contamination falls into one of 3 categories: 5X, 3X, or 1X. Those items categorized as 5X are completely decontaminated, entirely safe, and are not considered MPPEH. Material categorized as 3X is expected to be free of explosion hazard but not enough information is available to certify it as *safe*. Material categorized as 1X is contaminated or partially decontaminated and expected to present an explosion hazard. Items categorized as 1X and 3X are MPPEH. All munitions-related material is considered 3X until the inspection process takes place, and 3X material must be handled and treated as ammunition and explosives.

MPPEH will be encountered during the excavation of the former Firing-range Berm and debris pits and may also be encountered during other excavation activities part of the TCRA. MPPEH processing, storage, demilitarization and safety are discussed below. An ESS has been prepared in accordance with Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8020.15 (series) and is provided as Appendix F. The ESS provides additional details regarding MPPEH management.

6.9.1 MPPEH Processing

MPPEH Safe to Move

The potential for encountering MPPEH items, in the form of 20mm projectiles, is very high. They routinely percolate to the surface from the burial pits after rain events or very high tides. Other forms of MPPEH may be encountered during the excavation of the former Firing-range Berm, which will include a disposal area. Each MPPEH item will be identified and examined to determine if it is MD or MEC. Those that are considered to be MD will be placed into containers at a collection point near the excavation site and taken to Magazine M354 for storage at some point during the work day. The determination as *safe*, and the certification/verification as 5X is planned to occur on a daily basis, the intent being to avoid the accumulation of 3X items and the associated requirements for their storage. MPPEH and radiologically impacted material collected during excavation activities will be segregated and stored in the designated area separately.

MEC

The Travis Air Force Base Explosive Ordnance Disposal (EOD) Detachment or Moffett Army EOD detachment will be notified if MEC items are encountered. The SUXOS will make this determination. Those items will be cordoned off until the EOD Detachment can respond to conduct on-site, blow-in-place (BIP) procedures. BIP procedures will require the notification of several agencies to coordinate the events that must take place before the intentional detonation can occur. A Quantity/Distance (Q/D) arc for the BIP procedure will be determined based on the Tables 13-1 or 13-2 of NAVSEA OP 5 (NAVSEA, 2006), but not less than 1,250 feet. All non-essential personnel within the Q/D arc will be removed before the demolition operations take place. The SUXOS and other UXO technicians will assist the EOD Detachment in preparing for the event as required.

Demilitarization

When the project is completed, the accumulated MPPEH items will require demilitarization prior to their final disposition. The 20mm target practice (TP) projectiles that are anticipated to be recovered will be cut into several pieces with a reinforcing-bar cutter. Other MPPEH items, if any are found, will be demilitarized in accordance with DoD Instruction 4160.21-M-1 (DoD, 1991). The certification/verification process and demilitarization of the projectiles will take place in Magazine M353, which will have a 200-foot EZ established while these activities are taking place.

Magazine Operations

Magazine M354 will be used to store MPPEH and material certified as *safe*. The magazine has site approval for storing MPPEH and a site approval request has been submitted to NOSSA for processing MPPEH in Magazine M353. A net explosive weight (NEW) limit of 100 pounds of Hazard Category/Division 1.1, explosives will be used for Magazine M354. An inventory of MPPEH items stored in the magazine(s) will be maintained to ensure the NEW limit is not exceeded. A 500-foot Explosive Safety Quantity-Distance (ESQD) arc has been established for the magazine.

The SUXOS will ensure that the types of MPPEH items (if more than one type is found) stored in the magazine(s) do not pose a hazard when they are stored together. Only MPPEH material that is compatible with other types of MPPEH may be stored together. Table 3-10 of NAVSEA OP 5 (NAVSEA, 2006) provides guidance on what types of ammunition and explosives, by compatibility group, may be mixed in storage.

The requirements for magazine exits and the use of a red flag when the magazine is being used, housekeeping, signage, security fire breaks and physical condition regulations, provided in NAVSEA OP 5 (NAVSEA, 2006) or DDESB Instruction 6055.9-STD (DoD, 2004) will be followed to the greatest extent possible. A high-security lock will be used to secure the magazine(s) and the gates to the magazine area will also be kept locked when the magazine(s) are not being used. A map of the magazine area with the associated ESQD arcs can be found in Figure 6-3.:

6.9.2 MPPEH Safety

This section provides general safety precautions for MPPEH operations:

- Know and observe federal, state, and local laws and regulations that apply to the transportation, storage, and usage of explosives.
- Do not permit metal truck bodies, to contact explosive containers.
- Do not transport metal, flammables, or corrosive substances with explosives.
- Do not allow smoking, or the presence of unauthorized or unnecessary persons, in vehicles containing explosives.
- Do not store explosives, fuses, or fuse lighters in wet or damp places, or near oil, gasoline, cleaning solution or solvents, or near radiators, steam pipes, exhaust pipes, stoves, or other sources of heat.
- Do not store any sparking metal or sparking metal tools in an explosive magazine.
- Do not permit smoking, matches, or any source of fire or flame in or near an explosive magazine.
- Do not allow leaves, grass, brush, or debris to accumulate within 50 feet of an explosive magazine.
- Do not permit the discharge of firearms in the vicinity of an explosive magazine.
- Do not place MPPEH where they may be exposed to flame, excessive heat, sparks or impact.
- Do not expose MPPEH or devices containing MPPEH, to the direct rays of the sun. Such exposure increases sensitivity and deterioration.
- Ensure that MPPEH are returned to their proper containers and the containers are closed after use.
- Do not carry MPPEH or explosive components in pockets or elsewhere on the body.
- Carefully load and unload MPPEH from vehicles. Never throw or drop MPPEH from the vehicle.
- Do not drive vehicles containing MPPEH through cities, towns, or villages, or park them near such places as restaurants, garages, and filling stations, unless absolutely necessary.

- Store MPPEH only in a magazine that is clean, dry, well-ventilated, reasonably cool, properly located, substantially constructed, bullet- and fire-resistant, and securely locked.
- Ensure that the exclusion zone is clear of any unauthorized personnel before beginning activities involving MPPEH.
- Do not handle, use, or remain near MPPEH during, or during the approach of an electrical storm. Store MPPEH in the magazine when inclement weather is forecasted.
- Do not transmit on a radio within the hazardous of electromagnetic radiation to ordnance distance of that radio. Do not turn the cellular telephone within 10 feet of any MPPEH.

The two-man rule shall apply whenever MPPEH is handled or transported and during disposal or treatment operations on or off the range.

6.10 POST-EXCAVATION SAMPLING

Post-excavation samples for the disposal trench will be collected following establishment of a grid system along the excavation bottom, including sloped sidewalls. One sample will be collected at a randomly located point within a 25-foot by 25-foot grid cell of the excavation bottom, and one random sample will also be collected from the perimeter sidewall every 25 linear feet. For the radiological anomaly excavations, due to the limited lateral size of the excavation (5-foot radius), one sample will be collected from the floor of each excavation. Samples will be scanned for radionuclides by the on-site field gamma spectroscopy system to verify the presence of radioactivity. The sample will be sent to an off-site laboratory for gamma spectroscopy in accordance with EPA 901.1. In addition, 10 percent of the samples analyzed by gamma spectroscopy will be analyzed for strontium-90 (^{90}Sr) in accordance with the Department of Energy (DOE) Sr-01/Sr-02 method. These confirmation samples will not be analyzed for chemical constituents. The SAP (Appendix B) details post-excavation sampling requirements and procedures.

In addition to collecting and analyzing samples from the excavation bottom and sidewalls of the disposal trench and anomaly excavation sites, a 100 percent high-density gamma scan will be performed at these areas. The lateral extent of the disposal trench excavation will be over-excavated in 1-foot step-outs when 1) the initial post-excavation sample results from a sidewall sample are 3 sigma above background or 2) radiological surveys identify an area with radioactive contamination above the 3 sigma above background. If over-excavation is performed, then additional samples will be collected from that perimeter sidewall. The vertical extent of the excavation of the disposal trench will not be over-excavated since the site is being excavated to groundwater.

6.11 STOCKPILE CHARACTERIZATION

Soil stockpiles generated during excavation activities that do not contain radioactive contaminants, radioactively contaminated materials, including low-level mixed waste, discrete radioactive point sources, and wastewater from dewatering, decontamination will require characterization for disposal. Waste characterization sampling procedures are detailed in the SAP (Appendix B).

Stockpiled soil that does not exceed radiological readings of 3 sigma above background will be sampled to characterize the soil. Soil samples will be collected from this material at a frequency of two samples per 100 cubic yards. The samples will be sent to an off-site laboratory and analyzed for metals, gamma spectroscopy, and 10 percent of these soil samples will also be analyzed for VOCs; SVOCs, including PAHs; pesticides; PCBs; total extractable petroleum hydrocarbons (TPH-extractable), and ^{90}Sr. Asbestos, Soluble Threshold Limit Concentration (STLC), and Toxicity Characteristic Leaching Procedure (TCLP) will be added as applicable.

Soil that is identified as radioactively contaminated, including low-level mixed waste or mixed waste, will be stored in B-25 boxes or bins that are up to approximately 20 cubic yards in size and sampled to characterize the soil for disposal. Samples will be collected from the containers at a frequency of two samples per container. The samples will be analyzed by the DON's selected waste broker for chemical analyses to meet the requirements of the disposal facility. These analyses may include VOCs; SVOCs, including PAHs; pesticides; PCBs; Title 22 metals; TPH-extractable; and radionuclides, as well as asbestos, STLC, and TCLP.

6.12 BACKFILL PLACEMENT AND COMPACTION

Following completion of post-excavation sampling and prior to placement of imported backfill, a topographical survey will be performed, and then an 8-ounce layer of geotextile will be placed over the bottom and sidewalls of the excavation. The geotextile layer will function as an excavation boundary indicator.

All excavated material (soil, debris, and so forth) will be disposed off site and will not be used to backfill any excavation. The excavations will be backfilled with clean import material. Backfill will be placed in the excavation in 12-inch lifts. Where possible, the backfill material will be compacted by wheel or track rolling to a firm, unyielding condition (no rutting) and verified by the PQCM. No compaction testing shall be conducted as part of this TCRA. The final 6 inches of backfill will not be compacted but will be graded to match the surrounding elevation for site restoration.

Once all excavations have been backfilled to the existing grade, a topographic survey will be performed by a licensed land surveyor. The survey will document existing surface features and conditions in sufficient detail to generate a topographic map with 1-foot contour intervals.

6.13 SITE RESTORATION

Upon completion of backfilling activities, the excavation area will be reseeded with native vegetation. Hydroseeding will be performed, if necessary, with a predetermined seed mixture following the addition of soil conditioners and amendments. All seeding activities will be closely coordinated with the RPM.

6.14 DECONTAMINATION OF EQUIPMENT AND FREE-RELEASE SURVEYING

As part of the demobilization activities, free-release surveys will be conducted on all equipment, tools, and storage areas prior to their demobilization and decommissioning. The instruments that will be used for free-release surveys will be an Eberline E-600 with a SHP380AB probe (or equivalent). Smears will be taken and counted with the Eberline Hand Ecount dual-range scaler (or equivalent). Survey details and measurement results will be recorded in the field logbook and the results included in the radiological release survey report and the radiological release log. Free-release criteria for alpha contamination of less than 20 dpm/cm^2 for removable contamination and less than 100 dpm/cm^2 fixed contamination and for beta/gamma contamination of less than 100 dpm/cm^2 for removable contamination and less than 1000 dpm/cm^2 fixed contamination will be specified for the site.

Survey elements for excavators, dozers, and similar-type heavy equipment will include surface scans and removable contamination smears taken at the cab interior, under-carriage, tracks, stick, and bucket's interior and exterior surfaces. Survey elements for loaders and backhoes, and similar rubber tire equipment will include surface scans and removable contamination smears taken at all four tires, the front loader bucket interior and exterior surfaces, left and right hydraulic stabilization pads, the backhoe bucket interior and exterior surfaces, and cab interior. Hand tools used for radium-containing material removal will be surveyed for free release. Tools include shovels, pry bar, pick, broom, and similar items. If equipment survey results are below the site free-release criteria, the equipment will be released to the equipment rental vendor.

6.15 DEMOBILIZATION

Demobilization will consist of surveying, decontaminating and removing all construction equipment and material, cleaning the project site, inspecting the site, and issuing a certification of completion. Demobilization activities will also involve collection and disposal of all contaminated material, including decontamination water and disposable equipment for which decontamination is inappropriate.

Prior to removal from the project area, all decontaminated equipment and material will be inspected and accepted by the ROICC, Site Health and Safety Specialist (SHSS), and the Site Superintendent. These individuals will certify that decontamination was performed for all equipment and material. A copy of each decontamination certificate will be provided to the ROICC and vendors, if requested. The original certificate will be maintained in the project file.

Site cleaning activities will include repair of any erosion or runoff-related damage; grading of all areas used for construction; removal of all material such as excess construction material, wood, debris, and other foreign material; and removal of all construction equipment and storage boxes.

Once all construction equipment and material have been removed from the project site, the ground surface impacted by the TCRA activities will be surveyed for gamma-emitting radionuclides. Data obtained from the mobilization survey will be compared to the data collected during the demobilization survey to ensure that radioactive materials have not been relocated or additional radioactive contamination has been introduced to the areas used to perform the removal actions.

The RPM and Navy Technical Representative (NTR) will conduct a pre-final inspection during demobilization activities. Any outstanding items will be noted in the punch list and will need to be corrected prior to the final inspection.

7.0 WASTE MANAGEMENT PLAN

The purpose of this Waste Management Plan (WMP) is to present the waste management practices and procedures to be followed for the types and quantities of waste expected to be generated during the implementation of the project. The WMP identifies waste management activities conducted during the storage and the preparation and/or disposal of waste (including waste characterization, packaging, storage, and management while in storage). The transportation and disposition of waste materials at appropriate disposal and recycling facilities is also included. It is the responsibility of the PjM to verify that all project personnel are aware of the requirements stipulated in this plan.

The WMP provides information on how wastes, including potentially hazardous wastes such as excavated soil, contents of buried drums and containers (if encountered), PPE, and decontamination water associated with project activities, will be managed and disposed. Potential radioactive and mixed waste will be generated during site activities; however, the DON's selected broker will be responsible for the transportation and disposal of all radioactive waste generated during this TCRA activities. The DON is also responsible for the transportation and disposal of demilitarized MPPEH. In addition, a secondary goal of this section is to ensure that waste minimization practices are followed, to the extent practical, to reduce the volume of waste that will be generated, stored, and removed from the site for disposal.

The WMP is also a primary component of the TtEC Compliance Program, which includes on-site environmental compliance inspections. The WMP will be revised if the scope of this project or the applicable regulations change.

7.1 PROJECT WASTE DESCRIPTIONS

Potential waste streams associated with the removal activities at IR Sites 1, 2, and 32 are categorized as follows:

- Contaminated soil (RCRA, non-RCRA hazardous waste and non hazardous) excavated during the removal action
- LLRW including soil and point sources
- Hazardous contents (liquids and solids) from buried containers (if encountered)
- Oversized contaminated debris - rock, wood, piping, concrete, scrap metal, drums and other containers
- Wastewater, including impacted stormwater runoff, and fluids from equipment and personnel decontamination
- Non-hazardous solid waste, such as trash, empty calibration gas canisters, and inert construction debris

- Used oil (including motor oil, hydraulic fluid, greases, antifreeze/coolant, etc.), oil filters, fuel and air filters from equipment maintenance operations
- Decontamination pad solids/sludges
- Used PPE
- Used polyethylene liners from soil stockpiles and screening pad
- Demilitarized MPPEH

7.2 WASTE MANAGEMENT

Per the Feasibility Study (BEI, 2005b) and RI (Battelle, 2006), the substantive requirements of the state and federal hazardous waste generation, characterization, storage, treatment, and management regulations of tit. 22 Cal. Code Regs., Sections 66261, 66262, and 66264 and tit. 40 CFR, Parts 261, 262 and 264 are applicable to the management of hazardous wastes generated during the removal action and associated project activities. A summary of the key aspects of the waste management program is provided below.

7.3 WASTE CLASSIFICATION

Unless excavated soil, and container contents removed from the excavation are predetermined to be hazardous waste, tit. 22 Cal. Code Regs., Section 66261 and Part 261, 40 CFR requires a determination of whether or not the materials are a hazardous waste. Where a clear hazardous waste determination cannot be made, the materials will be sampled in accordance with the SAP (Appendix B). A determination will then be made as to whether the material is a listed hazardous waste, a characteristic waste based on the criteria for ignitibility, reactivity, corrosivity, or toxicity. The California state requirements for determining whether a waste is hazardous under the toxicity characteristic requires a SLTC leaching procedure and a totals analysis for certain inorganics and organics that is generally more conservative than the federal TCLP. California also has additional hazardous waste classification criteria (including 24-hour fish bioassays) that may need to be considered on a case-by-case basis. Therefore, some wastes may be considered hazardous wastes under California regulations and not under federal regulations. These wastes are referred to as non-RCRA wastes.

Based on current analytical data for the area, the soil to be excavated may be a RCRA or a non-RCRA hazardous waste due to concentrations of certain constituents (e.g., inorganics such as lead, etc.) that exceed hazardous waste levels. Excavated soil will be characterized to determine if it is a hazardous, non-hazardous, or mixed waste and to determine the appropriate disposal options. Excavated soil will be sampled and analyzed for VOCs, PAHs, pesticides, PCBs, TPH, metals, ^{226}Ra, and ^{90}Sr and when necessary ignitibility, corrosivity, and reactivity.

In addition to the excavated soil, the waste classification requirements will also apply to contents from buried containers, decontamination water generated from decontamination activities, collected stormwater, excavated debris, and waste oils and fluids generated from the on-site project equipment. Wastewater resulting from stormwater runoff and decontamination water will be collected and contained within a portable aboveground tank. When the tank or container is approximately half-full or at least every 60 days, whichever occurs first, the tank will be sampled to determine proper disposition of the wastewater. If analytical results indicate that the water is hazardous, arrangements will be made immediately to transport it off site to a Class I treatment or disposal facility. If the water is non-hazardous, as shown by analytical, it may continue to be generated within the tank, until the next 60-day period is up or the tank is filled, whichever comes first. PPE and soil stockpile liners will be presumed hazardous and will be disposed of at an off-site Class I landfill. Debris will also be characterized to determine if it is a hazardous waste. Waste oil and other fluids generated during equipment maintenance activities will be collected, contained, and sent off site for recycling.

7.4 WASTE ACCUMULATION AND STORAGE

40 CFR, Part 262 and tit. 22 Cal. Code Regs., Section 66262, consist of regulations applicable to the generation, storage, management, and accumulation of RCRA and non-RCRA hazardous wastes, respectively. Specific requirements apply to the accumulation time for hazardous wastes on site and to the accumulation and labeling of hazardous wastes. This project will result in the temporary accumulation of hazardous wastes in staging piles, containers, and tanks. These wastes will be managed, accumulated, and inspected in accordance with the regulations.

7.4.1 Soil Stockpiles and Staging Piles

Soil excavated during this project will be stockpiled on lined and bermed stockpile areas prior to off-site disposal. It is anticipated the excavated material will consist of RCRA hazardous, non-RCRA hazardous and non-hazardous soil due to varying concentrations of metals, especially lead. Soil encountered around buried drums/containers that appears to be impacted from a leaking drum/container will be segregated from other excavated soil and will be presumed to be hazardous.

If soil excavated from the area is determined to be RCRA hazardous waste, then the RCRA staging pile regulations of Section 264.554 of 40 CFR may apply. Under these regulations, a staging pile is an accumulation of solid, non-flowing remediation waste that is not in a containment building and is used only during removal operations for temporary storage at a facility. The waste pile permitting requirements of RCRA can be avoided through proper designation and management of a staging pile for RCRA hazardous wastes, the land disposal restrictions (LDRs), and minimum technology requirements. A staging pile must be located within the contiguous property under the control of the owner/operator where the wastes to be managed in the staging pile originated. The staging pile regulation also requires:

- The standards and design criteria for the staging pile must facilitate a reliable, effective and protective remedy and must consider the volume and types of wastes intended for storage, length of operation, potential for release from the unit, potential migration from potential releases, and potential for exposure to human and environmental exposure to potential releases from the unit.

- The staging pile must be designed so as to prevent or minimize releases of hazardous wastes and hazardous constituents into the environment, and minimize or adequately control cross-media transfer, as necessary to protect human health and the environment through the use of liners, covers, run-on/runoff controls or other means.
- The staging pile must not operate for more than 2 years.
- Within 180 days following the operating term of the staging pile, it must be closed in accordance with Parts 265.258(a) and 265.111 of 40 CFR, Part 265.258(a) requires the owner/operator to remove and decontaminate all waste residues, contaminated containment system components (e.g. liners), contaminated subsoil, and structures and equipment contaminated with waste and leachate, and manages them as hazardous waste. Part 265.111 requires the owner/operator to close the facility in a manner that minimizes the need for further maintenance, and controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere.
- Designation for the use of the design criteria and the specific closure requirements for a proposed staging pile must be included in the Work Plan. Approval of this Work Plan by the regulatory agencies, shall constitute approval of the establishment of the staging piles.

For non-RCRA hazardous soil (e.g., soil with TCLP lead concentration less than 5 milligrams per liter [mg/L] and a total lead concentration greater than 1,000 mg/kg or an STLC of greater than 5.0 mg/L), in accordance with Division 20, Chapter 6.5, Section 25123.3 of the California Health and Safety Code, the material can be stockpiled at the site for up to 90 days without satisfying all substantive requirements of a hazardous waste facility permit provided the following conditions are met:

- The soil does not contain free liquids.
- The waste is accumulated on an impermeable surface (minimum 20-mil liner).
- The generator controls against wind dispersion and rain runoff.
- The generator inspects the site weekly and after storms to ensure that the erosion controls are working properly.
- After final off-site transportation, the accumulation site is inspected and remediated as necessary.
- The site is certified for compliance with these standards by a registered engineer.

A log of all soil and debris stockpiles (or staging piles) will be maintained and updated on a daily basis. The log will include: date of accumulation, date of sampling, analytical results obtained or pending, hazardous or non-hazardous designation, etc.

In addition to the aforementioned requirements, the State Water Resources Control Board Policy Number 92-08, which pertains to the control of stormwater discharges from construction activities, may also be relevant and appropriate to the temporary storage of stockpiled materials. Appropriate BMPs, included in the SWMP (Appendix E), will be implemented to protect stockpiles from erosion and stormwater run-on and runoff. These BMPs include erosion control, stormwater drainage control, secondary containment, fugitive emissions and wind dispersion control, and spill prevention.

7.4.2 Wastewater and Waste Fluids

Title 22 Cal. Code Regs., Section 66264 and 40 CFR, Part 264, contain applicable requirements for facilities that store hazardous wastes in tanks or containers for over 90 days. Decontamination water and stormwater that come in contact with the waste stockpiles will be collected and stored on-site in a PE tank of an appropriate capacity. The tank will be installed, managed and inspected in accordance with the substantive requirements of tit. 22 Cal. Code Regs., Sections 66264.191, 66264.192, 66264.193, and 66264.194. These regulations require specific engineering and design specifications, daily inspections of the tanks, adequate secondary containment (i.e., 100 percent of the tank volume plus the maximum rainfall from a 25-year, 24-hour storm event), and closure standards. The contents of the tank will be characterized per the requirements of tit. 22 Cal. Code Regs., Section 66261 to determine appropriate disposal options.

When possible, waste fluids generated from heavy equipment maintenance activities will be collected and removed from the site by the maintenance contractor for recycling. If waste fluids are required to be stored on site, they will be labeled accordingly, contained within DOT approved 55-gallon drums and situated within a pre-designated and properly designed hazardous waste container storage area. Containers of hazardous wastes containing free liquids have stringent secondary containment requirements. These requirements include:

- A base free of cracks or gaps and sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed.
- The base will be sloped or the containment system will be otherwise designed and operated to drain and remove liquids resulting from leaks, spills, or precipitation. Alternatively, the containers may be elevated on pallets to prevent contact with accumulated liquids.
- The containment system will have sufficient capacity to contain 10 percent of the volume of containers or the volume of the largest container, whichever is greater.
- Spilled or leaked waste and accumulated precipitation will be removed from the sump or collection area in a timely manner to prevent overflow of the collection system.

7.4.3 Excavated Drums and Containers

During the planned project excavation activities, buried containers of various condition, size, and content may be encountered. Any containers and contents extracted during excavation activities will be presumed to be hazardous and will be managed as such until determined otherwise. Containers that are uncovered and appear to be in suitable condition for extraction (i.e., intact and not leaking) will be placed in over-pack containers capable of holding the entire contents of the original container. The contents will then be sampled and characterized for compatibility and proper storage. Containers that are uncovered and appear to be in poor condition or are leaking will be characterized and the contents will be removed into appropriate containers. The original container will then be extracted and placed into an over-pack container. Following initial compatibility testing, containers and contents will be stored in a pre-designed container storage area, which has secondary containment for container storage areas. Incompatible materials will be segregated from each other to prevent commingling in the event of a spill or release.

7.4.4 Demilitarized MPPEH

Demilitarized MPPEH will be placed in a suitable container and stored in Magazine M354. Demilitarized MPPEH will be disposed of in an appropriate landfill.

7.4.5 Radiological Point Sources

Radiological point sources (such as radium-containing dials) will be packaged in metal drums in accordance with DOT regulations specified in 49 CFR, Subpart I, and will be stored in Magazine M353 or M354. The DON is responsible for the transportation and disposal of radiological point sources.

7.4.6 Used PPE

Used PPE will be stored in DOT-approved 55-gallons drums within the designated hazardous waste container storage area, which will be designed and managed in accordance with the substantive requirements of the container management regulations codified in tit. 22 Cal. Code Regs. 66264.170 through 66264.178.

7.4.7 Container Labeling

Containers of potentially hazardous waste will be labeled with indelible ink with the following information: source and location, contents and quantity, potential health, safety, and environmental hazards, accumulation start date, date container sampled, parameters analyzed for, and the words "Analysis Pending – Potentially Hazardous." Once containers are determined to contain hazardous waste they will immediately be labeled with a completed "Hazardous Waste" label, which will include:

- EPA Identification Number of the generator
- Name and address of the generator
- EPA waste code
- DOT shipping name (prior to off-site shipment)
- Description of contents
- Date of generation (date first drop of waste placed in container)

An inventory of waste containers will be maintained for later submittal to the DON. In addition, weekly inspections of container storage areas will be conducted and logged while wastes remain in these areas to ensure the integrity of the containers and secondary containment, to check for leaks or spills, and to ensure labels and markings are in good condition.

7.4.8 Waste Accumulation Areas

Hazardous waste storage areas require:

- A sign with the legend, "Danger Hazardous Waste Area-Unauthorized Personnel Keep Out" (written in English and Spanish), will be posted at each 90-day accumulation area and stockpile in sufficient numbers to be seen from any approach. The signs will be legible from a distance of at least 25 feet.
- Aisle space will be maintained to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency, unless aisle space is not needed for any of these purposes.
- The following emergency equipment will be located or available to personnel during active waste management activities at each accumulation area:
  - A device, such as a telephone or a hand-held two-way radio, capable of summoning emergency assistance will be available.
  - Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment will be available.
  - Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or water spray systems.
  - A spill response kit for minor spills. The kit will include a shovel, adsorbent pads and/or "kitty litter," and a collection container.

Bulk quantities of fuel, oil, or other hazardous materials will not be stored on site. Equipment fueling and maintenance activities will be performed by an off-site contractor on an as-needed basis.

7.5 WASTE DISPOSAL

Soil excavated during this project, which may include RCRA and non-RCRA hazardous wastes, is to be disposed of off site at an appropriately permitted CERCLA waste disposal facility.

Non-soil-related wastes, which may include drum contents, decontamination water, debris, used PPE, used oil, and impacted stormwater, will be managed in accordance with the regulations and transported off site for appropriate recycling or disposal. Each waste stream requiring off-site disposal will be sampled and analyzed to ensure that it is properly characterized and profiled and meets the waste acceptance criteria and packaging requirements for the proposed TSDF prior to transport. Hazardous waste debris generated on site, which has been treated using an alternate treatment technology as indicated in 40 CFR 268.45 and tit. 22 Cal. Code Regs., Section 66268 (i.e., decontaminated with a water wash and spray) will be disposed of as non-hazardous solid waste at a Class III landfill. Used PPE and debris (e.g., oversized material, PE liners, PVC piping, etc.) that is determined to be a hazardous waste and is unsuitable for decontamination, will be sent off site to a Class I CERCLA hazardous waste landfill facility. Waste oil and other fluids generated during equipment maintenance activities will be collected, contained, and sent off site for recycling. Demilitarized MPPEH will be disposed of at a Class III landfill. The DON is responsible for the transportation and disposal of demilitarized MPPEH. All potential radioactive or mixed waste will be transported and disposed of at appropriate landfills by a waste broker under contract with the DON.

Hazardous waste will be disposed only at a hazardous waste disposal facility approved by the DON and permitted for the disposal of the particular type of hazardous waste generated. Wastes disposed of off site will be sent to RCRA Subtitle C or RCRA Subtitle D facilities that meet the requirements of 40 CFR, Part 300.440 (CERCLA Off-site Policy). The Chemical Waste Management facilities in Kettleman City, California, and in Buttonwillow and Westmoreland, California, are Class I hazardous waste facilities that will be considered for hazardous waste disposal. The B-25 boxes and 55-gallon drums of potential LLRW material may be shipped by the DON selected waste broker to RACE, LLC in Memphis, Tennessee, where the material would be placed in the Bulk Survey for Release (BSFR) program. BSFR is unique to Tennessee LLRW processors and allows small quantities of radioactive material that is distributed throughout a waste stream to be legally disposed of in a Tennessee landfill or to Envirocare Landfill in Utah.

7.6 WASTE TRANSPORTATION

TtEC will be responsible for shipping RCRA, non-RCRA hazardous waste and non hazardous waste streams off site resulting from TCRA activities at IR Sites 1, 2, and 32 at Alameda Point. Hazardous wastes sent off-site for disposal or recycling will be done so in accordance with the DOT Hazardous Material Transportation regulations of 49 CFR, Parts 171 through 177 and 40 CFR, Part 262, Subpart B and tit. 22 Cal. Code Regs. Section 66262, which involve packaging, placarding, labeling, and manifesting requirements, and with appropriate LDR certification notices per 40 CFR, Part 268 and tit. 22 Cal. Code Regs., Section 66268. Personnel having the required DOT training will perform all DOT functions. In addition, all transporter and disposal contractors will be subject to the TtEC subcontractor qualification process. Under no circumstances will the TtEC personnel sign hazardous waste manifests.

Material that does not exhibit one of the nine DOT hazard class characteristics (i.e. explosives, gases, flammable/combustible liquids, flammable solids/spontaneously combustible materials/ dangerous when wet materials, oxidizers and organic peroxides, toxic materials and infectious substances, radioactive materials, corrosive materials) is not regulated under DOT rules for hazardous material transportation. If material is suspected to be hazardous, it will be shipped under the appropriate hazard class. All hazardous waste will be transported under DOT hazardous material regulations.

Each shipment of a suspected hazardous material will be properly classed using the Hazardous Materials Table in 49 CFR 172.101. DOT-trained personnel will make all determinations. The Transportation and Disposal Plan, Appendix G, details the transportation and disposal elements for this TCRA.

7.7 WASTE MINIMIZATION

To minimize the volume of waste, the following general guidelines will be followed:

- Materials will not be contaminated unnecessarily.
- Work will be planned ahead.
- Only the material (i.e. chemicals) needed to perform the work activity will be taken into the exclusion zone.
- Additional material can be brought to the work location if it is found to be necessary.
- Materials can be stored in large containers, but the smallest reasonable container will be used to transport the material to the location where it is needed.
- Cleaning and extra sampling supplies will be maintained outside any potentially contaminated area to keep them clean and to minimize additional waste generation.
- Pre-fabricated materials, barriers, support equipment, etc., outside will be maintained or constructed outside potentially contaminated areas.
- Mixing of detergents or decontamination solutions will be performed outside potentially contaminated areas.
- Drop cloths or other absorbent material will be used to contain small spills or leaks.
- Containers will be used to minimize the spread of contamination.
- Contaminated materials will not be placed with clean materials.

- Wooden pallets inside the exclusion zone will be covered with plastic.
- Material and equipment will be decontaminated and reused when practical.
- Volume reduction techniques will be used when practicable.
- Waste containers will be verified to ensure that they are solidly packed to minimize the number of containers.
- Only the size waste containers adequate to contain the volume of waste generated will be used.
- Less hazardous substances will be used whenever possible (i.e., only the volume of standard solutions needed for testing will be brought; minimal amounts of decontamination water and solvent rinses will be used).

7.8 WASTE MANAGEMENT INSPECTION AND DOCUMENTATION PROGRAM

This section presents the waste inspection procedures and documentation program to be employed during the project field activities.

7.8.1 Inspections

While all waste accumulation areas will be informally inspected on a daily basis, formal inspections of all accumulation areas will be conducted and recorded at least weekly in accordance with 40 CFR, Part 264, Subpart I and tit. 22 Cal. Code Regs., Section 66264. However, daily inspections will be conducted for tanks containing hazardous waste (wastewater). In addition, soil stockpiles will be inspected daily to ensure liners that are in place, the stockpiles are adequately covered, and the covers are anchored sufficiently. The PQCM or his designee will conduct inspections. Inspections will be logged in a field notebook, and a weekly (daily for tanks) inspection checklist will be completed. The container storage area(s) will be inspected to ensure the following:

- Containers are in good condition. If a container is not in good condition or appears to be leaking, the waste will be transferred to another container.
- Containers are made of materials that will not react with, and are otherwise compatible with, the hazardous waste to be stored.
- Containers are closed at all times, except when adding or removing waste.

Tanks used for storage of collected runoff and decontamination water will be inspected on a daily basis and the inspections will be logged. The inspections will ensure that tanks are properly labeled and that they are in good condition (no severe rusting, apparent structural defects or deterioration and have no visible leaks).

7.8.2 Documentation

Documentation requirements apply to all waste managed during project activities. Field records will be kept of all waste generation activities. All pages of the field data record log will be signed and dated by the supervising field leader who is entering the data. In addition, the following information will be recorded in the log:

- Description of generating activities
- Location of waste generation (including depth, if applicable)
- Type and volume of waste
- Date and time of generation
- Description of any waste sampling, including:

  Type of test
  Laboratory where sample is to be sent
  Sampling method
  Name of sampler
- Name of person recording information
- Name of field manager at time of generation

7.8.3 Hazardous Waste Manifests and LDR Certification

All hazardous waste transported from the site will be accompanied by a Hazardous Waste Manifest. DON personnel will be responsible for reviewing and signing all waste documentation, including waste profiles, manifests, and LDR notifications (manifest packages). Prior to signing the manifest, the designated DON official or the ROICC, will ensure that pre-transport requirements of packaging, labeling, marking, and placarding are met according to 40 CFR, Parts 262.30 through 262.33 and 49 CFR, Parts 100 through 178.

The DON will receive one copy of the manifest; the remaining copies will be given to the transporter. The manifest will be returned to the DON's signatory official for the base's record-keeping requirements.

Copies of all manifests for waste generated at the site will be kept in a compliance file within the TtEC's project files. The PjM will provide the DON with the generator's copy of the manifest.

An LDR form will accompany the shipment of hazardous waste to the TSDF. The TSDF will be notified prior to the waste being sent. The following items must accompany the notification and are included in one of the following facility specific forms:

- EPA Hazardous Waste Generator identification number for Alameda Point
- Manifest number, including state disposal application number

- Waste analysis data
- Corresponding concentration-based or technology-based treatment standards will be identified if the waste is also land disposal restricted

RCRA record-keeping requirements per 40 CFR, Parts 262.20 through 262.44, including retention of signed copies of manifests from the designated facility that received the waste, will be followed. Additionally, biennial and exception reporting information will be submitted, as necessary, according to tit. 22 Cal. Code Regs., Sections 66262.41 and 66261.42 and 40 CFR, Parts 262.41 and 262.42. Additional reporting may be required in accordance with Cal. Code Regs., Section 66262.43 and 40 CFR, Part 262.43.

7.9 UPDATING THE WASTE MANAGEMENT PLAN

The WMP will be updated as changes in site activities or changes in applicable regulations.

8.0 TRAFFIC CONTROL PLAN

This Traffic Control Plan provides guidelines and addresses measures for vehicular traffic control during the TCRA at IR Sites 1, 2, and 32. Traffic volume and circulation at Alameda Point falls under the purview of the city of Alameda Department of Public Works, which periodically analyzes the transportation infrastructure. Alameda Point has existing roadways that lead to the project site. Field personnel assigned to this project will be temporarily working at the site during business hours.

8.1 ANALYSIS OF POTENTIAL IMPACTS

During the approximately 6-month construction fieldwork period, the site will generate an average of 24 one-way passenger vehicle trips carrying project workforce to and from the site each day. Approximately 375 one-way commercial truck trips will be required during the entire project. This number includes mobilization and demobilization of heavy equipment (16 loads), transportation and delivery of soil fill material to the site (20 loads), off-site transportation of contaminated soil (332 loads), and off-site transportation of non-hazardous liquids (2 loads), and off-site transportation of non-hazardous debris (5 loads).

To reach the site, from Interstate 880, vehicles will exit the freeway at Broadway and follow signage directing them to Alameda via the Webster Tube and continue south on Webster Street (CA 260) to Atlantic. Make a right on Atlantic then a right on Main Street. Vehicles will follow Main Street around and make a left at Navy Way. Vehicles will enter into the Alameda Point facility at the former main gate entrance on Navy Way. Vehicles will veer to right and make a right hand turn at West Red Line Avenue. Vehicles will proceed past the baseball field (on right) and turn right at the access road between the baseball field and gym building. The vehicles will proceed through the gate (baseball field gate) veer left and proceed west on the former runway where it terminates at the worksite. If a problem exists at the Webster Tube, the Site Superintendent will inform the DON and use an alternate traffic route, which will require vehicles to proceed from Interstate 880 to the 29th Street exit. Vehicles will head south over the 29th/Park Street Bridge, continue south to Encinal Avenue (CA 61) and turn right (west). Vehicles will continue west on Encinal Avenue (CA 61) as it becomes Central Avenue (CA 61) until they reach Webster Street (CA 260). Vehicles will turn right on Webster Street (CA 260), turn left on Atlantic, turn right on Main Street and then follow the above directions. The trucks will exit the site using the same route (note: the north bound tunnel traffic is via the Posey Tube). Once on Interstate 880, the truck route will depend on the final destination of the waste or product. All weight-restricted highways and city streets will be avoided. Figure 8-1 illustrates the proposed traffic routes for the project.

Based on data available from the city of Alameda Department of Public Works, Webster Street (a four-lane street, two lanes each way) is designed to handle 1,600 vehicles per lane per hour. Current usage of Webster Street is 30,000 total vehicles per day or 625 vehicles per hour per lane.

An average of 27 vehicles per day over the life of the project will be associated with the TCRA activities at the facility. Based on the city of Alameda's traffic data, it is estimated that the project will not negatively impact the exiting traffic conditions in the area.

In addition, the schedules for the delivery and transportation of fill and site equipment, as well as off-site transportation of contaminated soils to landfills, will be planned to minimize interference with the normal traffic pattern in the area. The majority of the trucks will have capacities greater than 20 tons. The project will require permitted, oversized vehicles for the transportation of heavy and extra-wide construction equipment.

Due to the limited duration of construction activities (6 months), the impact to transportation or traffic patterns is expected to be insignificant. Heavy construction equipment such as front-end loaders, excavators, backhoes, and other support vehicles will remain at the site for the duration of the field activities after initial mobilization. This equipment will not leave the site until they are no longer needed. Vehicles used for commuting workers will be parked in designated areas within the support zone of the laydown area.

8.2 TRAFFIC SAFETY MEASURES

In order to expedite the passage of traffic through the Alameda Point facility and to the work area, TtEC will install and maintain the necessary signs, lights, temporary railings, barricades, and other facilities for the sole convenience and direction of tenant traffic, as well as to prevent potentially hazardous conditions. If necessary, TtEC will furnish competent flagmen whose sole duties will be to direct the movement of construction traffic through the former base area toward the work area and to give adequate warning to nearby personnel and tenants of any dangerous conditions to be encountered.

Convenient access to roadways will be maintained during construction activities. Water and dust abatement measures will be applied as necessary to the on-site roads used by construction vehicles for alleviation or prevention of dust nuisance.

No material or equipment will be stored where it may interfere with the free and safe passage of tenants. In addition, TtEC will adhere to all Alameda speed limit requirements.

8.3 TRAFFIC CONTROLS

Traffic controls will be used to provide for the efficient completion of work activities in a safe working environment while minimizing the impact to the normal traffic flow. Traffic controls will be required during removal activities in the excavation and stockpile areas to allow for equipment operation and truck loading for off-site transportation. Traffic controls may include, but will not be limited to, the following:

- Traffic flow will be maintained at all times during construction activities on through roads.
- End dumps and other transportation trucks removing waste/debris from IR Sites 1, 2, and 32 will be scheduled to avoid queuing along major streets. Close coordination between the Site Superintendent and the transporter dispatcher will be maintained at all times during loading and unloading activities.
- A sufficient area for parking will be provided to all passenger vehicles in the support area and all haul trucks in the exclusion zone.
- Cones, flags, signs, and other traffic control measures will be used, as needed, to facilitate loading and unloading.
- A full-time flagman will be stationed at the baseball field gate to ensure that no unauthorized access to the work site is permitted. The gate will be locked when work activities are either stopped or concentrated at the remediation sites and continuous ingress and egress to the worksites are not required.

In order to prevent congestion of site access roads during loading and hauling operations, all trucks will be queued along the runway area north of the baseball field gate. During non-construction periods, non-applicable signs will be covered with black plastic or temporarily removed.

Other project-specific measures will be used to minimize the impacts of the proposed construction activities. These measures include the following:

- Clear access points for trucks will be maintained at the project entrance to allow for efficient movement of construction-related traffic and expedite the entry and exit of construction vehicles in and out of the site.
- An adequate turning radius will be provided in all areas, including loading areas near the stockpiles.
- Sufficient area will be provided for parking all vehicles on site during construction, including space for haul trucks.
- Close coordination will be maintained between the DON and all other facility contractors to ensure safety and to minimize impacts to other activities within Alameda Point.

All traffic control activities shall conform to the applicable specifications of the *State of California Manual of Traffic Controls for Construction and Maintenance Work Zones* (California Department of Transportation, 1996) and will be approved by the DON.

9.0 ENVIRONMENTAL PROTECTION PLAN

The existing natural resources within the vicinity of the site consist of marine and biological resources; however, due to the disturbed and developed nature of the site, there are no sensitive or critical habitat or biota in the site area. Descriptions of pertinent information about resources in the area of the site are presented below.

9.1 EXISTING ENVIRONMENTAL CONDITIONS

IR Sites 1, 2, and 32 are a mix of disturbed and undisturbed areas. IR Sites 1 and 32 are located in the northwest section of Alameda Point, while IR Site 2 is located in the southwest section. IR Sites 1 and 32 are bordered on the north by the Oakland Inner Harbor and IR Sites 1 and 2 are bordered on the west by the San Francisco Bay. There are numerous existing uses of the San Francisco Bay, which are designated in the *Water Quality Control Plan, San Francisco Bay* (Regional Water Quality Control Board [RWQCB], 1995) and include industrial service supply; navigation; water contact recreation; non-contact water recreation; ocean commercial and sport fishing; saline water habitat; and preservation of rare and endangered species, marine habitat, fish migration, and shellfish harvesting (RWQCB, 1995).

IR Site 1

IR Site 1 is mostly disturbed and covered by artificial fill with a portion of the site occupied by a concrete runway. Historically, this area of the base was filled with bay dredge sediments. The site is relatively flat with slight depressions that sometimes flood during the winter rains. Shoreline slopes exist on the northern and western boundary and are currently stabilized by large boulders (riprap). This area is referred to as the coastal margin. It averages approximately 50 feet wide; it is offset from the site proper by a low berm. The berm slopes fairly steeply to the water. The site was previously used as a waste disposal site and consisted of several disposal areas. A portion of Runway 13 runs northwest-southeast through the site. There are a few uninhabited buildings and building foundations; a former picnic area and basketball court are located in the southern portion of the site.

The land on Alameda Point that comprises IR Site 1 is mostly disturbed ruderal non-native grasslands with scattered seasonal wetland features with little topographic variation. The dominant upland plants include fennel, thistles, ryegrass, mustard, yellow sweet clover, coyote bush, and common plantain. The dominant wetland vegetation includes *rumex salicifolius, lotus corniculatus, eleocharis macrostechya*, and *distichlis spicata*. Dominant species at the site include European starlings, red-winged blackbirds, snipes, common sparrows, Canada geese and other migratory waterfowl, harriers, black-tailed jackrabbits, California ground squirrels, and feral rabbits.

There are concrete and asphalt runways, taxiways, and roads through IR Site 1. Taxiways and runways are inactive. There is perimeter chain-link fencing around each side of the site, except along the shoreline (see Figure 2-1). Chunks of concrete and asphalt have been placed as riprap along the beach zone. There are no residential or active commercial buildings nearby. However, there are some abandoned structures that were once part of base operations. There are no utility poles or overhanging utility lines in the area. Numerous groundwater monitoring wells are located throughout the site.

The United States Army Corps of Engineers (USACE) jurisdictional seasonal wetlands have been identified on IR Site 1. These areas comprise approximately 11 acres within the boundaries of the site, as shown on Figure 2-1.

IR Site 2

IR Site 2 is primarily undeveloped land that includes upland and wetland areas and encompasses approximately 110 acres. Historically, this area of the base was filled with bay dredge sediments that underlie and cover an approximately 77-acre disposal area. The permanent wetland on site covers approximately 33 acres and is bounded by the disposal area to the north and east and by the coastal margin adjacent to the San Francisco Bay on the south and west. The permanent wetland contains two perennial ponds. The northern pond is connected to the bay by a culvert. The southern pond was created by removal of dredged materials for use as a cover for the disposal area. The seasonal wetlands on site comprise approximately 4 acres.

A thin strip of land between the disposal area's permanent wetland and the bay is referred to as the coastal margin. It acts as a buffer for the disposal area and is composed of the perimeter dike and riprap seawall. Subsurface materials in the coastal margin differ from those in the disposal area. The interior margin lies outside the disposal area and is associated with scattered seasonal wetlands to the north and east.

The land on Alameda Point that comprises IR Site 2 is mostly disturbed ruderal non-native grasslands with scattered seasonal and permanent wetland features. The dominant upland plants include fennel, thistle, ryegrass, mustard, ice plant and coyote bush. The dominant wetland vegetation includes *rumex salicifolius, salicornia rubra, lotus corniculatus* and *distichlis spicata*. Dominant species at the site include European starlings, red-winged blackbirds, snipes, common sparrows, Canada geese and other migratory waterfowl, harriers, black-tailed jackrabbits, California ground squirrels, and feral rabbits.

There is an earthen berm that surrounds much of the site. Dirt roads run through the site as well. There is perimeter chain-link fencing along the north and east sides of the site. There is no fencing along the shoreline (see Figure 2-2). Chunks of concrete and asphalt have been placed as riprap along the beach zone. There are no residential or active commercial buildings nearby. However, there are several abandoned munitions bunkers within the site boundaries, which are adjacent to scattered seasonal wetlands. There are no storm drains within the area. Disturbed swales consisting of non-native and ruderal vegetation drain the upland perimeter of IR Site 2. There are no utility poles or overhanging utility lines in the area. Numerous groundwater monitoring wells are located throughout the site.

Historic and recent reconnaissance activities have identified USACE jurisdictional wetlands on site and are shown on Figure 2-2. The wetlands were classified as either permanent or seasonal, and the areas comprise approximately 30 acres and 4 acres, respectively, within the boundaries of the site.

IR Site 32

IR Site 32 is approximately 5.8 acres in size, located in the northwest portion of Alameda Point. It abuts IR Site 1 on the west and the Oakland Inner Harbor on the north. A taxiway runs adjacent to the site, between the site and the harbor; several abandoned buildings and a munitions bunker are on the site. The perimeter of the site is fenced.

The primary vegetation on the site is comprised of non-native grasses, with occasional clumps of ice plant. Approximately half of the site is covered with vegetation, the remainder with concrete, asphalt, or buildings. There are no trees or shrubs. Canada geese, *Branta canadensis*, nest in the ice plant and Black phoebe, *Sayornis nigricans*, nest in the abandoned buildings. Ground squirrels, feral rabbits, and black-tailed jack rabbits are found in the area, but none were seen on the site during the April 2006 survey.

9.1.1 Threatened, Endangered and Sensitive Species

Special-status species that could potentially occur at IR Sites 1, 2, and 32 are summarized below. The species listed below are federally or state-designated threatened or endangered species. Some species do not have legal status under federal or state endangered species acts but are identified by the state of California as "Species of Special Concern." However, none of the plants or wildlife identified below has been found during historical or present vegetation and wildlife surveys performed from 1995 to 2004.

Contra Costa goldfields *(Lasthenia conjugens)*

Santa Cruz tarplant *(Holocarpha macradenia)*

Kellogg's horkclia *(Horkelia cuneata sericea)*

Point Reyes bird's beak *(Cordylanthus maritimus palustris)*

Adobe sanicle *(Sanicula maritima)*

Chinook salmon *(Oncorhynchus tshawytscha),* winter run

Longfin smelt *(Spirinchus thaleichthys)*

Delta smelt *(Hypomesus transpacificus)*

Coho salmon *(Oncorhynchus kzsutch)*

Alameda whip snake *(Masticophis lateralis euryxanthus)*

California least tern *(Sterna antillarum browni)*

American peregrine falcon *(Falco peregrinus anatum)*

Western snowy plower *(Charadrius alexandrinus nivosus),* coastal population

Saltmarsh common yellowthroat *(Geothlypis trichas sinuosa)*

Alameda song sparrow *(Melospiza melodia pusillula)*

Double-crested cormorant *(Phalacrocorax auritus*), rookery sites

California black rail *(Laterallus jamaicensis coturniculus*)

California clapper rail *(Rallus longirostris obsoletus)*

Caspian tern *(Sterna caspia),* nesting colonies

Forster's tern *(Sternaforsteri),* nesting colonies

California brown pelican *(Pelecanus occidentalis californicus),* nesting colony

California horned lark *(Eremophila alpestris actia)*

Loggerhead shrike *(Lanius ludovicianus)*

California gull *(Larus californicus)*

Northern harrier *(Circus cyaneus),* nesting sites

Merlin *(Falco columbarius)*

Long-billed curlew *(Numenius americuanus),* breeding sites

Burrowing owl *(Athene cunicularia),* burrowing sites

Common loon (*Gavia imer),* breeding colony

Fork-tailed storm petrel *(Ocanodromafurcata),* rookery sites

American white pelican *(Pelicanus erythrorhynchos),* nesting colony

Clark's grebe *(Aechmophorus clarkii)*

Western grebe *(Aechmophorus occidentalis)*

Great blue heron *(Ardea herodias),* rookery sites

Great egret *(Casmerodius albus),* rookery sites

Snowy egret *(Egreta thula),* rookery sites

Black-crowned night heron *(Nycticorax nycticorax),* rookery sites

Black-shouldered kite *(Elanus caeruleus),* nesting colony

Common murre *(Uria aalge),* nesting colony

Salt-marsh harvest mouse *(Reithrodonomys raviventris)*

San Francisco dusky-footed woodrat *(Neotomafuscipes annectens)*

Townsend's western big-eared bat *(Plecotus townsendii townsendii)*

California mastiff bat *(Eumops perotis californicus)*

Northern (Steller) sea lion *(Eumetopias jubatus)*

Salt-marsh wandering shrew *(Sorex vagrens halicoetes)*

Alameda Island mole *(Scapanus latimanus parvus)*

9.2 RUN-ON AND RUNOFF CONTROL PROVISIONS

Stormwater will be prevented from running onto excavated areas and soil stockpiles through sandbag berms, haybales, or other physical obstructions to prevent stormwater from entering those areas. Runoff will be prevented by limiting the amount of water that runs onto the excavations and soil stockpiles and by capturing or diverting that water. The SWMP describes BMPs designed to prevent run-on and runoff at the site. The SWMP is located in Appendix E.

9.3 REGULATORY REQUIREMENTS

9.3.1 Air Resources

Measures will be taken during removal activities to minimize the release of airborne particulates within and outside the boundaries of the worksites. Dust and particulates will be controlled to minimize contaminant spread and to protect human health and the environment.

9.3.1.1 Dust and Particulate Control

Work procedures will be designed to control and minimize particulate emissions. The specific requirements and measures to be taken are shown in Table 9-1. Control of fugitive particulates will involve cleaning loose dirt from haul vehicles, enforcing speed limits on facility roads, watering down dry or barren work areas and roadways, and covering soil stockpiles at the end of every shift.

A decontamination pad will be constructed. All equipment will be inspected before leaving the project sites to ensure they are in an acceptable condition (e.g., free of dirt on the undercarriage, frame, tail gate, wheels, and axles) for site exit and decontaminated. Vehicles and/or equipment that cannot be easily cleaned by dry methods may be washed and air-dried before leaving the site(s). All wastewater will be captured for future disposal.

9.3.2 Stormwater Management

Because an area greater than 1 acre of land will be disturbed as a result of the TCRA, the substantive requirement of preparing and SWMP is considered applicable and/or relevant for this TCRA. A permit will not be filed, as permits are considered administrative in nature under CERCLA. In order to comply with the substantive requirements, an SWMP, which describes how to comply with the requirements for stormwater management during construction activities, has been included as Appendix E.

9.4 RELEASE PREVENTION, RESPONSE, AND REPORTING

All releases are preventable through proper inspections, management of hazardous materials and wastes, and accountability. The following sections describe how to prevent releases, and in the event that they do occur, the actions that must be taken to correct and respond to the situation.

9.4.1 Spill Prevention

Releases will be prevented by ensuring that hazardous materials and hazardous wastes are managed properly. Containers and work areas will be regularly inspected to identify potential spill hazards prior to their occurrence. Hazardous materials will be maintained in closed containers, and kept in specified hazardous material storage areas when not in use.

Materials can be stored in large containers, but the smallest reasonable container will be used to transport the material to the location where it is needed. This will minimize the release, if one should occur.

Less hazardous substances will be used whenever possible, for example, using Simple Green® instead of using strong solvents containing high levels of VOCs.

9.4.2 Spill Response

Spill kits will be available at refueling locations and at hazardous material/hazardous waste storage locations. Spill kits may consist of absorbent pads, "kitty litter", plastic bags, and an empty drum to containerized spilled material. Spill kits will be replenished as they are used.

Should a release occur at the site, the release should be stopped, if it is safe to do so. Any stormwater inlets or pathways to water should be blocked to prevent the release from reaching waterways. As soon as feasible, notifications shall be made to the PjM and Project Environmental Safety Manager (PESM). The PjM will notify the DON and will make and will provide a determination as to whether the release is reportable to any regulatory agencies. Immediately following the release, it shall be cleaned up (soil removed, absorbents applied, if necessary).

9.4.3 Spill/Release Reporting

Releases of hazardous materials will be reported to the PjM and PESM as soon as possible after the spill occurs in order to determine if the release must be reported to any regulatory agencies. Spills which exceed the reportable quantity (RQ) or which cause a sheen to occur on water must be immediately reported to the National Response Center.

9.5 DOCUMENTATION AND RECORDS RETENTION

Specific documentation that must be maintained on site, and remain part of the project files include:

- weekly hazardous waste and site inspections (as described in the WMP)
- weekly and rain event stormwater inspections (as described in the SWMP)
- air monitoring records (as described in the SHSP)
- waste management records, such as profiles, manifests, and LDRs (as described in the WMP)

9.6 UPDATING THE ENVIRONMENTAL PROTECTION PLAN

The Environmental Protection Plan will be updated, if necessary, as site conditions change.

10.0 PROJECT MANAGEMENT PLAN

The project management team will be responsible for all technical and administrative aspects of the radiological survey activities. Included among the team's responsibilities are the project schedule, staffing, data management, document control, project meetings, and reporting.

10.1 PROJECT SCHEDULE

The proposed schedule for implementation of in this TCRA Work Plan is included as Figure 10-1. The schedule is presented in a critical path method format. The schedule has been prepared using a PC-based cost, scheduling, and control system called PRIMAVERA®. PRIMAVERA has many features, including the identification of critical paths and the ability to compare the initial base plan to the current project schedule.

The schedule includes preparatory activities, mobilization, pre-construction activities, construction activities, demobilization and final report preparation. Removal activities have been planned to start after the approval of the TCRA Work Plan and procurement of the necessary equipment, materials, and subcontracting services.

Six main activities will be followed during the course of this project:

- **Stage 1 – Preparatory activities.** This stage includes preparation of the project submittals including the TCRA Work Plan, notifications and procurement.
- **Stage 2 – Mobilization activities.** This stage includes mobilization of equipment, manpower and supplies, conducting site-specific training; conducting environmental resources, land, MPPEH and geophysical surveys, vegetation clearance, and conducting radiological measurements in three background areas.
- **Stage 3 – Pre-construction activities.** This stage includes construction of the soil stockpile area, soil screening area, installation and troubleshooting of MPPEH screening equipment, and conducting the surface radiological survey to confirm the location of all radiological anomalies.
- **Stage 4 – Construction activities.** This stage includes excavation of the disposal trench and radiological anomalies, MPPEH excavation and screening, MPPEH demilitarization, waste characterization confirmation sampling and analysis, backfilling of the excavated areas, and restoration of the site, including reconstruction of the asphalt and concrete pavement areas.
- **Stage 5 – Demobilization.** This stage includes free-release surveys and decontamination of all project equipment and tools; transportation and off-site disposal of contaminated soils, decontamination wastewater, used PPE, debris, and other wastes; followed by demobilization of all equipment and materials.

- **Stage 6 – Final Report.** This stage includes preparation of a final report to document the results of all removal activities performed at IR Sites 1, 2, and 32.

10.2 PROJECT RESPONSIBILITIES

The DON RPM for this project is Mr. Andrew Baughman. Mr. Baughman is responsible for project management, budget control, schedule maintenance, and contacting regulatory agencies. Mr. Baughman is also responsible for community relations and ensuring that the removal activities are in compliance with the applicable rules and regulations. Mr. Doug Delong of the CSO is responsible for coordination of removal activities with different DON and City of Alameda departments and personnel. Mr. Gregory Grace is the ROICC, responsible for the technical oversight and QC. Mr. Matthew Slack is the technical representative for the RASO and is responsible for the technical oversight and review of the project documents and all issues related to radiological activities.

TtEC's PjM, Mr. Abram Eloskof, will be responsible for general project administration. Mr. Eloskof oversees budget, schedule, document preparation, and will ensure the quality of all project activities and deliverables. The Site Superintendent, Mr. Bob Wells, will manage fieldwork and provide oversight to the subcontractors, and coordinating with the CSO, ROICC, and the PjM. Mr. Vincent Richards will act as the PQCM. As the PQCM, Mr. Richards will coordinate with the QC Program Manager (Ms. Mary Schneider) to ensure that all field activities are in compliance with the project specifications. Mr. Richard Quinn will be the SHSS on site and will be responsible for ensuring that field activities are conducted in compliance with the SHSP (Appendix A). As the SHSS, he will coordinate with the PESM, Mr. Roger Margotto, Certified Industrial Hygienist (CIH). Additional support will be provided by other engineering and technical resources. A project organization chart showing the relationship among select team members is provided as Figure 10-2.

The following is a list of the key project, DON, and regulatory contacts:

Agency	**Contact**	**Project Title**
NAVFAC SW 1455 Frazee Road, Suite 900 San Diego, CA 92108-4310	Mr. Andrew Baughman (619) 532-0902 andrew.baughman@navy.mil	RPM
BRAC Program Management Office (PMO) 1455 Frazee Road, Suite 900 San Diego, CA 92108-4310	Mr. Thomas Macchiarella (619) 532-0940 thomas.macchiarella@navy.mil	BRAC Environmental Coordinator
BRAC PMO CSO – San Francisco Bay Area 410 Palm Ave., Building 1, Suite 161 San Francisco, CA 94130-1806	Mr. Doug DeLong (415) 743-4713 (510) 772-8832 (cellular) douglas.delong@navy.mil	BRAC Environmental Compliance Manager

Agency	Contact	Project Title
NAVFAC SW 1455 Frazee Road, Suite 900 San Diego, CA 92108-4310	Ms. Joyce Howell-Payne (619) 532-0923 joyce.howell-payne@navy.mil	Contract Specialist
NAVFAC SW 1220 Pacific Coast Highway San Diego, CA 92132	Mr. Narciso Ancog (619) 619-532-3046 narciso.ancog@navy.mil	Quality Assurance (QA) Officer
NAVFAC SW 2450 Saratoga Street, Building 110, Suite 200 Alameda Point, Alameda, CA 94501-7545	Mr. Gregory Grace (510) 749-5940 gregory.grace@navy.mil	ROICC
NAVFAC SW 2450 Saratoga Street, Building 110, Suite 200 Alameda Point, Alameda, CA 94501-7545	Mr. Robert Perricone (510) 749-5942 robert.perricone@navy.mil	ROICC/Construction Management Technician
RASO Building 1971 NWS P.O. Box Drawer 260 Yorktown, VA 23691-0260	Mr. Matthew Slack (757) 256-1414 matthew.slack@navy.mil	RASO
EPA, Region IX 75 Hawthorne Street (SFD-8-2) San Francisco, CA 94105-3901	Ms. Anna-Marie Cook (415) 972-3029 cook.anna-marie@epa.gov	EPA RPM
Cal/EPA DTSC Office of Military Facilities 700 Heinz Avenue, Building F, Suite 200 Berkeley, CA 94710	Mr. Tom Lanphar (510) 540-3776 tlanphar@dtsc.ca.gov	Cal/EPA DTSC RPM
Water Board, San Francisco Region 1515 Clay Street, Suite 1400 Oakland, CA 94612	Mr. Erich Simon (510) 662-2355 ersimon@waterboards.ca.gov	Water Board RPM
USFWS P.O. Box 159 Alameda, CA 94501	Ms. Rachel Hurt (510) 377-8375 rachel_hurt@fws.gov	USFWS
TtEC 1940 E. Deere Ave., Suite 200 Santa Ana, CA 92705-5718	Mr. Abram Eloskof (949) 756-7521 (714) 620-5530 (cellular) abram.eloskof@tteci.com	PjM
TtEC 1940 E. Deere Ave., Suite 200 Santa Ana, CA 92705-5718	Ms. Mary Schneider (949) 756-7586 mary.schneider@tteci.com	QC Program Manager
TtEC 1230 Columbia St., Suite 750 San Diego, CA 92101-8536	Mr. Lance Humphrey (619) 471-3519 (619) 988-5974 (cellular) lance.humprey@tteci.com	SUXOS

Agency	Contact	Project Title
TtEC 1230 Columbia St., Suite 750 San Diego, CA 92101-8536	Mr. Roger Margotto (619) 471-3503 (714) 810-3742 (pager) roger.margotto@tteci.com	PESM
TtEC 3200 George Washington Way, Suite G Richland, WA 99352-3429	Mr. Cliff Stephan (509) 371-0140 (509) 430-4655 (cellular) cliff.stephan@tteci.com	PHP
TtEC 1940 E. Deere Ave, Suite 200 Santa Ana, CA 92705-5718	Mr. Nathan Mudry (949) 756-7509 (949) 230-7847 (cellular) nathan.mudry@tteci.com	Project Biologist
TtEC 1940 E. Deere Ave, Suite 200 Santa Ana, CA 92705-5718	Mr. Bob Wells (650) 280-0573 (cellular) bob.wells@tteci.com	Site Superintendent
TtEC 1940 E. Deere Ave, Suite 200 Santa Ana, CA 92705-5718	Mr. Vincent Richards (949) 756-7568 (949) 283-0589 (cellular) vincent.richards@tteci.com	PQCM
TtEC 1940 E. Deere Ave, Suite 200 Santa Ana, CA 92705-5718	Mr. Richard Quinn (415) 671-1990 (650) 450-1969 (cellular) richard.quinn@tteci.com	SHSS
TtEC 1940 E. Deere Ave., Suite 200 Santa Ana, CA 92705-5718	Mr. Nicholas Weinberger (949) 756-7588 nicholas.weinberger@tteci.com	Project Chemist

10.3 DATA MANAGEMENT

The following is a summary of the data management tools that will be employed for the duration of this project:

- PRIMAVERA and Harper Shuman accounting software will be used for all schedule and project cost tracking.
- Home and field office staff for technical data management will use Microsoft® Excel spreadsheets. Microsoft Word will be used for word processing.

10.4 DOCUMENT CONTROL

TtEC's internal document control procedures will be followed for the duration of the project. Additional guidance provided by the DON will be used for document control, particularly for matters relating to regulatory compliance. Management of internal and external correspondence will be administered at the home office in San Diego, California. Document control will include assigning an alphanumeric code to each submittal.

Radiological field records will be prepared, reviewed, and maintained in accordance with Appendix D-6, Radiological Records. The SOP also addresses the retention of radiological records following completion of the project.

10.5 MEETINGS AND REPORTS

Project status/CQC meetings will be held weekly (or at less frequent intervals if desired by the ROICC). The meeting will be held at the project site and will be attended by the PQCM, Site Superintendent, SHSS, ROICC, and ROICC Construction Management Technician. The PQCM will notify the ROICC at least 48 hours in advance of each meeting. The following shall be accomplished at each meeting:

- Review the minutes of the previous meeting.
- Review the schedule.
- Review the status of submittals.
- Review the work to be accomplished in the following 2 weeks and documentation required. Schedule the three phases of control and testing.
- Resolve QC and production problems.
- Address items that may require revisions to the Site-specific CQC Plan.

Minutes of the meetings will be prepared by TtEC and submitted to the DON. Daily reports will be prepared by the PQCM and submitted to the ROICC. Monthly reports will be prepared by the PjM and submitted to the RPM. The monthly reports will include work completed by the end of each month and work that is planned for the following month.

11.0 COMMUNITY RELATIONS ACTIVITY

Several community relation activities will be conducted to inform the public about the ongoing activities. As the lead agency for the environmental IRP activities at Alameda Point, the DON is responsible for conducting community relation activities for the work at IR Sites 1, 2, and 32.

11.1 PUBLIC INFORMATION

For a complete record of activities associated with this TCRA, documents will be contained in information repositories that are located at:

1) Alameda Main Public Library (Historic Alameda High School)
   2220-A Central Avenue
   Alameda, California

2) Alameda Point, Former NAS Alameda
   950 West Mall Square, Suite 141
   Alameda, California

The complete Administrative Record is located at 1220 Pacific Highway, San Diego, California, and is maintained by Ms. Diana Silva, NAVFAC SW Administration Record Manager, (619) 532-3676.

11.2 PUBLIC PARTICIPATION

To encourage local participation in the hazardous waste cleanup program at Alameda Point, the DON established a Restoration Advisory Board (RAB). This board is a citizen-based committee representing local community interests. RAB meeting agendas, minutes, and presentation materials are included in the Administrative Record for public review.

The removal actions at IR Sites 1, 2, and 32 will be discussed at regularly scheduled community meetings and with the RAB. All meetings are advertised locally in an effort to encourage public attendance and participation.

12.0 REFERENCES

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TABLES

TABLE 5-1

INSTRUMENTATION FOR RADIOLOGICAL SURVEYS

Measurement/ Technique	Type of Instrumentation		Typical Background	Typical Efficiency (%)	Detection Sensitivity
	Detector	Meter			
Surface gamma scans (vehicle-based or hand-held LARADS) or static direct measurement (at soil sample locations)	NaI 2-inch by 2-inch scintillation, Ludlum Model 44-10	Thermo Eberline E-600 (or equivalent)	100 to 12,000 cpm; varies with calibration γ	N/A	200 cpm-2,000 cpm γ. Varies with calibration.
Static alpha/beta scan (contamination surveys)	Dual phosphor (ZnS/NE102) general purpose survey probe HP 380AB (or equivalent) (100 cm^2)	Thermo Eberline E-600 (or equivalent)	100-200 cpm β 5-10 cpm α	~22 β total efficiency ~11 α total efficiency	~ 110 dpm/100 cm^2 β ~ 20 dpm/100 cm^2 α
Exposure rates (area monitoring)	Thermo Eberline MicroREM Meter (or equivalent)	(Same as detector)	7-8 μR/hr	N/A	2 μR/hr
Low background scaler	5-cm (2-inch) diameter alpha and beta sensitive scintillator (or equivalent)	Thermo Eberline HandECount	N/A	~50 β total efficiency ~83 α total efficiency	~ 110 dpm/100 cm^2 β ~ 20 dpm/100 cm^2 α
Gamma energy analysis	High-purity Germanium detector	ORTEC DigiDART	N/A	40-70	N/A

Notes:

α – alpha
β – beta
γ – gamma
μR/hr – microroentgen per hour
cm – centimeter
cm^2 – square centimeter
cpm – count per minute
dpm – disintegration per minute
LARADS – Laser-assisted Ranging and Data System
N/A – not applicable
NaI – sodium iodide

TABLE 5-2

RELEASE CRITERIA FOR MATERIALS, EQUIPMENT, SOIL, AND WATER

Radionuclide	Surfaces - Fixed (dpm/100 cm^2)	Surfaces -Removable (dpm/100 cm^2)	Soil (pCi/g)	Water (pCi/L)
Radium-226	100 α	20 α	1.0	5.0
Strontium-90	1,000 β	200 β	10.8	8

Notes:

These limits are for the release of equipment and materials and are based on *Regulatory Guide 1.86* (Atomic Energy Commission, 1974).

Types of radiation: α - alpha, β^- - beta
cm^2 – square centimeters
dpm – disintegrations per minute
g – gram
L – liter
pCi – picocurie

TABLE 6-1

AUTHORIZED BLAST SHIELD CONSTRUCTION MATERIALS AND THICKNESS

Construction Material	Required Thickness	Comments
Plexiglas (cast)	1.13 inches	Most recommended. May be layered. Available commercially off the shelf.
Lexan®	2.16 inches	Single pane
Bullet-resistant glass	0.83 inches	Least recommended

U.S. Army Engineering and Support Center, 2006.

TABLE 9-1

AIRBORNE EMISSIONS AND CONTROL MEASURES

Types of Activities	Types of Emissions	Prevention Measures
Excavation, mechanical screening, and backfilling	Dust/particles generated during excavation	Reduce amount of disturbed area at any one time.
		Use wind barriers to keep dust down.
	Dust/particulates generated from traversing unpaved areas for removing/importing materials	Construct/maintain wind barriers to suppress airborne emissions.
		Apply water or chemical suppressants (if required) to limit airborne emissions.
		Limit number of vehicles on unpaved roads.
		Reduce/enforce speed limits on unpaved roads.
	Dust/particulates generated from handling bulk materials	Place and secure plastic sheeting (e.g., tarps, visqueen) over any materials that might be removed by wind action.
		Construct/maintain wind barriers to suppress airborne emissions.
	Dust/particles generated from materials on vehicles (prevention and removal of carry-out or track-out)	Dry clean prior to leaving the site(s).
		Wet clean prior to leaving the site(s).

FIGURES

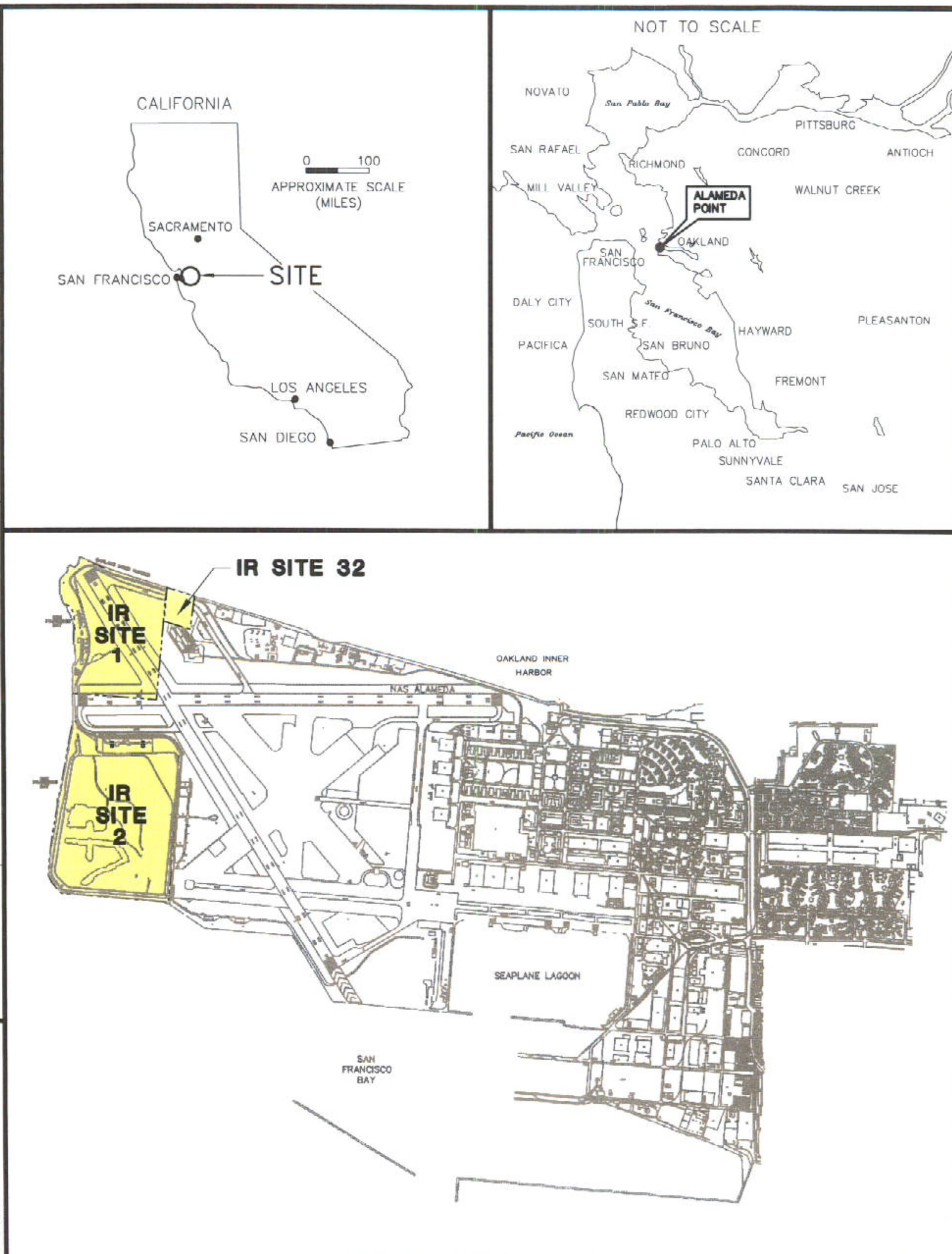

Figure 1-1

SITE VICINITY MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT - ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 07023211.DWG
DCN: ECSD-RACIV-07-0232
CTO: #0015
APPROVED BY: AE
CHECKED BY: JA
REVISION: 0
DRAWN BY: MD
DATE: 01/31/07

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PLOT/UPDATE: DEC 15 2006 14:09:37

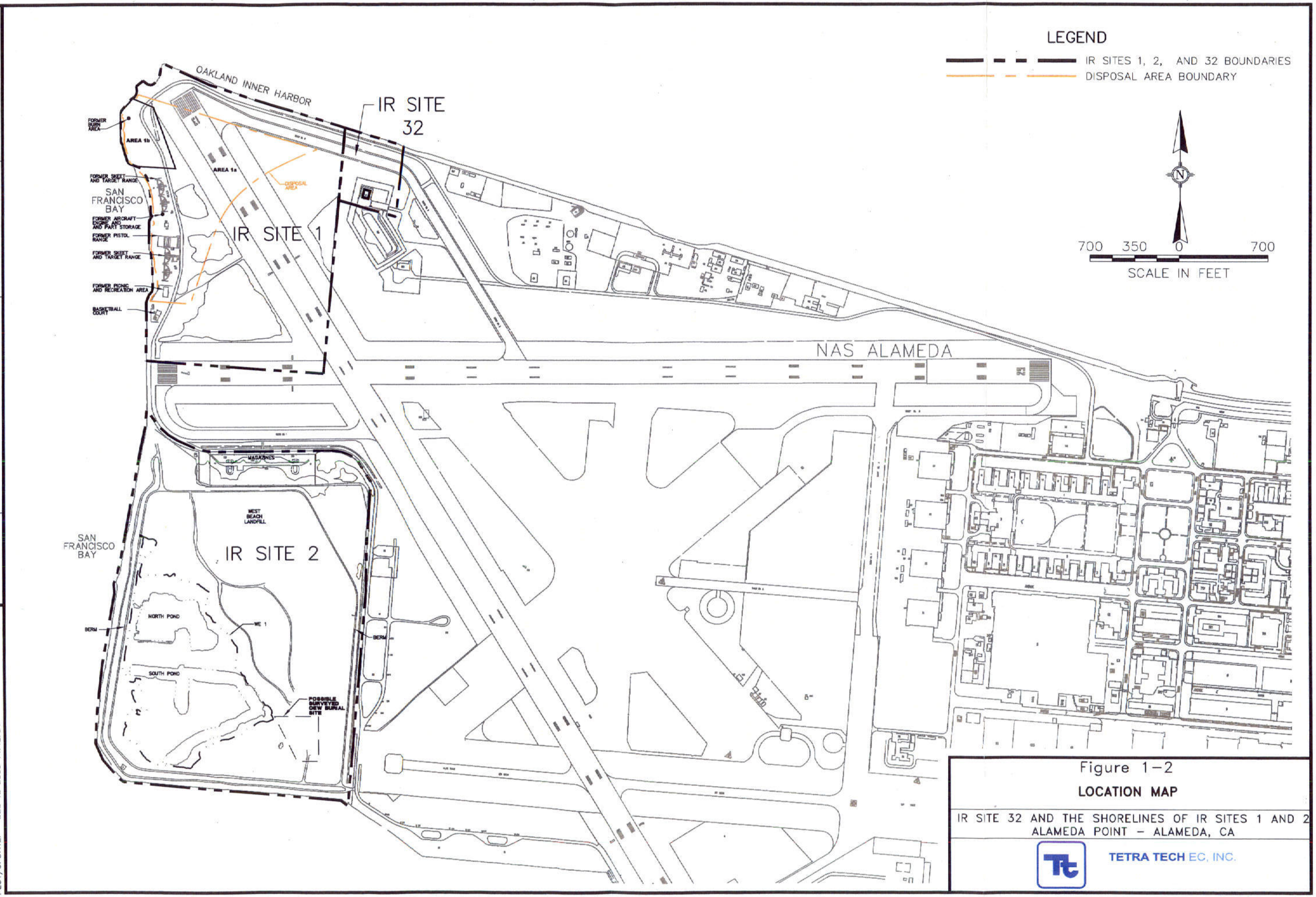

Figure 1-2

LOCATION MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT - ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 07023212.DWG
DCN: ECSD-RAC-07-0232
CTO: #0015
APPROVED BY: AE
CHECKED BY: JA
REV: REVISION 0
DRAWN BY: MD
DATE: 01/31/07

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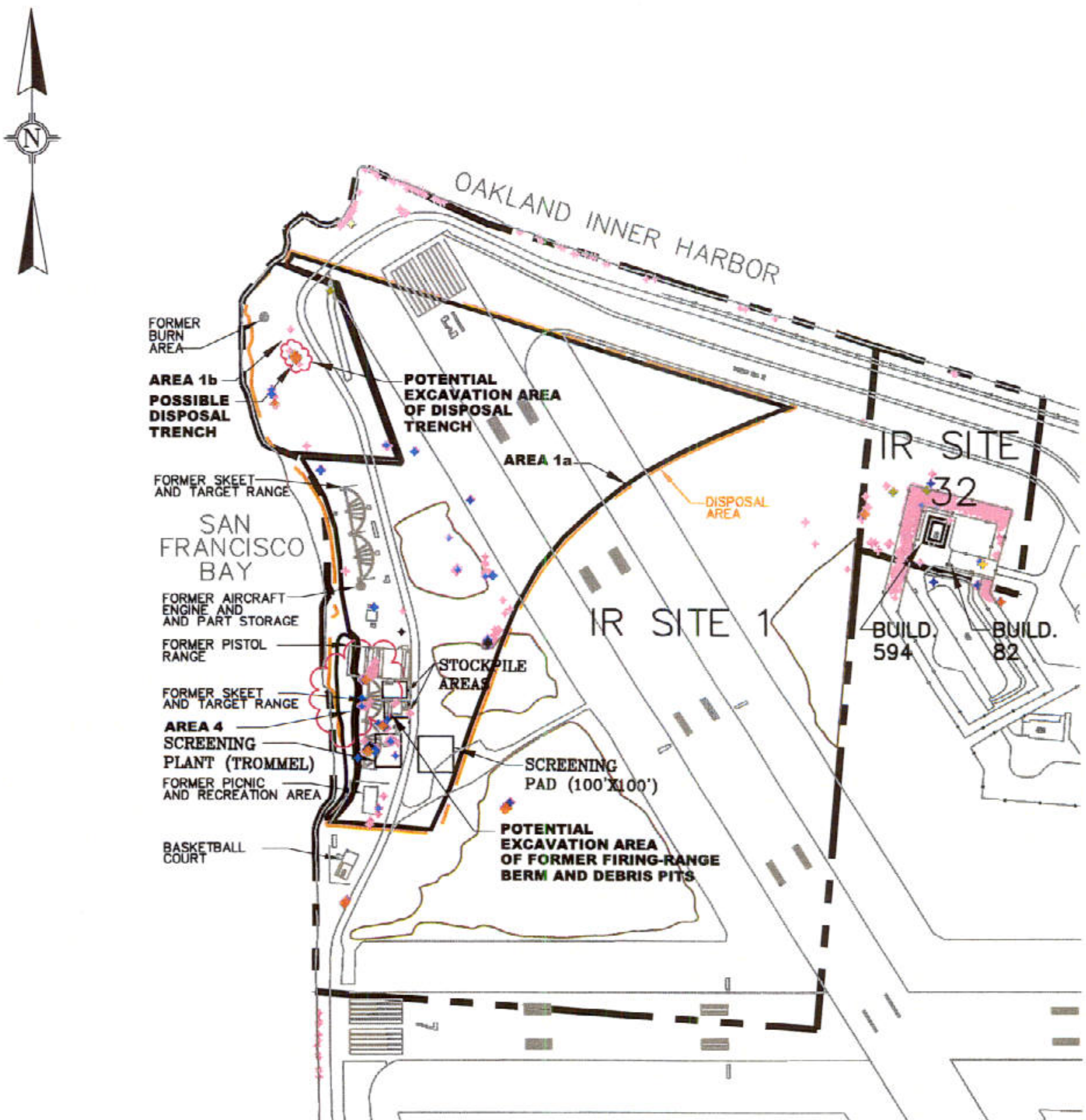
PLOT/UPDATE: DEC 15 2006 14:12:34



LEGEND

IR SITE 1 AND 32 BOUNDARIES

DISPOSAL AREA BOUNDARY

SEASONAL WETLAND BOUNDARY

500 250 0 500

SCALE IN FEET

NET CPM VALUES

- 4K–10K
- 10K–15K
- 15K–20K
- 20K–25K
- 25K–30K
- 30K–35K
- 35K–40K
- 40K–45K
- 45K–50K
- >50K

SOURCES:

1. OU–3 REMEDIAL INVESTIGATION REPORT, FINAL BY TETRA TECH EM INC., PUBLISHED IN RANCHO CORDOVA IN 1999.
2. 2004 AND 2006 RADIOLOGICAL DATA PROVIDED BY EBERLINE SERVICES.

Figure 2–1

IR SITE 1 AND 32

SITE DETAIL MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2

ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 07023221.DWG

DCN: ECSD-RACIV-07-0232 | CTO: #0015

APPROVED BY: AE

CHECKED BY: JA | REVISION: 0

DRAWN BY: MD | DATE: 01/31/07

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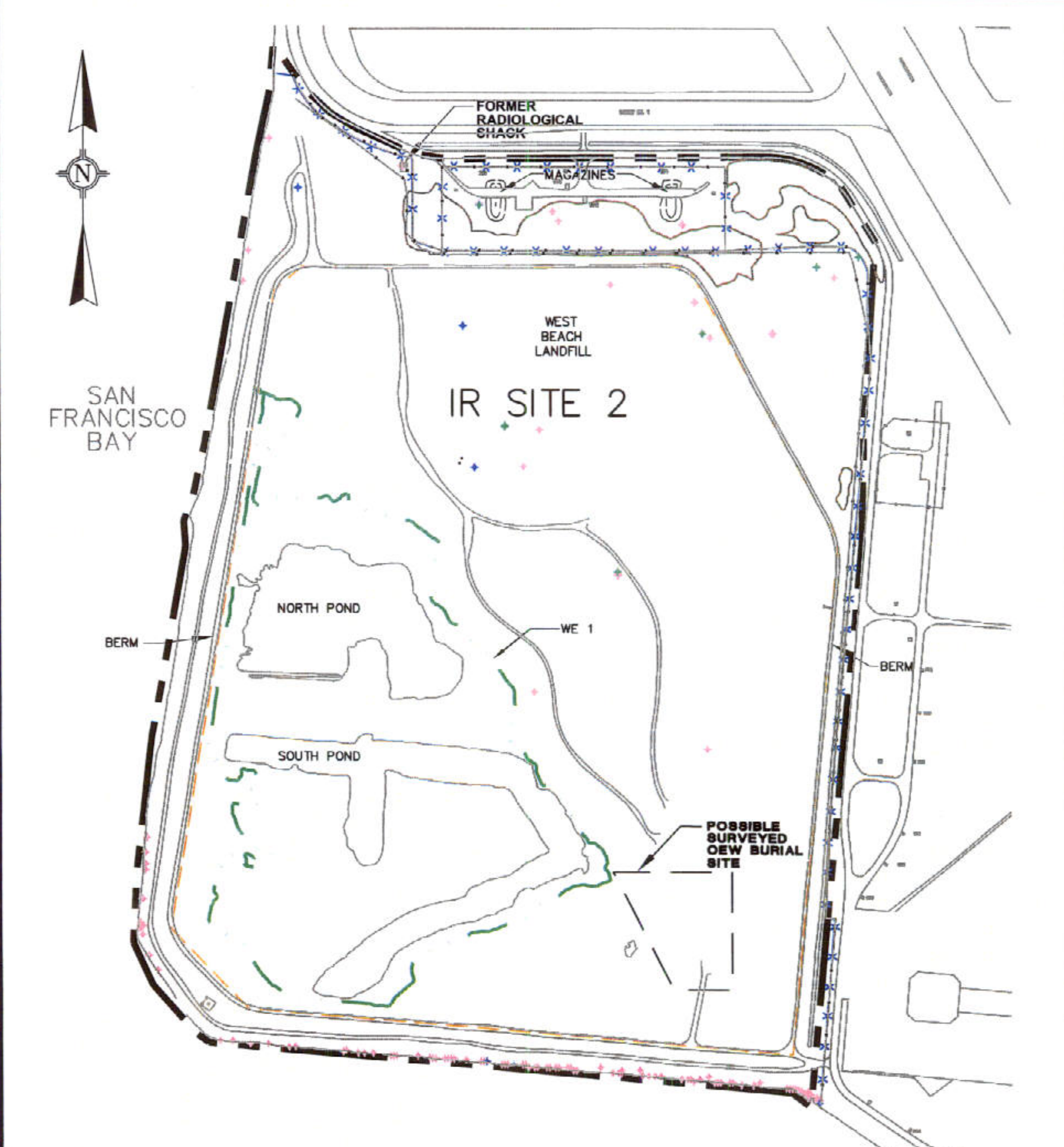
PLOT/UPDATE: JAN 17 2007 12:45:38

DRAWING NO: 07023222.DWG
DCN: ECSD-RAC-07-0232
CTO: #0015
APPROVED BY: AE
CHECKED BY: JA
REVISION: 0
DRAWN BY: MD
DATE: 01/31/07



LEGEND

IR SITE 2 BOUNDARY
FENCE LINE
PERMANENT WETLAND BOUNDARY
SEASONAL WETLAND BOUNDARY
BERM
WE WETLAND
OEW ORDINANCE AND EXPLOSIVE WASTE

SOURCE:
2004 AND 2006 RADIOLOGICAL DATA PROVIDED BY EBERLINE SERVICES.

NET CPM VALUES
4K–10K
10K–15K
15K–20K

500 250 0 500
SCALE IN FEET

Figure 2–2
IR SITE 2
SITE DETAIL MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

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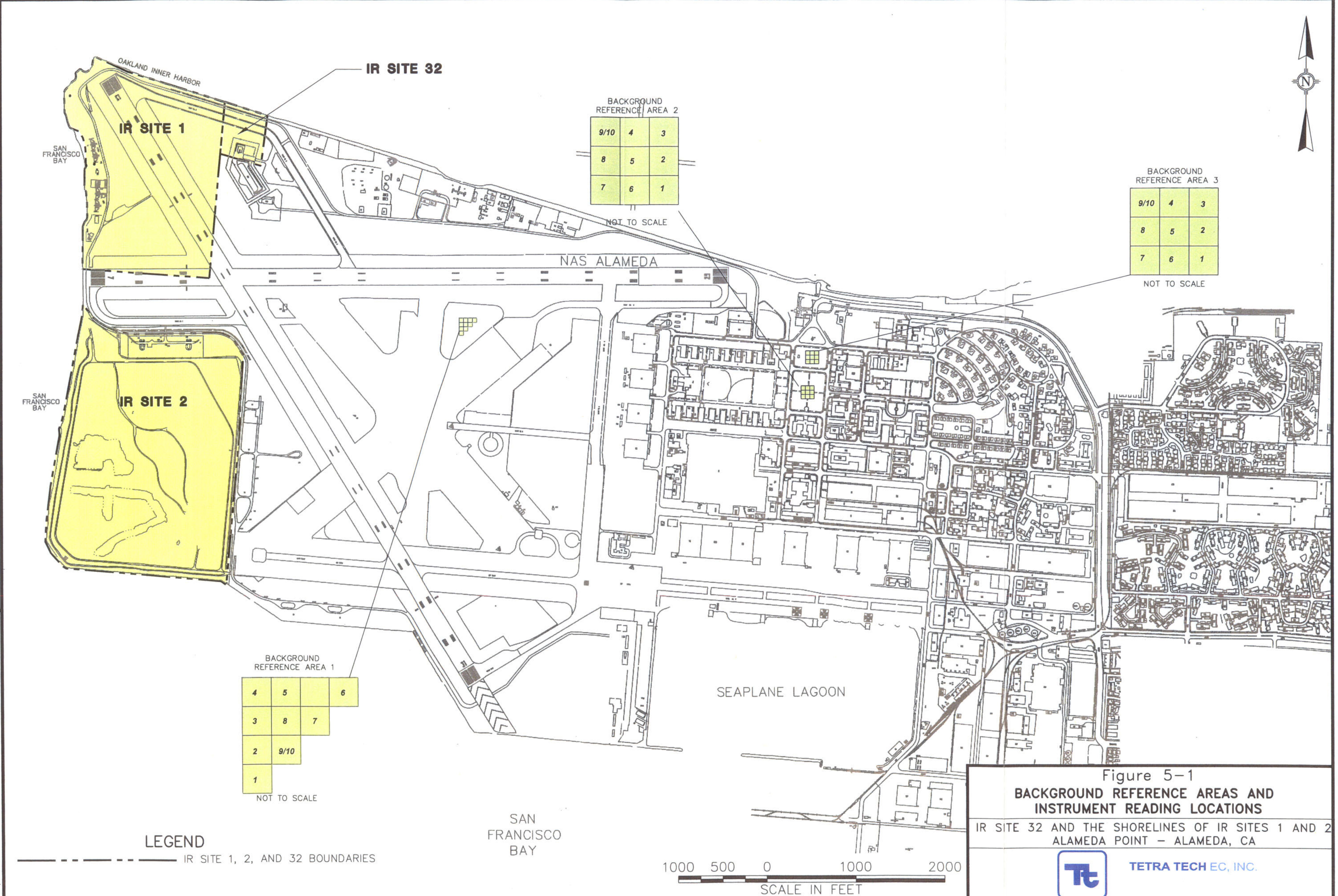

Figure 5-1
BACKGROUND REFERENCE AREAS AND INSTRUMENT READING LOCATIONS
IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 07023251.DWG
DCN: ECSD-RAC-07-0232 CTO: #0015
APPROVED BY: AE
CHECKED BY: JA REV: REVISION 0
DRAWN BY: MD DATE: 01/31/07

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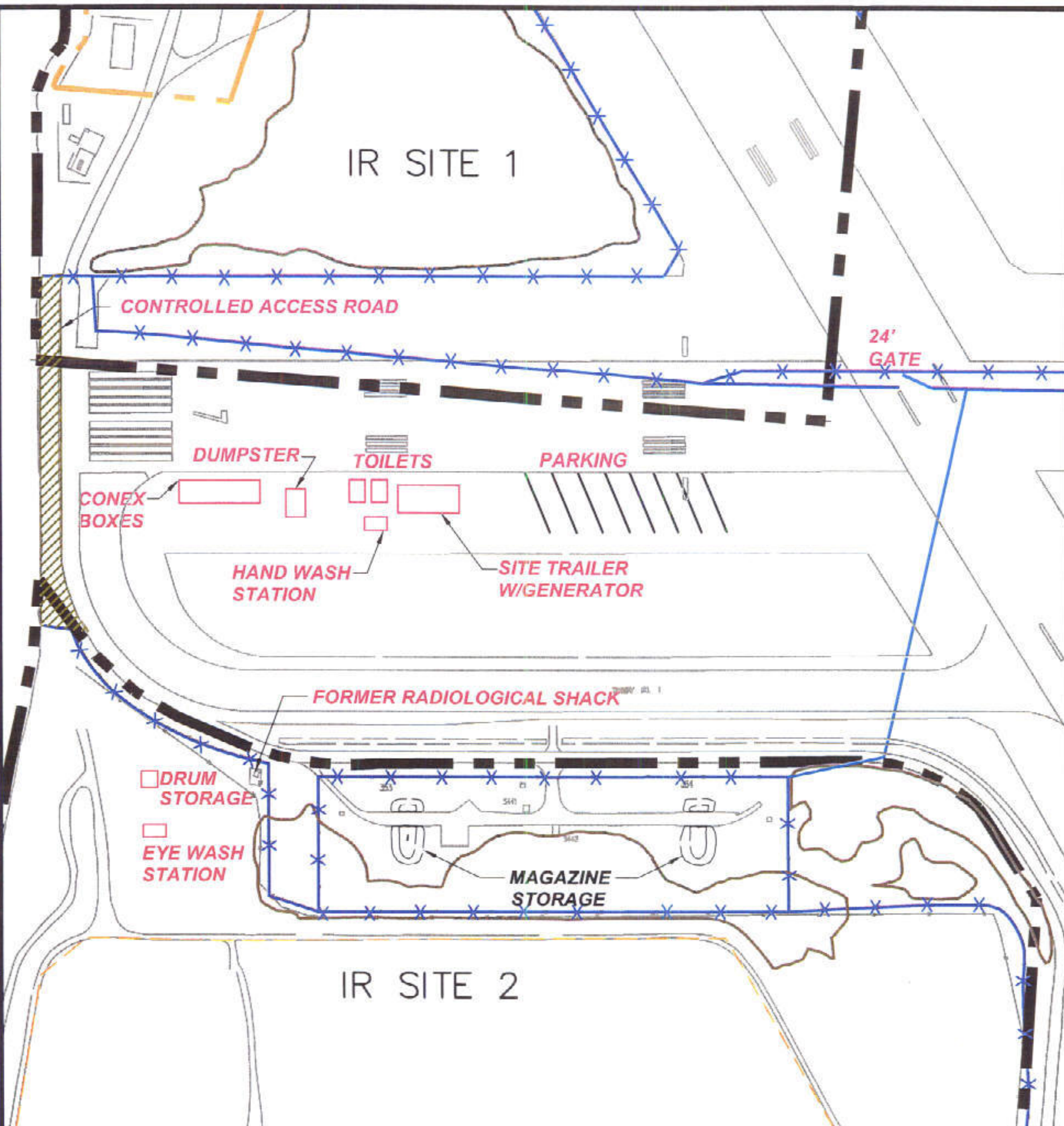

LEGEND

- IR SITE 1, 2, AND 32 BOUNDARIES
- DISPOSAL AREA BOUNDARY
- EXISTING FENCE LINE
- SEASONAL WETLAND BOUNDARY
- TEMPORARY FENCE
- BERM ROAD

NOT TO SCALE

Figure 6-1

TEMPORARY FACILITIES

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC

DRAWING NO: 07023261.DWG

DCN: ECSD-RAC-07-0232 | CTO: #0015

APPROVED BY: AE

CHECKED BY: JA | REVISION: 0

DRAWN BY: MD | DATE: 01/31/07

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DATE: 01/31/07	REV: REVISION 0		CTO: #0015	07023262.DWG

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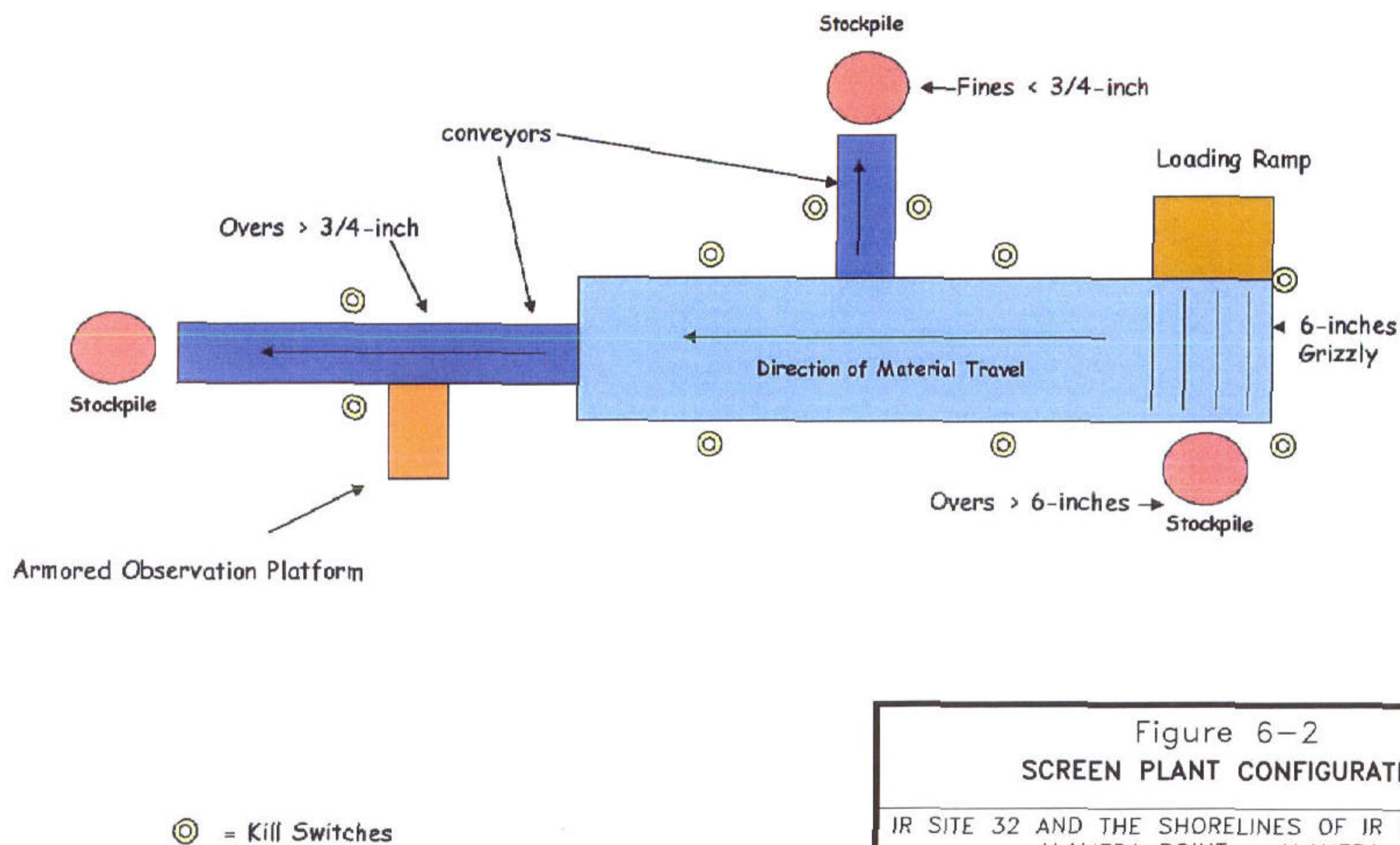

NOT TO SCALE

Figure 6-2
SCREEN PLANT CONFIGURATION

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

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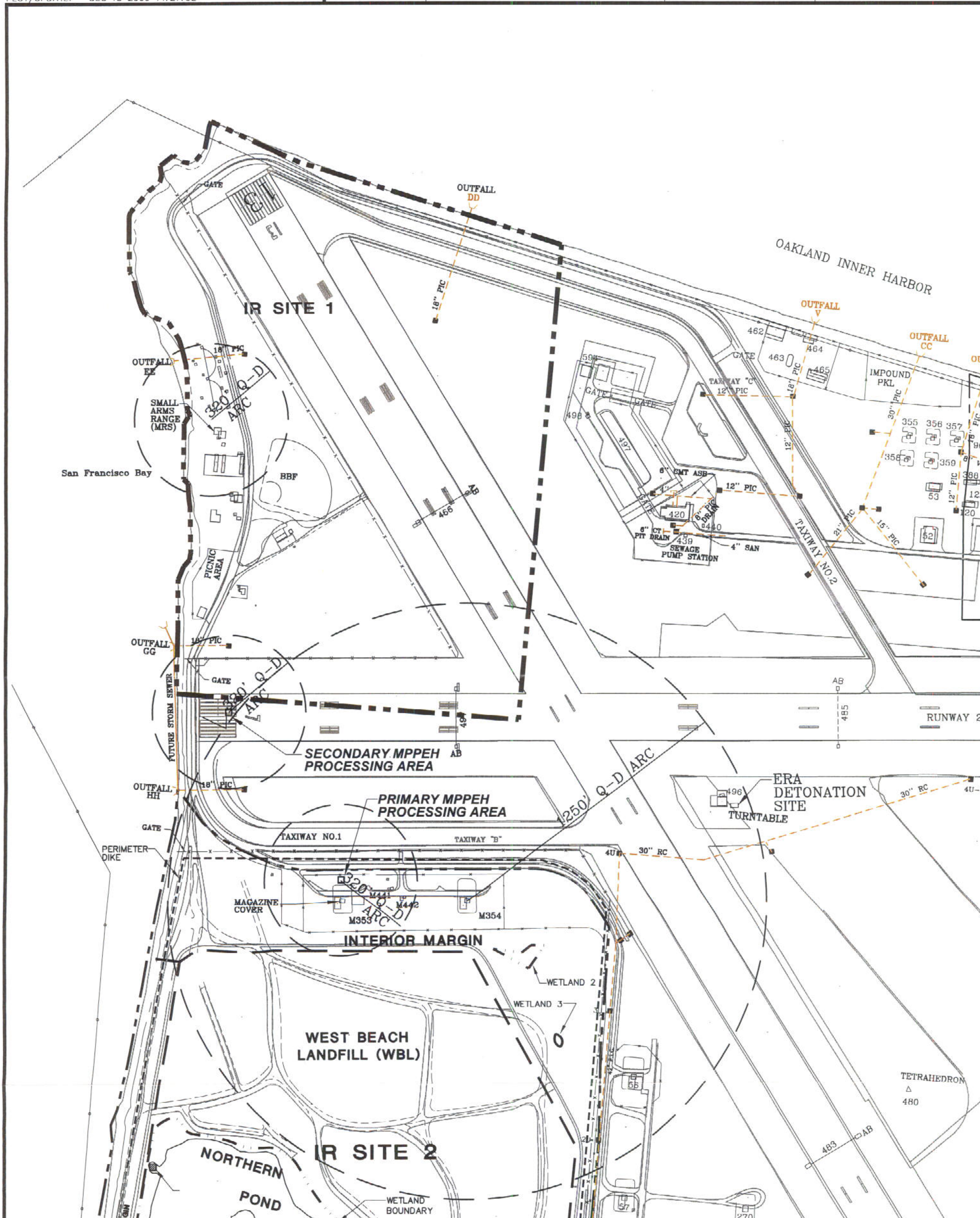


LEGEND

- SITE BOUNDARY
- FENCELINE
- Q-D (QUANTITY DISTANCE) ARC

400 200 0 400

SCALE IN FEET

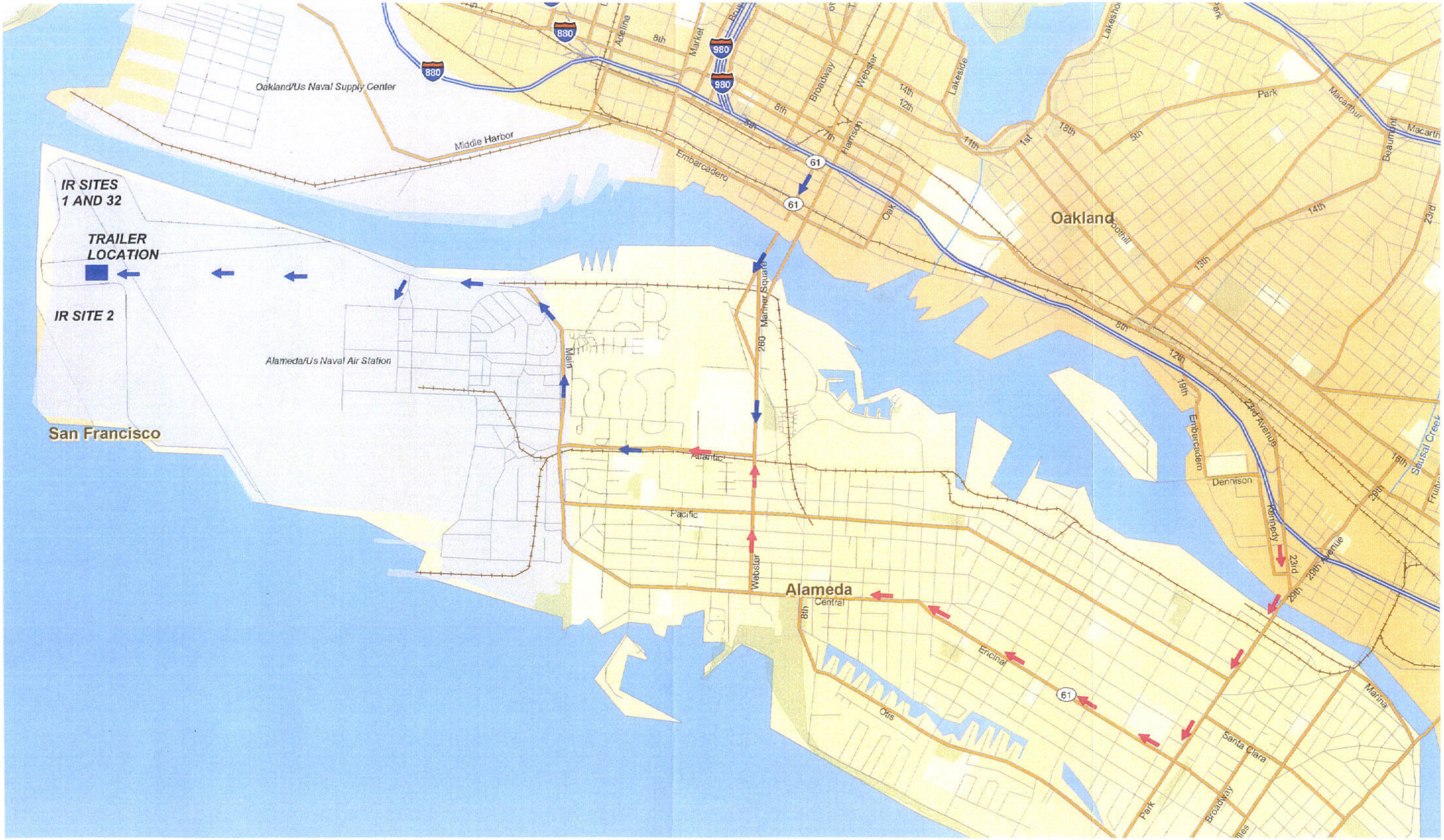
N

Figure 6-3

IR SITE 1 Q-D ARC AND EXCLUSION ZONE

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.



LEGEND

TRANSPORTATION ROUTE

ALTERNATE TRANSPORTATION ROUTE

Figure 8–1

TRAFFIC CONTROL ROUTE AND ALTERNATE

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 07023281.DWG

DCN: ECSD-RAC-07-0232 CTO: #0015

APPROVED BY: AE

CHECKED BY: JA REV: REVISION 0

DRAWN BY: MD DATE: 01/31/07

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PLOT/UPDATE: DEC 15 2006 14:31:08

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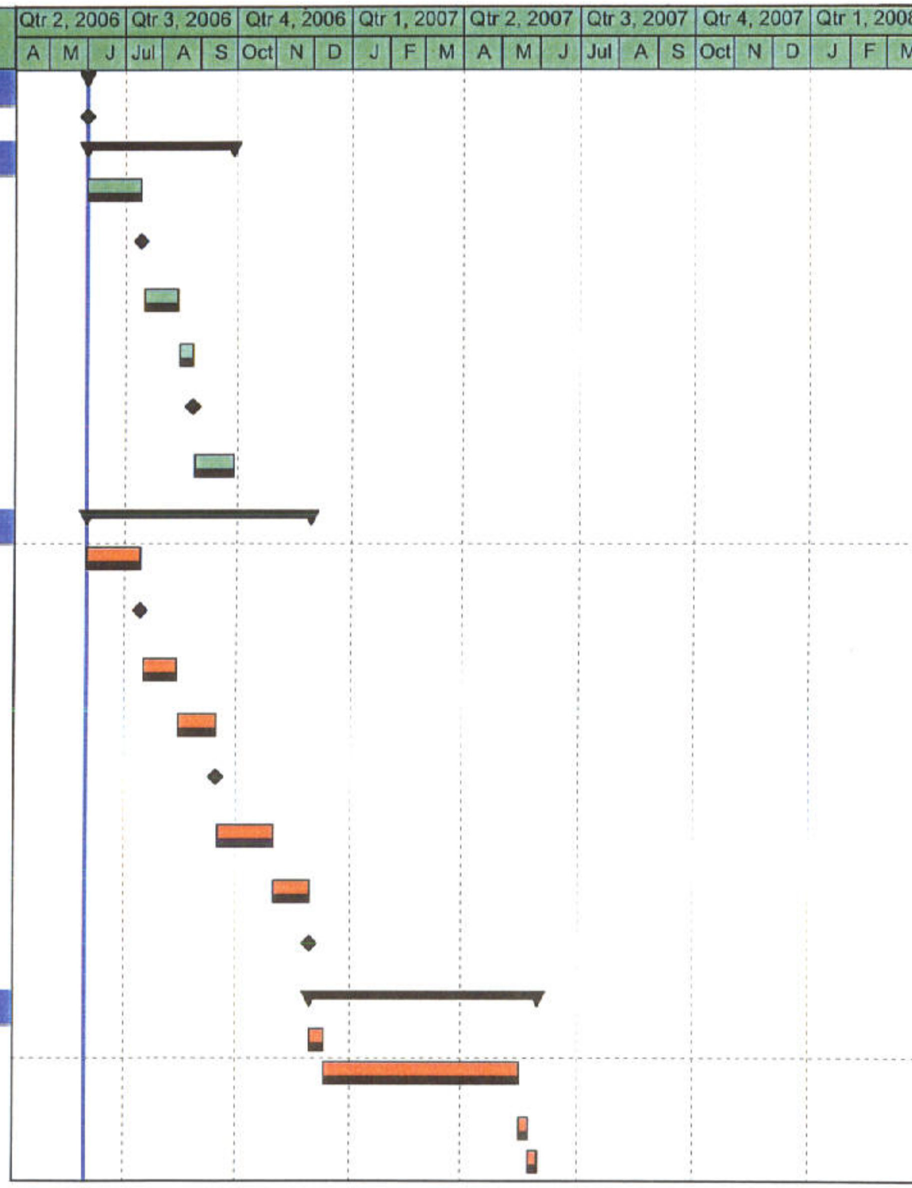
CTO Award		0	31-May-06	31-May-06	0
TO-15-NP01	CTO Award	0	31-May-06		0
Action Memo		84	31-May-06	27-Sep-06	296
TO-15-0010	Prepare Internal Draft Action Memo	32	31-May-06	14-Jul-06	296
TO-15-0015	Submit Internal Draft Action Memo	0		14-Jul-06	296
TO-15-0030	Navy Review of Action Memo	21	17-Jul-06	14-Aug-06	296
TO-15-0070	Prepare Draft Action Memo	9	15-Aug-06	25-Aug-06	296
TO-15-0100	Submit Draft Action Memo	0		25-Aug-06	296
TO-15-0090	Regulatory Agencies Review	22	28-Aug-06	27-Sep-06	296
Work Plan		127	31-May-06	29-Nov-06	0
TO-15-0020	Prepare Internal Draft Work Plan	32	31-May-06	14-Jul-06	0
TO-15-0060	Submit Internal Draft Work Plan	0		14-Jul-06	0
TO-15-0040	Navy Review of Internal Draft Work Plan	21	17-Jul-06	14-Aug-06	0
TO-15-0080	Prepare Draft Work Plan	22	15-Aug-06	14-Sep-06	0
TO-15-0120	Submit Draft Work Plan	0		14-Sep-06	0
TO-15-0110	Regulatory Agencies Review	32	15-Sep-06	30-Oct-06	0
TO-15-0130	Prepare Final Work Plan	20	31-Oct-06	29-Nov-06	0
TO-15-0140	Submit Final Work Plan	0		29-Nov-06	0
Construction		128	30-Nov-06	31-May-07	0
TO-15-MB01	Mobilization	8	30-Nov-06	11-Dec-06	0
TO-15-0150	Time Critical Removal Action	110	12-Dec-06	16-May-07	0
TO-15-0160	Site Restoration	5	17-May-07	23-May-07	0
TO-15-DB01	Demobilization	5	24-May-07	31-May-07	0



Primary Baseline
Summary
Actual Work
Remaining Work
Critical Remaining Work
Milestone

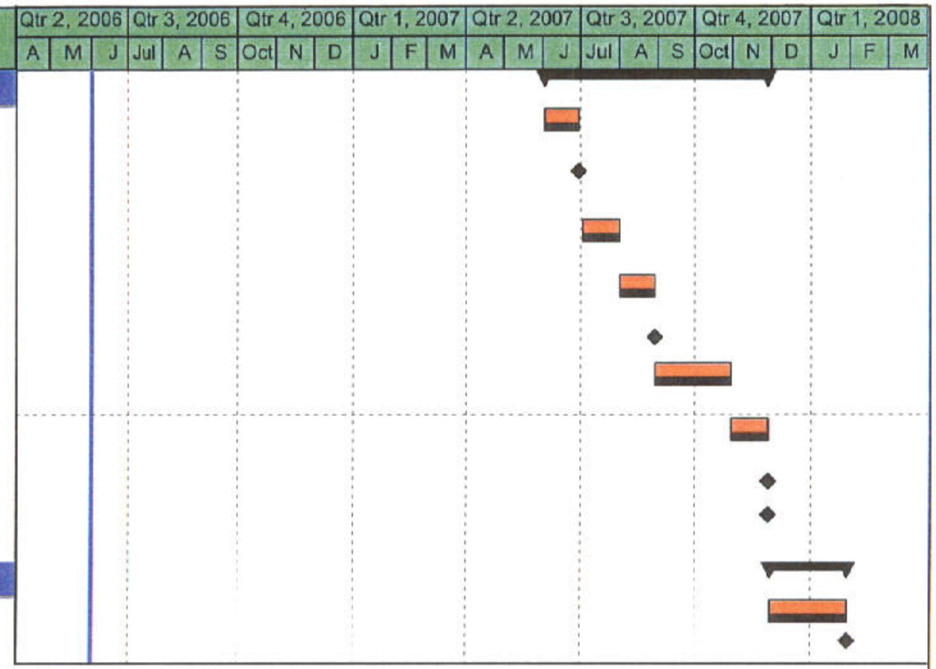
SWDIV RAC IV

CTO 0015

Figure 10-1, Project Schedule

TETRA TECH EC, INC.

Activity ID No.	Activity Name	Rem. Dur.	Start	Finish	Total Float
Post-Construction Reports		127	01-Jun-07	28-Nov-07	0
TO-15-0170	Prepare Internal Draft Post Construction Report	21	01-Jun-07	29-Jun-07	0
TO-15-0190	Submit Internal Draft PCR	0		29-Jun-07	0
TO-15-0180	Navy Review of Internal Draft PCR	21	02-Jul-07	31-Jul-07	0
TO-15-0200	Prepare Draft PCR	20	01-Aug-07	28-Aug-07	0
TO-15-0220	Submit Draft PCR	0		28-Aug-07	0
TO-15-0210	Regulatory Agencies Review	43	29-Aug-07	29-Oct-07	0
TO-15-0230	Prepare Final PCR	20	30-Oct-07	28-Nov-07	0
TO-15-0250	Submit Final PCR	0		28-Nov-07	0
TO-15-TC01	Technical Completion	0		28-Nov-07*	0
Project Closeout		39	29-Nov-07	28-Jan-08	0
TO-15-0240	CTO Closeout	41	29-Nov-07	28-Jan-08	0
TO-15-CP01	CTO Complete	0		28-Jan-08*	0



Primary Baseline
Summary
Actual Work
Remaining Work
Critical Remaining Work
Milestone

SWDIV RAC IV

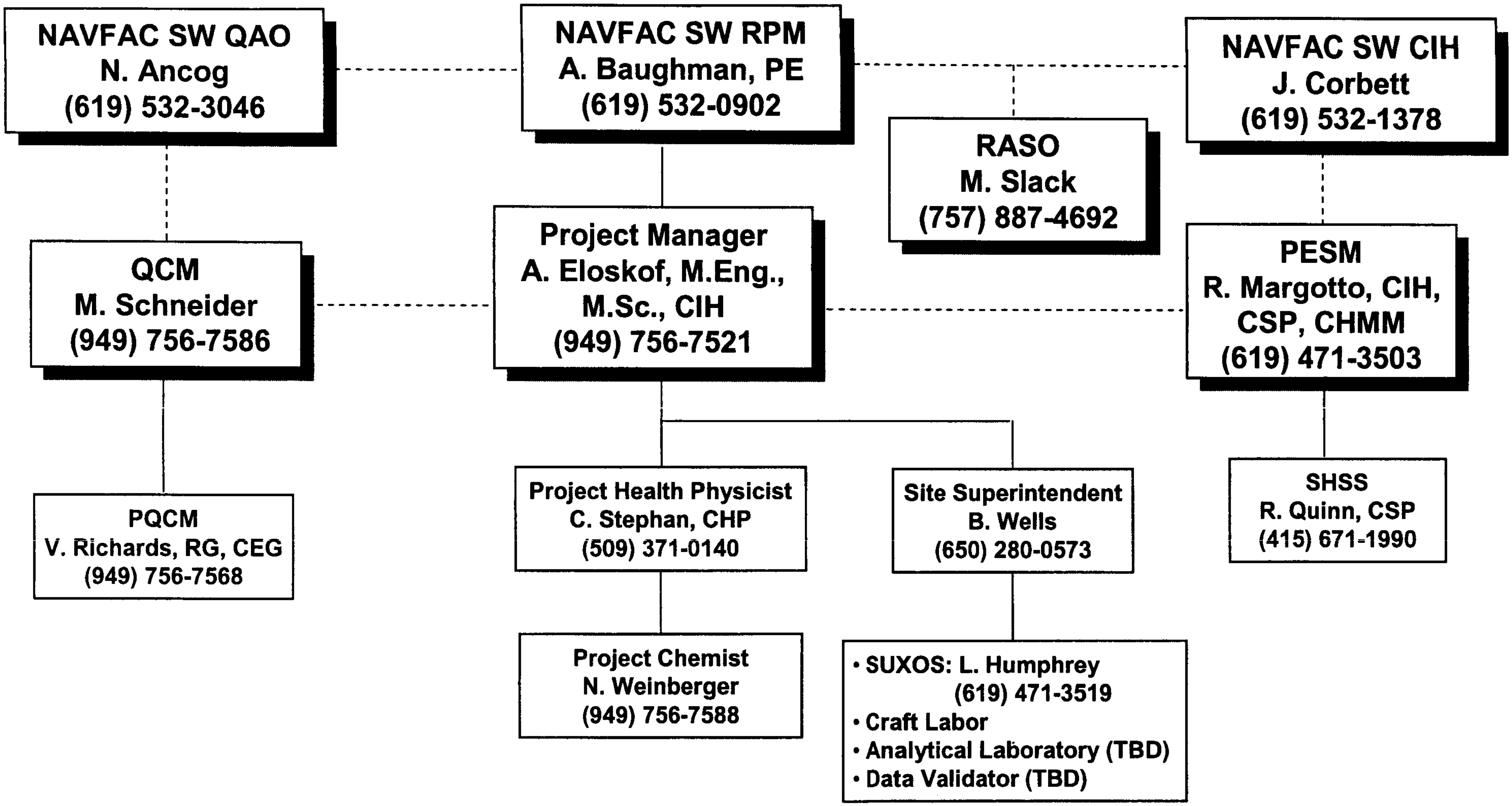
CTO 0015

Figure 10-1, Project Schedule

TETRA TECH EC, INC.

Figure 10-2

Project Organization Chart



Legend
------- = In regular contact and coordination
——— = Directly reports to above

APPENDIX A

SITE HEALTH AND SAFETY PLAN

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0015

APPENDIX A

FINAL

SITE HEALTH AND SAFETY PLAN

March 2, 2007

INSTALLATION RESTORATION SITES 1, 2, AND 32
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-07-0748

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, CA 92101-8536

Roger N Margotto, CIH

Roger Margotto, CIH
Program Health and Safety Manager

Abram S. Eloskof, M.Eng., M.Sc., CIH
Project Manager

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ATTACHMENTS

ABBREVIATIONS AND ACRONYMS

A2B	anti-two blocking
°F	degrees Fahrenheit
ABIH	American Board of Industrial Hygiene
ACGIH	American Conference of Governmental Industrial Hygienists
ACO	Administrative Contracting Officer
AHA	Activity Hazard Analysis
ALARA	as low as reasonably achievable
ALI	annual limit of intake
APR	air-purifying respirator
BEI	Bechtel Environmental, Inc.
bgs	below ground surface
BRAC	Base Realignment and Closure
Cal. Code Regs.	California Code of Regulations
Cal-OSHA	California Occupational Health and Safety Administration
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CNS	central nervous system
CO	carbon monoxide
CPR	cardiopulmonary resuscitation
CQC	Contractor Quality Control
CRZ	contamination reduction zone
CTO	Contract Task Order
DAC	derived airborne concentration
dBA	decibels, A-scale
Dig Alert	Underground Service Alert
DoD	Department of Defense
DON	Department of the Navy
E&E	Ecology and Environment
EHS	Environmental Health and Safety
EM	Engineer Manual

ABBREVIATIONS AND ACRONYMS
(Continued)

EMM	earthmoving machinery
ESS	Environmental Safety Supervisor
EZ	exclusion zone
FCR	Field Change Request
FEV10	Forced Expiratory Volume, one second
FID	flame ionization detector
FOPS	falling object protective system
FVC	Forced Vital Capacity
GFCI	ground fault circuit interrupter
H_2S	hydrogen sulfide
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
IR	Installation Restoration
kV	kilovolt
LEL	lower explosive limit
LLRW	low-level radiological waste
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter
MGFD	munition with the greatest fragmentation distance
mm	millimeter
MPPEH	material potentially presenting an explosive hazard
mrem	millirem
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NAS	Naval Air Station
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NEC	National Electrical Code
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission

ABBREVIATIONS AND ACRONYMS
(Continued)

NVLAP	National Voluntary Laboratory Accreditation Program
O_2	oxygen
OEW	ordnance and explosives waste
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PESM	Project Environmental Safety Manager
PHP	Project Health Physicist
PID	photoionization detector
PjM	Project Manager
PM	Program Manager
PPE	personal protective equipment
ppm	parts per million
PQCM	Project Quality Control Manager
QA	quality assurance
QC	quality control
RAC	Remedial Action Contract
RASO	Radiological Affairs Support Office
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RQ	reportable quantity
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
SCBA	self-contained breathing apparatus
SHSP	Site Health and Safety Plan

ABBREVIATIONS AND ACRONYMS
(Continued)

SHSS	Site Health and Safety Specialist
SOP	Standard Operating Procedure
SUXOS	Senior Unexploded Ordnance Supervisor
TCRA	time-critical removal action
TLV	Threshold Limit Value
TtEC	Tetra Tech EC, Inc.
TWA	time-weighted average
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

Tetra Tech EC, Inc. (TtEC) has been contracted by the Department of the Navy (DON) to conduct a time-critical removal action (TCRA) for the cleanup of hazardous waste sites under the DON, Base Realignment and Closure (BRAC) Program Management Office West. This Site Health and Safety Plan (SHSP) applies to all work performed for the material potentially presenting an explosive hazard (MPPEH) removal activities; removal of the former Firing-range Berm and radiological anomalies, identified during previous radiation surveys conducted at Installation Restoration (IR) Sites 1, 2, and 32; vegetation clearance; geophysical investigations and utility clearance of excavation areas; establishment of soil and debris stockpile areas; sampling, segregation, and stockpiling of contaminated soil and debris; backfill and compaction with clean import material; waste transportation and disposal; demilitarization of MPPEH; and site restoration activities at the former Naval Air Station (NAS) Alameda, IR Sites 1, 2, and 32, Alameda, California. The TtEC Health and Safety Program for IR Sites 1, 2, and 32 consists of this document, the Contract Health and Safety Program, and the TtEC Corporate Health and Safety Program Manual.

1.2 APPLICATION

The Contract Health and Safety Program is applicable to all work conducted by TtEC and TtEC subcontractors under Naval Facilities Engineering Command, Southwest (NAVFAC SW) Remedial Action Contract (RAC) N62473-06-D-2201 for Contract Task Order (CTO) No. 0015. Essentially equivalent or additional health and safety procedures and practices may be approved by TtEC and implemented by TtEC subcontractors where necessary. All subcontractors are required to follow the TtEC Health and Safety Program and procedures, unless changes are approved by the TtEC Project Environmental Safety Manager (PESM), who is a Certified Industrial Hygienist (CIH), and the DON Contracting Officer. The TtEC PESM will review TtEC and subcontractor SHSPs prior to the initiation of fieldwork.

1.3 APPLICABLE STANDARDS, REGULATIONS, AND GUIDANCE DOCUMENTS

Adherence to applicable portions of federal, local, national consensus organization, and corporate health and safety standards, regulations, and guidance manuals are required during field activities. These include, but may not be limited to, the following:

- 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health Standards, General Industry

- State regulations including Title 8 California Code of Regulations (Cal. Code Regs.) (California Occupational Health and Safety Administration [Cal-OSHA]) and Title 24 Cal. Code Regs. (Health and Safety Code)
- TtEC Corporate Health and Safety Program Manual
- TtEC Project Rules Handbook
- *Navy/Marine Corps Installation Restoration Manual* (DON/Marine Corps, 2000)
- U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Engineer Manual (EM) 385-1-1 (USACE, 2003)
- *Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices* (American Conference of Governmental Industrial Hygienists [ACGIH], most current publication)
- *Occupational Safety and Health Guidance for Hazardous Waste Site Activities* (U.S. Department of Health and Human Services, 1985)

1.4 PLAN ORGANIZATION

This plan discusses many activities pertaining to the environmental remediation at the facility, which consist primarily of the MPPEH removal from the former Firing-range Berm located on IR Site 1, demilitarization of MPPEH, removal of radiological anomalies identified during previous radiation surveys conducted at the IR Sites 1, 2, and 32. These efforts may include the vegetation clearance; geophysical investigations and utility clearance of excavation areas; establishment of soil and debris stockpile areas; sampling, segregation, and stockpiling of contaminated soil and debris; backfill and compaction with non-impacted excavated soils or clean import material; waste transportation and disposal; and site restoration activities.

1.5 SUMMARY OF MAJOR RISKS

These specific activities for field implementation of the TCRA at IR Sites 1, 2, and 32 include:

- Permitting and notifications
- Preparatory activities and meetings
- Environmental resources surveying
- Mobilization
- Clearing of vegetation
- Topographic surveying
- Geophysical surveying
- Radiological surface screening of previously identified low-level radiological waste (LLRW)
- Identification and removal of LLRW

- Soil excavation and removal of radioactive material and MPPEH
- Secondary radiological screening of excavated material
- Segregation and stockpiling of the screened material (soil, radioactive material, MPPEH, and construction debris)
- Post-excavation sampling
- Backfill placement and compaction
- Waste classification, storage and disposal
- Free-release survey and decontamination of equipment and tools
- Demobilization

Large earthmoving machinery (EMM) and soil screening equipment will be used during the course of this project, so the applicable processes and precautions will be employed to mitigate the hazards associated with operations using this equipment. Site access control will be achieved by the existing security fence, which surrounds the entire area of the IR sites, which will reduce and/or eliminate trespassers.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization chart (Figure A.2-1) shows the key individuals involved in the project.

2.1 PROGRAM MANAGER

The Program Manager (PM) has the overall responsibility for the health and safety of site personnel at all projects under this contract. The PM will ensure that adequate resources are provided to the field health and safety staff to carry out their responsibilities as outlined below. The PM will also ensure that fieldwork is scheduled with adequate personnel and equipment resources to complete the job safely.

2.2 PROJECT MANAGER

The Project Manager (PjM) is responsible for managing all technical and business aspects of the project. This includes the development of the best technical approach and budget for the CTO scope and managing technical aspects, cost, schedule, project issues as work progresses, and subcontractor oversight. The PjM will also ensure that adequate personnel and resources are available to complete the project safely. TtEC Environmental Health and Safety (EHS) Procedure 1-2 specifies that line managers (PjMs, Construction Managers, and Site Superintendents) have the responsibility to integrate loss control principles into all operations and to ensure that:

- All projects are implemented in compliance with all environmental, safety, and health laws and regulations, EHS Program requirements, and Environmental Management System requirements.
- EHS plans are developed, approved, and implemented in accordance with TtEC requirements.
- Personnel understand the requirements of the project SHSP and each individual understands his/her responsibility for plan implementation.
- Personnel have all required training and are capable of performing all assigned tasks.
- Facilities and equipment meet TtEC and government regulations.
- Work rules are enforced.
- Inspections and incident investigations are conducted per program requirements. The PjM or designated manager will conduct monthly health and safety inspections of the jobsite.
- Effective corrective actions are implemented in a timely manner following inspections, audits, incident investigations, etc.

- Clients are notified of TtEC incident reporting procedures.
- Appropriate disciplinary action is implemented by line supervision when necessary.

2.3 SITE SUPERINTENDENT AND SENIOR UXO SUPERVISOR

The Site Superintendent coordinates all construction activities and the Senior Unexploded Ordnance Supervisor (SUXOS) supervises all MPPEH removal activities. The Site Superintendent will ensure that all work is performed in accordance with the contract requirements in a safe and healthful manner. As line managers, the SUXOS/Site Superintendent has the same responsibilities for health and safety program implementation as the PjM. The SUXOS/Site Superintendent will:

- Ensure that work crews have adequate resources to effectively conduct field activities.
- In conjunction with the Site Health and Safety Specialist (SHSS), ensure that proper protective equipment is being used by all personnel.
- Ensure that appropriate disciplinary actions are taken when health and safety requirements are not being followed or when unsafe practices occur.
- Oversee work practices to verify that they are in accordance with the SHSP.
- Understand and be familiar with the SHSP.
- Participate in the daily tailgate safety meetings.
- Observe project personnel for signs of chemical or physical trauma.
- Immediately notify the SHSS and the PESM of any illness, accident, injury or near-miss incident.
- Correct any hazards disclosed by project workers or the SHSS.

The Site Superintendent and SUXOS have the authority to suspend field activities if the health and safety of personnel are in danger. The Site Superintendent has the overall responsibility for implementing the TCRA and the SUXOS will be the alternate for the Site Superintendent should he be away from the site.

The Site Superintendent will submit to the DON Administrative Contracting Officer (ACO), upon request, copies of the certificates (or acceptable alternative documents) of the most recent health and safety training required by 29 CFR, Part 1910.120 for all the personnel who will be working on site. Copies of the training certificates (or acceptable alternative documents) will also be kept at the worksite.

2.4 PROJECT ENVIRONMENTAL SAFETY MANAGER

The PESM is responsible to implement and oversee the Contract Health and Safety Program and to develop, implement, and approve all SHSPs. Any changes to the established Contract Health and Safety Program or SHSP must be at the direction of, and approved by the PESM, with concurrence of the DON ACO. The PESM or designee will not necessarily be on site during all remedial activities, but will be readily available for consultation when required.

The PESM or designee is a CIH, certified by the American Board of Industrial Hygiene (ABIH) and directs the activities of the SHSS. The PESM has the authority to stop unsafe operations, remove unqualified personnel from the work area, and approve changes to the SHSP. Duties of the PESM include:

- Overseeing all aspects of the SHSP from development to implementation.
- Advising the SHSS on all related health and safety aspects.
- Reviewing site-specific plans for completeness and compliance.
- Reviewing other site documents as they affect health and safety (Activity Hazard Analyses [AHAs], Sampling Plans, etc.).
- Reviewing and evaluating all monitoring results.
- Establishing and monitoring all related health and safety procedures through site safety inspections and audits.
- Ensuring that TtEC employees receive the required EHS regulatory training.
- Fulfilling specific responsibilities for project EHS personnel that are identified within each EHS procedure.
- Functioning as a technical resource for all environmental compliance, safety, loss control, and industrial hygiene issues.

2.5 SITE HEALTH AND SAFETY SPECIALIST (SHSS)

The potential for encountering MPPEH necessitates the use of an Unexploded Ordnance (UXO) Safety Officer to act as the SHSS for this project, during removal of the former Firing-range Berm at IR Site 1. That person will be qualified as compliant with USACE Data Item Description OE-025, Personnel/Work Standards. It should be noted that several activities may take place concurrently during the removal of MPPEH such as the removal of radiological anomalies and there may be a need for another SHSS to deal with such activities. A full time SHSS may be assigned to the project as determined by the PESM and the PjM.

The SHSS will be present on site, as required, during field operations and is responsible for all health and safety activities and the delegation of duties to the health and safety staff in the field. The SHSS is responsible for the implementation of this SHSP, ensuring that appropriate personal protective equipment (PPE) is used relative to the hazards that may be encountered, verifying that communication systems are in place, monitoring conformance with safety and emergency response procedures, giving safety briefings, ensuring that safety equipment is maintained, and conducting safety drills and exercises. Additionally, the SHSS will implement the approved unexploded ordnance (UXO) and explosives safety program in compliance with all Department of Defense (DoD), federal, state and local statutes; analyze UXO and explosives operational risks, hazards and safety requirements; and enforce personnel limits and exclusion zones (EZs).

The SHSS has stop work authorization, which will be executed upon the determination that an imminent safety hazard or potentially dangerous situation exists. Work cannot restart until clearance has been authorized by the SHSS. The SHSS is also responsible for maintaining the site health and safety logbooks.

The SHSS will possess the knowledge and experience necessary to ensure all elements of the approved SHSP are implemented and enforced on site. Every SHSS will be certified in training in first aid and cardiopulmonary resuscitation (CPR) by a recognized organization such as the American Red Cross Association. TtEC EHS Procedure 1-1, Responsibilities for Program Implementation states that the SHSS is responsible for:

- Ensuring that TtEC employees understand the requirements of TtEC EHS Program and procedures through training and communication
- Developing or assisting with the development of EHS plans in conjunction with project personnel
- Assisting management with EHS plan implementation
- Performing specific tasks in accordance with EHS plans
- Fulfilling the specific responsibilities for project EHS personnel that are identified within each EHS procedure

Additional responsibilities, as described in the TtEC EHS Program, include but are not limited to:

- Investigating all accidents, injuries, illnesses, near-misses, and other incidents
- Ensuring that employees are trained on the risks of hazardous substances used on this project
- Maintaining a Material Safety Data Sheet (MSDS) file to provide easy access to all employees
- Performing inspections to ensure that all containers are labeled
- Ensuring that the SHSP is read, understood, and signed by all field personnel, including subcontractors
- Ensuring that tailgate safety meetings are conducted on days that work is performed and that all meetings and any other additional training is documented

- Assessing employee exposure through specified monitoring protocols and ascertaining that protective measures are appropriate
- Verifying that project safety equipment is inspected, as required by the EHS Program
- Immediately reporting to the Resident Officer in Charge of Construction (ROICC) circumstances that result in a fatal injury, where one or more persons are admitted to a hospital, or where property damage to government property occurs
- Notifying the ROICC within 24 hours, of all incidents required to be reported by EM 385-1-1 (USACE, 2003)
- Verifying that all personnel have the necessary training and medical clearance prior to entering EZs or contamination reduction zones (The SHSS will inform the Site Superintendent of any site personnel with medical restrictions)
- Determining and posting routes to medical facilities and emergency phone numbers; arranging for emergency transportation to medical facilities
- Maintaining training records and medical certifications for all on-site personnel including subcontractors
- Serving as the Project Hazard Communication Coordinator

TtEC employs other full-time personnel as Environmental Safety Supervisors (ESSs) and personnel who have been cross-trained as ESSs. (The ESS is the equivalent of the SHSS.) Each TtEC SHSS has a minimum of 6 months work experience with hazardous materials and has completed a minimum of 40 hours additional specialized training in personal and respiratory protective equipment, program implementation, and in proper use of air monitoring instruments, air sampling methods, and interpretation of results. These SHSSs have had at a minimum, the Occupational Safety and Health Administration (OSHA) 10-hour Construction Safety course. On each project, an ESS is assigned to assist line management with EHS Program implementation. The ESS may have collateral duties.

2.6 SITE PERSONNEL

The PjM or the Site Superintendent or SUXOS may select, as needed, personnel to function as supervisors who will ensure that their subordinates comply with all requirements of this plan.

A list of personnel authorized to have access to the remediation or worksite will be compiled and maintained on site by the SHSS. This list will include employees of TtEC, subcontractors, and representatives of governmental agencies that may require access. All authorized personnel will meet the requirements of the SHSP and be approved by the SHSS or Site Superintendent prior to entering any EZ or controlled area when potentially hazardous activities are being conducted.

Although the employer is responsible for providing a safe and healthful workplace, each employee is responsible for their own safety, as well as the safety of those around them. Employees will use all provided equipment in a safe and responsible manner as directed by the

Site Superintendent and will follow the policies set forth in this SHSP, and in the TtEC EHS Program Manual posted on TtEC Corporate Reference Library. Each employee is responsible for immediately reporting any injuries, incidents, and safety infractions to a supervisor or the SHSS so treatment can be obtained and/or corrective action taken. Equipment operators are responsible for the maintenance, inspection, and safe operation of their equipment. They will report any equipment malfunctions or necessary repairs to the Site Superintendent.

2.7 PROJECT QUALITY CONTROL MANAGER

The Project Quality Control Manager (PQCM) inspects the preparatory and initial phases of projects for compliance with health and safety requirements.

2.8 SUBCONTRACTED PERSONNEL AND THIRD PARTIES

All subcontracted personnel are responsible for compliance with this SHSP and other applicable regulations, and they must fulfill the requirements established by this plan. Subcontractor personnel must receive a briefing from the SHSS prior to unescorted access to the project site and they must acknowledge receipt of the plan and the hazard communication briefing. On-site subcontractors are responsible for providing their personnel with appropriate PPE as specified by the plan. Subcontractor and third-party personnel have the authority to request a work area hazard assessment by the SHSS prior to the commencement or continuation of work.

Subcontractors will:

- Provide updated documentation of all training (Hazardous Waste Operations and Emergency Response [HAZWOPER]) refresher training, waste management training, etc. and medical certifications for work in the EZ
- Report all incidents and accidents immediately to the Site Superintendent or the SHSS
- Maintain a Drug-free Workplace Program in compliance with the Federal Drug-free Workplace Act

2.9 VISITORS

All visitors to TtEC project sites will report to the main office trailer and sign the visitor's log. TtEC employees who are not assigned to the Facility or the RAC Program Management Office will contact the Site Superintendent, the PjM or the SHSS before venturing to the project site. Subcontractor visitors will contact their manager on site.

In no case, will visitors be allowed on to any project site area until they have acknowledged their site indoctrination, safety training and understanding of the SHSP after they are provided with a specific briefing regarding the hazards of the area they intend to visit. PPE will be issued as needed to TtEC employees and government employees (as required by the contract). No PPE will be issued to subcontractor employees.

Visitors who do not meet the training requirements of 29 CFR, Part 1910.120 (8 Cal. Code Regs., Section 5192) will not be issued PPE. These visitors will not enter any active work area or EZ on site. If it is necessary for a visitor to enter active work areas or EZs, all work in these areas will be stopped. The visitors can only enter these areas when it is considered safe to do so by the SHSS or Site Superintendent. These visitors will be escorted at all times.

3.0 SITE HISTORY AND PROJECT DESCRIPTION

The following sections provide a description of IR Sites 1, 2, and 32 and related background information.

3.1 SITE DESCRIPTION AND BACKGROUND

Alameda Point is located on the westernmost end of Alameda Island, which lies on the eastern side of San Francisco Bay, adjacent to the city of Oakland. Alameda Point is rectangular in shape, approximately 2 miles long east-to-west, 1 mile wide north-to-south, and was occupied by the 1,734-acre former NAS Alameda until its closure in 1997.

IR Site 1 is located at the northwestern corner of Alameda Point, Alameda, California. The site makes up Operable Unit (OU) 3 of former NAS Alameda and is proposed to be transferred to the City of Alameda for use as a golf course and regional park trail.

IR Site 2 is located on the western coastline of Alameda Point, Alameda, California, and includes the West Beach Landfill (the landfill), the West Beach Landfill Wetland (the wetland), and the associated interior and coastal margins. IR Site 2 encompasses OU-4A of former NAS Alameda and is proposed to become part of the planned wildlife refuge.

IR Site 32 is located immediately east of IR Site 1 at Alameda Point, Alameda, California. The Navy completed a Remedial Investigation of IR Site 32 and a Draft Remedial Investigation Report was due in September 2006 (see Figures A.3-1, A.3-2, A.3-3, and A.3-4).

3.1.1 IR Site 1

IR Site 1, the 1943–1956 Disposal Area, is located in the northwestern corner of Alameda Point. The site was operated between 1943 and 1956 as the former NAS Alameda's main site for waste disposal. An estimated 15,000 to 200,000 tons of waste were placed in IR Site 1, including old aircraft engines, LLRW, scrap metal, waste oil, paint wastes, solvents, cleaning compounds, and construction debris. In addition, other naval installations disposed of wastes at this site, including the Oak Knoll Naval Hospital, Naval Supply Center Oakland, and Treasure Island. Materials reportedly placed in the disposal area included municipal garbage, sludges, plating wastes, acids, mercury, polychlorinated biphenyl (PCB)-contaminated fluids, rags, batteries, inert ordnance, spoiled food, asbestos, pesticides, creosote, waste medicines, and reagents.

The former pistol range area is located in the western portion of IR Site 1 and consists of a pistol range, a shotgun range, and an area immediately north of the pistol range used for disposal of spent ordnance (20 millimeter [mm], lead bullets, and pellets). According to employee interviews, during the construction of the pistol range, excavation went to a depth of 8 feet to remove buried debris such as fence material, aircraft engine parts, and so forth. At the same time, an unknown number of 55-gallon drums filled with fired 20mm projectiles were dumped in this excavation. These projectiles were also mixed into concrete (as aggregate) used for the pistol range foundations. Soil sampling at the pistol range showed that total lead concentrations were in the range of less than 10 to 34,000 milligrams per kilogram (mg/kg); cadmium was detected at concentrations of 130 mg/kg and zinc at 7,400 mg/kg at two sampling locations.

3.1.2 IR Site 2

IR Site 2 encompasses approximately 110 acres and is bordered by San Francisco Bay to the south and west. The disposal area at IR Site 2 covers approximately 77 acres in the most southwestern portion of Alameda Point. The wetland covers approximately 33 acres and the wetland is bounded by the disposal area within IR Site 2 to the north and east and by the coastal margin adjacent to San Francisco Bay on the south and west. The wetland contains two perennial ponds. The northern pond is connected to the bay by a culvert. The southern pond was created by removal of dredged materials for use as a cover for the disposal area. Hypersaline has since filled the excavation area and created the pond. The only material known to have been deposited in the wetland is scrap metal (Ecology and Environment [E&E], 1983).

The thin strip of land between the disposal area or wetland and the bay is referred to as the coastal margin. It acts as a buffer for the disposal area and the wetland and is composed of the perimeter dike and riprap seawall. Subsurface materials in the coastal margin differ from those in the disposal area and wetland. The interior margin lies outside the disposal area and wetland, to the north and east. It also contains part of the perimeter dike and includes all areas outside the dike to the north and east. It is a geographic definition used primarily for classifying sampling locations. Grasses and thistles are the dominant vegetation of the upland areas while birds-foot trefoil, brass buttons, and pickleweed inhabit the wetlands.

IR Site 2 was used as the main disposal area for Alameda Point from approximately 1952 through 1978. An estimated 1.6-million tons of waste were deposited (E&E, 1983). The wastes included municipal solid waste, waste chemical drums (contents unknown), solvents, oily waste and sludge, paint waste, plating wastes, industrial strippers and cleaners, acids, mercury, PCB-containing liquids, batteries, LLRW from radium dials and dial painting, scrap metal, inert ordnance, asbestos, several pesticides (solid and liquid), tear gas agent, biological waste from the Oak Knoll Naval Hospital, creosote, dredge spoils, and waste medicines and reagents (E&E, 1983). Ordnance and explosives waste (OEW) may have also been deposited in the 2.5-acre (approximate) Possible OEW Burial Site located in the southern part of the disposal area. A seawall was constructed along the southern and western edges of the site, and a 36-inch culvert was installed in the seawall to hydraulically connect San Francisco Bay to waters within the seawall. A substantial (10- to 15-foot) dike was installed around the perimeter of the site when disposal operations ceased.

3.1.3 IR Site 32

IR Site 32 is approximately 5.8 acres. The site encompasses the former Northwestern Ordnance Storage Area and extends north to the Oakland Inner Harbor. The majority of IR Site 32 is open space covered with asphalt, gravel, weeds, and brush.

An open space area in the eastern portion of the site was used for equipment, vehicle, and aircraft storage. Two buildings are located within IR Site 32: Buildings 594 and 82. Building 594 contains dormitory rooms, a kitchen, and a security-monitoring panel and was previously used as a storage and repair shop for underwater weapons. Building 82 is a concrete guard shack. Buildings 594 and 82 were constructed in 1979. There are no documented releases of hazardous substances in either of these buildings.

In 1883, the South Coast Pacific Railroad constructed a rail causeway over 2 miles long that extended into San Francisco Bay from the northwest corner of Alameda Island (Bechtel Environmental, Inc. [BEI], 2005). The former causeway crossed the northern portion of present-day IR Site 32 and consisted of railroad tracks built on a mud- and rubble-filled double-rock wall, with a rail yard and a passenger terminal built on a trestle at the end. A fire destroyed the original rail line in 1902; a second line was built parallel to the original rail path. Based on aerial photographs, it appears that all railroad tracks in the vicinity of and at IR Site 32 were removed by 1960; no surface evidence of the former railroad is visible at IR Site 32.

Fill activities at IR Site 32 began in 1919 and the area was completely filled by 1936. Except for the Alameda Mole, the site had been entirely under water prior to 1919.

3.2 SURROUNDING LAND USE

IR Sites 1, 2, and 32 are currently fenced and the area outside the fenced area consists of primarily former DON residence housing and some light industrial/commercial tenants who moved in when the base was closed. The sheriff's department uses the runways for training purposes.

3.3 PROJECT DESCRIPTION

The major field activities associated with the project include the removal of the former Firing-range Berm and associated MPPEHs and potential LLRW, locating and removal of the disposal trench at IR Site 1 and removal of potential radiological anomalies identified during previous radiation surveys conducted at the IR Sites 1 (excluding Area 1a, the proposed cover area), 2, and 32. These efforts may include vegetation clearance; geophysical investigations and utility clearance of excavation areas; establishment of soil and debris stockpile areas; sampling, segregation, and stockpiling of contaminated soil and debris, backfill and compaction with non-impacted excavated soils or clean import material, and waste transportation and disposal. Other activities could include excavation, demilitarization of MPPEHs, and other similar activities that will prepare the IR sites for eventual transfer. Site restoration activities will occur upon completion of the fieldwork.

4.0 POTENTIAL HAZARDS

Site-specific hazards associated with this CTO are summarized below.

4.1 CHEMICAL HAZARDS

Historical analytical results show low levels of chlorinated solvents, as well as polynuclear aromatic hydrocarbons (PAHs). However, records show that the landfill has accepted a wide variety of wastes including, lead, acid batteries, grease, oil and antifreeze, and demolished military aircraft engines. There may also be very low levels of metals in the first few inches of soil in the area where radiological anomalies are present. It should be noted, however, that the former Firing-range Berm soil contains high levels of metals, namely lead, cadmium, and zinc. MSDS for these contaminants and any additional chemicals found or brought on the site will be acquired and reviewed with all personnel during daily safety meetings. Attachment 1 of this SHSP contains MSDS of the anticipated contaminants. It is possible that additional chemicals may also be discovered. The SHSS will ensure that site personnel receive training on all of these chemicals, in accordance with EHS Procedure 4-2, Hazard Communication Procedure. A master file of MSDSs for chemicals at the site and any additional chemicals brought onto the site for use on this project will be kept in the TtEC site trailer. If unknown materials or chemicals are encountered, the SHSS will contact the PESM for additional guidance regarding these materials and to evaluate the need for additional training and protection. Dust control measures will be implemented to minimize visible dust and potential inhalation exposures for airborne contaminants.

There are numerous physical hazards identified with the site, including those associated with construction, use of heavy equipment, fire hazards, and electrical hazards. Environmental hazards associated with the physical location of the TCRA sites include heat stress, noise, and flora and fauna contact. Although the Alameda climate is temperate, there is a potential for hazards caused by adverse weather conditions, especially during the summer months.

The PESM and SHSS will initially specify the levels of protection and air monitoring requirements based on the data provided or obtained prior to investigative/excavation activities. These requirements may change as site conditions are more fully evaluated. Table A.4-1, Chemical and Radiological Hazards Assessment, summarizes the chemical and radiological hazards at the project site.

TtEC's protective equipment requirements, combined with the requirement to wash arms, face, and hands before eating or smoking, should prevent exposure through these routes. In addition, the SHSS and work supervisors will observe and warn crew members to be aware of the initial symptoms of chemical or contamination exposure. The amount of exposure depends primarily on the specific activities undertaken and the care with which the activities are performed. The SHSS will remove any crew member from the worksite and have the worker medically evaluated if the following initial symptoms persist and are unexplained by other causes (such as allergy, common cold, heat stress, and so forth):

- Dizziness or stupor
- Nausea, headaches, or cramps
- Irritation of the eyes, nose, or throat
- Euphoria
- Chest pains and coughing
- Rashes or burns

4.1.1 Hazard Communication Program

The purpose of a Hazard Communication or the Employee Right-To-Know Program is to ensure that the hazards of all chemicals located at the project site are communicated (per 29 CFR, Part 1926.59, and/or 8 Cal. Code Regs., Section 5194) to all TtEC personnel and subcontractors. TtEC EHS Procedure 4-2 is the written Hazard Communication Program. This program requires:

- ***Container Labeling***—The SHSS will ensure that all drums and containers are labeled according to contents and include those from manufacturers and those produced on site by operations. All incoming and outgoing labels will be checked for identification, hazard warning, and name and address of responsible party.
- ***MSDSs***—There will be an MSDS located on site for each hazardous chemical used or known to be on site and a list of chemicals that require an MSDS will also be maintained.
- ***Employee Information and Training***—Training employees on chemical hazards will be accomplished through formal safety training conducted annually and informal safety meetings. Project-specific chemical hazards are communicated to employees through an initial site orientation meeting and during daily safety meetings held at field project sites.

4.2 ENVIRONMENTAL HAZARDS

The SHSS or Site Superintendent will discuss environmental hazards associated with each site location at the orientation meeting prior to the start of remediation activities.

4.2.1 Weather and Heat Stress

With the possible combination of ambient factors such as high air temperature, high relative humidity, low air movement, high radiant heat, and protective clothing, the potential for heat-related injuries is a concern. The potential exists for:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Heat stroke, heat cramps, and heat exhaustion will be covered in detail during the site orientation training that will be provided by the SHSS to all personnel associated with the project before work commences. The training will be compliant with OSHA (OSHA - 29 CFR, Part 1910.120 and/or 8 Cal. Code Regs, Section 5192) requirements. TtEC EHS Procedure 4-6, Temperature Extremes, describes the heat stress management and prevention program. This information will also be discussed during a safety "tailgate" meeting before each workday where heat stress may be a factor.

At 75 degrees Fahrenheit (°F), ambient temperature, the SHSS will initiate the procedures in the program. Workers are encouraged to increase consumption of water and electrolyte-containing beverages (such as Gatorade or equivalent) during warm weather. Water and electrolyte-containing beverages will be provided on site and will be available for consumption during work breaks.

At a minimum, workers will break every 2 hours for 10- to 15-minute rest periods when temperatures exceed 75°F. Additionally, workers will be encouraged to take rests whenever they feel any adverse effects that may be heat-related. The frequency of breaks may be increased after worker recommendation or decision of the SHSS or Site Superintendent.

Workers need to protect themselves from sunburn and should wear clothing that protects them from the sun and wear a sunscreen lotion with a skin protection factor of 15 or greater that is resistant to sweating. TtEC will provide sunscreen lotion to all workers.

The EHS procedure also describes a cold stress program; however, due to the location of the project, it is unlikely that there will be a need for this program.

4.2.2 Hearing Conservation Program

In and around heavy equipment operations, noise levels may exceed a time-weighted average (TWA) of 84 decibels, A-scale (dBA), which is the threshold for implementing a hearing conservation program. Hearing protection will be made available to all exposed employees. Personnel with a standard threshold shift will be restricted from high noise exposure or will be required to wear hearing protection at all times. TtEC EHS Procedure 4-4, Hearing Conservation, presents a hearing conservation program in compliance with OSHA regulations (29 CFR, Part 1910.95, 8 Cal. Code Regs., Sections 5095 through 5100).

4.2.3 Biological Hazards

Biological hazards may be encountered on site. Workers should anticipate the increased likelihood of encountering these hazards, especially in undeveloped outdoor areas. Animal bites and insect stings can cause localized swelling, itching, and minor pain that can be handled by first aid treatment. In sensitized individuals, however, effects can be more serious (e.g., anaphylactic shock) and can lead to severe reactions in the circulatory, respiratory, and central nervous system, and in some cases, death. The SHSS will identify personnel with a known reaction to bites and stings at the pre-job safety orientation meeting. Personnel will not attempt to capture or feed any wild or semi-wild animals such as cats, rats or ground squirrels due to the possibility of a bite or parasitic infestation.

Poison oak causes discomfort, irritation, and inflammation of the skin; therefore, project personnel will be warned to prevent contact with unknown plants. Protective clothing should reduce the probability of such exposure, and cleaning the skin thoroughly with soap and water after contact will also reduce risk of severe symptoms.

Animal and bird droppings often contain mold, fungus, or bacteria that represent a significant respiratory hazard that includes lung diseases and allergies. Personnel will be instructed to avoid all contact with animal droppings and will wear gloves and Tyvek protective wear, at a minimum, when entering areas that may have become refuges or nesting areas.

The hantavirus is sometimes transmitted by rodents found in the southwestern United States and causes respiratory distress, sometimes with fatal consequences. Similarly, rats transmit the arenavirus. Transmission of the hantavirus or arenavirus occurs with exposure to rodent droppings. Good hygiene practices such as washing hands and face prior to eating and drinking will help to minimize the potential for exposure to the hantavirus. Avoiding areas where there are concentrations of mouse droppings (hantavirus) or rat droppings (arenavirus), for example, will minimize exposure to either virus. The virus can be inhaled in the dust from areas where mice or rats have nested or left their droppings. Thorough washing of hands and face after removing PPE will further minimize the potential for exposure. If a building must be entered, workers should be prepared to wear respiratory protection in the event there are animal or bird droppings. All animal dropping can be sprayed with a bleach solution and the solution allowed to set for 30 minutes prior to work in the building. The bleach will reduce the potential for exposure to the viruses.

Personnel must use extreme caution when walking through an area, around buildings, and near objects such as drums and containers where a snake is likely to rest during the daytime. If a snake is encountered, slowly and quietly back away from the snake and inform all personnel of its location. Do not attempt to move or kill a snake as certain snakes are protected under state and federal laws. In the event of snakebite, do not try to move the affected individual. Wipe off the skin, as the venom will attack intact skin. Do not suck out the venom. Do not cut open the wound. Do not apply ice or ice packs. Do not use a tourniquet. Do not administer alcohol or medications. Call for medical assistance.

4.2.4 Storm Protection

If a warning of gale-force winds or stronger is issued, which is unlikely for the project area, precautions will be taken to minimize danger to personnel and property. Precautions will include closing all openings in buildings and vehicles; removing loose materials, tools and equipment from exposed locations; removing or securing other temporary work; and closing all portals in the site trailer. The SHSS will monitor daily weather predictions by listening to daily weather forecasts on the radio or television. If particularly ominous weather conditions are predicted, the SHSS will monitor radio broadcasts regularly. The Site Superintendent or SHSS will stop all work when wind speeds are 25 miles per hour or higher and will assess what work procedures can be safely performed when winds of that magnitude exist. Consideration will be given to fugitive dust and odor emissions, the safety of equipment in high winds, and the protection of workers from flying debris in windy conditions. No crane or boom work is permitted in winds 25 miles per hour or greater. (Certain crane manufacturers may specify lower wind speed limitations for safe operations. The SHSS must ensure that operational limitations of these cranes are not exceeded.) Workers will not enter any excavations during a rainstorm. The SHSS and Site Superintendent will make a decision as to whether work can continue, can continue with modifications, or cannot continue at all.

4.3 PHYSICAL HAZARDS

There are numerous physical hazards associated with activities planned for this project that could result in operational problems or cause accidents and/or personal injury to the workforce, if not identified beforehand.

To minimize physical hazards, TtEC has developed standard safety protocols, rules and guidelines that are promulgated in the TtEC Project Rules Handbook. Parts of that safety protocol are described in this SHSP, which will be followed at all times. Failure to follow safety protocols, or continued negligence of these policies will constitute a basis for disciplinary action to the offending employee.

All TtEC personnel will follow the requirements specified in the Project Rules Handbook and this SHSP. The Site Superintendent and SHSS will observe the general work practices of each worker and enforce the use of safe procedures to minimize physical hazards. Hard hats, safety glasses, and safety boots are required in all construction areas of the worksite, unless specifically exempted by the PESM, SHSS, or Site Superintendent.

4.3.1 Tripping, Slipping, and Falling Hazards

To minimize tripping hazards caused by debris, supplies, or equipment, the Site Superintendent and/or SHSS will ensure that these materials or equipment are removed from work areas and placed in designated storage areas on a daily basis The Site Superintendent will enforce this "housekeeping" effort throughout the day. The SHSS will remind personnel and subcontractors daily to maintain sure footing on all surfaces and will inspect all work areas prior to the start of work.

Where engineering controls (e.g., guardrails) cannot be installed and/or used, personnel working 6 feet above any surface (including man lifts) are required to wear safety harnesses and safety lanyards. The SHSS will inspect these before use. Additionally, workers will not work near the edges (less than 6 feet) of excavations with a vertical drop potential greater than 6 feet without fall protection.

4.3.2 Head and Back Injuries

At a minimum, workers will don hard hats and safety glasses prior to performing any site construction or investigation activities. This will prevent minor injuries caused by bumping one's head while working around process-related structures or equipment and prevent errant materials from entering one's eyes.

TtEC EHS Procedure 3-1, Ergonomics, requires all site personnel to receive instruction in proper lifting techniques and it requires the assistance of another person to lift heavy items (as perceived by the individual worker) or for objects heavier than 50 pounds and/or uneven weight distribution. Site personnel will use mechanical lifting equipment whenever possible to minimize worker exposure to lifting hazards.

4.3.3 Falling Objects

Site personnel will not work under operating equipment at any time, and the Site Superintendent and/or SHSS will ensure that areas under operating machinery remains clear. Dump truck drivers may remain in their trucks while being loaded with soil/debris if their trucks are equipped with a falling object protective system (FOPS). If their trucks are not equipped with FOPS, the drivers will exit their trucks and stand clear of the loading operation.

4.3.4 Heavy Equipment and Traffic

The use of heavy equipment for debris removal, excavation, and lifting presents the greatest potential for injury to personnel on any jobsite. To minimize these hazards, the Site Superintendent will designate mobilization routes to/from/through the project site for mobilization and daily operations. General guidelines apply to activities on or near heavy equipment and vehicles are provided as follows:

- Only qualified personnel will operate heavy equipment.
- All trucks and heavy equipment will have spotters for backing maneuvers.
- Personnel directly involved with spotting for the operator are the only personnel allowed in the vicinity of the machinery. All others will remain a safe distance away from these operations.

Personnel requiring to approach heavy equipment while operating will observe the following protocol:

- Make eye contact with the operator (and spotter).
- Signal the operator to cease heavy equipment activity.
- Approach the equipment and complete the task.

Specific traffic requirements include the following:

- All TtEC personnel will follow all local traffic rules.
- Company vehicles will yield to all bikes and pedestrians.
- Personnel working in areas subject to vehicular traffic (streets, parking lots, and so forth) will wear high-visibility safety vests.
- Barricades with flashing lights or reflectors will be used for all roads that are blocked because of equipment or excavation.
- Excavations left open will require more substantial barricades such as "K" rails or other barriers.
- Coordinate all traffic management issues with the DON Remedial Project Manager (RPM).

4.3.5 Site Pre-inspection of Heavy Equipment

TtEC projects will only use heavy equipment that is in safe working order. To sustain this policy, the SHSS and the assigned equipment operator will inspect each vehicle and piece of heavy equipment brought onto the project site prior to use. The vehicles/machinery will be examined to assess structural integrity, smooth operational performance, proper functioning of all critical safety devices, and for compliance with manufacturer's specifications and established safety regulations. All heavy equipment brought on to the project site will have a mechanic's certification that the equipment has been inspected and is safe to operate. There will be an operator's manual for each piece of heavy equipment and vehicle. Equipment that does not pass the pre-inspection will not be put into service until all necessary repairs are made to the satisfaction of the inspection group.

4.3.6 Operator Qualifications

Subcontractors will supply proof of their operator's capability and experience to operate the equipment in a safe manner, and only qualified operators familiar with the equipment planned for use will be permitted to operate it. TtEC reserves the right to remove any operator from the project site if there is a question or doubt concerning the operator's capabilities. There are specific training requirements for industrial truck (forklift) operators and crane operators that are specified in the TtEC EHS procedures and EM 385-1-1 (USACE, 2003). The Site Superintendent will determine through observations if equipment operators are competent to operate the heavy equipment they were selected to operate in the absence of specific training requirements.

4.4 ELECTRICAL HAZARDS

To prevent accidents caused by electrical shock, the SHSS will inspect all electrical connections on a daily basis and will shut down and lock out any equipment that is found to have frayed or loose connections until repairs are made by a qualified electrician. The equipment will be de-energized and tested before any electrical work is done. All equipment will be properly grounded prior to, and during all work and ground fault circuit interrupters (GFCIs) will be installed on every outdoor circuit between the power source and electric tool. Generators used to supply power on a project site will contain GFCIs.

Requirements for electrical safety include the following:

- All electrical wiring and equipment will be listed by a recognized testing laboratory. In California, the usual recognized testing laboratories are Underwriters Laboratory, Canadian Standards Association, and Factory Mutual. There are six other recognized laboratories that are rarely ever seen in the certification of electrical equipment. Some equipment manufactured in foreign countries has other listing certifications. Most foreign certifications are not recognized in California.
- Live parts of wiring and equipment will be guarded to protect personnel from electrical shock. Un-insulated live wires must be elevated at various distances from the ground and depending on the voltage carried by those lines. EM 385-1-1, 11E provides height requirements based on line voltages.
- Transformer banks and high-voltage equipment will be protected from unauthorized access.
- A qualified electrician will perform all work on electrical power supplies and lines.
- Flexible cords (extension cords) will contain the number of conductors required for service plus a ground wire. Cords will be rated for hard usage (S, SE, SEO, SO, SOO, ST, STO, STOO). It should be noted that this rating is not required to be listed on the cord itself, so check the wrapping or label that comes with the cord to ensure that the cord meets this requirement. Flexible cords will not be passed through doors, windows, or be placed on the ground where they are subject to being run over by

vehicles. If flexible cords must pass through walls, the cords will be protected by bushings or fittings.

- Flexible cords must be inspected on each day of use. No splices or fraying are allowed.
- Flexible cords will not be secured with staples, hung from nails or suspended by bare wire. Plastic tie straps, commonly used today, are acceptable.
- All portable lamps must have bulbs protected by a substantial guard that is attached to the lamp holder handle.
- All circuit breaker panels, electrical transformers and power supply equipment must be labeled as to the voltage contained therein.
- Every circuit breaker in all circuit breaker panels must be labeled to describe the circuit it controls.
- All breaker panels and electrical panels must have a cover protecting live, exposed wires.
- A minimum 36-inch clearance must be maintained on three sides of all circuit breaker boxes, transformers, and electrical supply equipment to provide unimpeded access to the equipment in the event of an emergency. Note: lower voltages require only a 30-inch clearance; however, TtEC's policy is 36 inches for all voltages.
- Circuit breaker boxes that are locked or are located in locked rooms must have a key readily available in the event of an emergency.

4.4.1 Portable Generators

Portable generators used on project sites must meet the requirements for grounding specified in the National Electrical Code (NEC), National Fire Protection Association 70. NEC 250-6 has certain exemptions for the grounding of portable and vehicle-mounted generators; refer to EM 385-1-1, Section 11C (USACE, 2003) for additional details. Portable generators will be operated in open air only where there is sufficient ventilation to prevent accumulation of exhaust gases and carbon monoxide.

4.4.2 Temporary Wiring and Lighting

The following rules apply to temporary wiring and lighting:

- A qualified electrician will design temporary wiring; a qualified engineer will approve the design and the system will be tested as required by EM 385-1-1, Section 11 (USACE, 2003).
- The bulbs of temporary lighting fixtures will be protected by guards and will not be suspended by the wire.
- Exposed empty light sockets and broken bulbs are not permitted.

- Temporary lighting circuits will be separate from electrical tool circuits and each circuit will be labeled as "LIGHTS ONLY" or "TOOLS ONLY," as appropriate.

4.4.3 Control of Hazardous Energy (Lock-out/Tag-out)

TtEC EHS Procedure 6-4, Lock-out/Tag-out, establishes the TtEC Control of Hazardous Energy Program. This program applies to all TtEC operations, with the following exceptions:

- Work on cord and plug connected electrical equipment where the plug is under the control of the employee performing the work
- Hot tap operations
- Work involving minor changes and adjustments to equipment during routine operations (such as small tooling adjustments)

Procedures to prepare for and apply a lock-out, and release a machine or piece of equipment from lock-out are provided below. These steps will be completed, in order, using the corresponding permit. While work is being performed under the lock-out, a copy of the completed permit will be posted at the equipment controls or work area as appropriate. (The steps below refer to sections of the permit form.)

1. **Section A**

   Complete the general information in Section A of the permit.

2. **Isolation points**

   The first step required to isolate a piece of equipment is to identify the sources of hazardous energy present. To identify the sources, the authorized employee will complete the following steps:

   - Survey the equipment and related schematics, blueprints, or as-built drawings, if available, for hazardous energy sources.
   - Identify the isolation points and device positions for controlling each source of hazardous energy.
   - Identify the isolation method to be used on each source.

   The above information will be documented in Section B of the Lock-out/Tag-out Permit as each point is identified.

3. **Notifications**

   Prior to applying a lock-out, the authorized employee will notify affected employees of the equipment to be locked out and sign Section C of the Lock-out/Tag-out Permit on the "Notifier" line.

4. **Equipment shutdown**

   Shut down the equipment or place into the desired configuration using normal operating procedures. The authorized employee will sign Section C of the Lock-out/Tag-out Permit on the "Shutdown by" line.

5. **Equipment isolation**

   To apply a lock-out to a piece of equipment, complete the following steps:

   - Place each energy isolation device into a position that will prevent the transmission of hazardous energy.
   - The authorized employee will lock out devices to each isolation point and control the key for each lock at all times. Only one key is permitted per lock.

   Complete Section D of the permit as each device is placed and sign the "Isolator" line in Section C.

   Notes:

   - Any lock-out device not containing an integral locking mechanism must be used in conjunction with a keyed lock.
   - Any energy isolation point not capable of being locked out must be controlled physically (e.g., removing handles or disconnecting).

6. **Release of stored energy**

   After the equipment has been locked and tagged as required in Section D, all remaining stored energy must be released. Methods for the release of stored energy include, but are not limited to the following:

   - Discharge and grounding of capacitors
   - Bleeding pressure from vessels and lines
   - Releasing mechanical sources of energy to engage blocks

   Stored energy has the potential to re-accumulate; therefore, verification of isolation will continue until work is complete. After releasing stored energy, complete Section E of the permit.

7. **Lock-out/Tag-out verification**

   After completing the lock-out of the desired piece of equipment, the effectiveness of the lock-out must be verified by the authorized employee by attempting to operate the machine. After attempting to operate the machine, sign Section C of the permit on the "Verifier" line.

8. **Performance of work**

   After verification and the receipt of the supervisor's approval signature, work may be performed on the locked/tagged equipment.

9. **Lock-out/Tag-out removal**:

   After work has been completed, the following steps will be followed to release equipment from lock-out/tag-out:

   - The area affected by the lock-out will be inspected to ensure that releasing the machine does not present a hazard to people and property.
   - Lock-out devices and tags will be removed.
   - Isolation devices will be returned to their operating positions.

- The equipment will be started.
- Affected employees will be notified of the release.
- Section F of the permit will be completed as the equipment is returned to service.

4.4.4 Tag-out

The use of tags without locks is prohibited, except in those cases where it is physically impossible to attach a locking device to an isolation point. When it is necessary to use tags without locks, the following procedures will be followed:

- The isolation point will be placed in the correct position to prevent the flow of energy.
- The device will be physically disconnected.
- A tag will be placed on the disconnected device.
- Employees will be warned not to tamper with the tag or isolation point.

4.4.5 Equipment-specific Lock-out/Tag-out Procedures

Because TtEC does not normally perform lock-outs of machinery on a repetitive basis, the lock-out/tag-out permit contained in Attachment 2 is designed for initial and unique lock-outs. Should it become necessary to repetitively lock out the same piece of equipment, specific procedures and permits for the equipment will be developed. Information contained in the equipment-specific procedure and permit should be the same as the information in Attachment A of the permit. The procedures will be generated by trained and knowledgeable project personnel and reviewed and approved by the PESM. Equipment-specific procedures are not required when all of the following conditions are present:

- The machine has no potential for stored energy or the re-accumulation of energy after shutdown.
- The equipment has a single, readily identifiable, and isolated source of energy.
- Isolation and lock-out of the source will completely de-energize and deactivate the equipment.
- The machine is locked out and isolated from that energy source during servicing and maintenance.
- A single lock-out device will achieve a locked-out condition.
- The servicing or maintenance does not create a hazard to other employees.

4.4.6 Shift Changes

If it is necessary to maintain the status of a locked-out machine or device past the end of the shift when the lock-out was initially installed, the following procedures will be adhered to:

- The incoming authorized employee will place their lock on the lock-out point and complete a new permit.
- The outgoing employees will remove their lock(s) after the new lock(s) are applied.
- If multiple shifts are not used, the initial locks may be left in place until the following day or until the equipment is released from lock-out/tag-out.
- The new shift supervisor will sign the permit before work is begun on the new shift. The last supervisor whose name is on the lock-out/tag-out permit is responsible for all activities related to the work activity.

4.4.7 Failure to Clear Locks

If a person should fail to clear a lock-out and their lock remains in place, the supervisor will attempt to contact the person who applied the lock and resolve the issue.

If the person cannot be contacted, the supervisor will investigate the situation and determine if removal of the lock will create a hazard in the work zone. If there is no hazard present, the supervisor will then verify that the work zone is clear, blocking devices have been removed, and the system has been restored to the normal configuration. The supervisor will then cut the lock off and restore energy to the system.

A written incident and investigation report per TtEC EHS Procedure 1-7, Incident Reporting and Investigating, will be prepared by the supervisor stating the reason for cutting the lock, why the lock was not removed, and the procedure used to ensure the safety of personnel in the area. The individual whose lock was cut off must be notified immediately. Project forms, including incident reporting and lock-out/tag-out forms, are included in Attachment 2.

4.4.8 Subcontractors

The Site Superintendent will be familiar with the nature of all on-site subcontractor work that may involve hazardous energy and ensure that they conform to established work practices that are at least as strict as this procedure. For any lock-out/tag-out requirements, the Site Superintendent will review and approve all subcontractor work preparation, apply his/her locks to the configuration, and sign the appropriate lock-out/tag-out procedure checklist.

4.4.9 Periodic Inspections

Periodic inspections, pursuant to EHS 3-3, Inspections, will be completed during the monthly surveillances by the SHSS, PESM or other qualified personnel to ensure that the lock-out/tag-out program is being effectively implemented. At a minimum, the following will be done:

- Existing lock-outs will be reviewed for effectiveness.
- Permits for each existing lock-out will be reviewed for adequacy.

- Incident reports and past permits will be reviewed to determine if deficiencies in the program exist.
- Corrections to the system will be made as warranted.
- Results will be logged in the health and safety logbook.

4.4.10 Training

Training requirements for personnel involved with, or affected by lock-out/tag-out are provided as follows:

- Authorized employees will receive training in the following prior to being allowed to use lock-out/tag-out procedures:
  - Recognition of hazardous energy sources
  - Types and magnitudes of energies available at the site
  - Methods and means needed for energy isolation and control
  - The requirements of this procedure and 29 CFR, Part 1910.147
- Affected employees will be instructed in the following:
  - Purpose of the lock-out/tag-out program
  - Use and requirements of this procedure and 29 CFR, Part 1910.147
  - Prohibitions of restarting or tampering with equipment that has been locked out
  - Prohibitions of tampering with locks and tags installed on equipment

Personnel not employed by TtEC will be briefed in the requirements of this program during site-specific orientations, when applicable. Training records will be maintained in accordance with TtEC EHS Procedure 1-9, Recordkeeping.

4.5 CONFINED SPACE ENTRY

A confined space is any enclosed area having a limited means of egress where ventilation is not adequate to remove a toxic or flammable atmosphere or prevent an oxygen deficiency. Examples of confined spaces include, but are not limited to: tanks; boilers; vessels; bins; manholes; tunnels; pipelines; underground utility vaults; or any open top space more than 4 feet in depth such as pits, tubes, trenches, or vessels.

TtEC EHS Procedure 6-1, Confined Space Entry, outlines confined space entry procedures in detail. If a confined space entry is planned, the PESM will be immediately contacted. The PESM, the SHSS and the Site Superintendent will identify existing confined spaces or confined spaces created by the nature of the work, and the SHSS will take actions necessary to prevent access to those spaces. If entry to a confined space is required, the SHSS will develop a confined space entry plan and AHA that will detail equipment requirements and procedures for the confined space entry. Prior to entry, the plan and the AHA must be reviewed, and approved by the PESM.

4.6 FIRE AND EXPLOSION HAZARDS

In areas planned for cutting or welding, atmospheric testing with a combustible gas indicator must be performed to determine if a flammable atmosphere exists. Hot work permits and procedures are found in TtEC EHS Procedure 6-5, Welding/Hot Work, and must be issued to control the presence of equipment or operations producing open flames or sparks. Permits are issued by the SHSS. The SHSS must establish a fire prevention and protection program by ensuring that flammable materials are properly stored and that safe work procedures and rules are followed. Smoking is not permitted anywhere on the project site, except in designated areas.

4.7 RADIOLOGICAL HAZARDS

Radioactive materials are present in the project site as documented by previous site surveys. If radioactive materials are encountered during radiological surveying of the former Firing-range Berm soil, during the excavation of the disposal trench, or potential locations of radioactive anomalies, the procedures outlined in Section 5.0, Radiological Controls, of the TCRA Work Plan will be followed. Specifically, following identification of a point source, the source will be removed with hand-digging tools or a small backhoe or equivalent, placed into an appropriately sized clear plastic bag, logged, packaged for placement into metal storage containers, and stored in a designated and posted radioactive material storage area for subsequent disposal.

At no time will workers directly touch or handle any material that is potentially radioactive without first notifying the Project Health Physicist (PHP). Workers will follow safe work practices described in the radiological protection plan. All radioactive work procedures and policies are reviewed and approved by the PHP.

4.7.1 Radiological Health and Safety

The necessary controls for radiologically safe operations will be implemented in accordance with TtEC's Standard Operating Procedures (SOPs), and current health physics practices. Critical requirements include the presence of a TtEC Radiation Safety Officer (RSO) to ensure compliance with the TtEC's SOPs and the radiological controls specified in Section 5.0 of the TCRA Work Plan; and the presence of Radiological Control Technicians at active work areas to ensure compliance with the Radiation Work Permit (RWP).

Dose rate, contamination, and air monitoring, including initial baseline sampling to determine radiological background conditions, will be performed in accordance with the requirements specified in the RWP and based on judgment of the Radiological Control Technician (RCT). PPE levels, dictated by radiological considerations and physical and chemical safety issues identified at each work location, will be assigned or modified, according to the approved RWP.

4.7.2 ALARA

The basic concept in radiation protection specifies that exposures to ionizing radiation and releases of radioactive materials should be managed to reduce collective doses to workers and the general public as low as reasonably achievable (ALARA). ALARA will be implemented during the course of the work specified in the TCRA Work Plan.

The basic methods used to control radiation exposure will include personnel training, personnel monitoring, evaluation of radiological conditions, use of RWPs, site control procedures, posting of potentially hazardous areas, implementation of engineering controls, and specification/use of PPE.

4.7.3 Radiation Work Permits

An RWP will be prepared that will specify the radiological safety requirements for activities performed at IR Sites 1, 2, and 32. Personnel assigned to site work will be required to understand the requirements and sign the RWP prior to beginning work.

4.8 INTERNAL COMBUSTION ENGINES AND PUMPS

The required engine/pump stop devices on such equipment such as the portable generators that will supply power to the project trailer, the trash pump that will pump water from the decontamination pad, and the screening plant to segregate the soil from potential MPPEH, etc. are provided as follows:

- Internal combustion engine: an ignition or grounding switch
- Diesel engine: either a quick-closing valve or equivalent device, which will shut off the air to the air-intake manifold of the engine and prevent entry of gas-laden air, or a means of releasing the engine compression, which will not produce an open flame or spark
- Electric motor: a suitable switch in the motor circuit, or a switch or stop button in the control circuit, approved for the location in which it is installed

Mud pumps will be equipped with a pressure-relieving device set to release at the upper limit of the safe working pressure of the pump. Such devices include direct spring-loaded safety valves, shear-pin safety valves, and rupture disks. There will be no valve between the pump and its pressure-relieving device. The point of discharge from a pressure-relieving device will be located where employees are not endangered by the discharge of fluids. Each pump will be equipped with bleeder valves. All personnel involved in the operation of the rig will know the exact location of each stop device.

4.9 SAFETY DURING TRAVEL

The individual(s) who will transport the screening plant or wide load construction equipment to site will:

- Be properly licensed and will only operate the vehicle according to federal, state, and local regulations
- Know the traveling height (overhead clearance), width, length and weight of the screening plant with carrier and know the highway and bridge load, width, and overhead limits, making sure that these limits are not exceeded and allowing an adequate margin of safety
- Be aware that the canopies of service stations and motels are often too low for a screening plant to clear with the mast in the travel position
- Watch for low hanging electrical lines, particularly at the entrances to project sites or restaurants, motels or other commercial sites
- Remove all ignition keys when the screening plant is left unattended

4.10 OVERHEAD ELECTRICAL HAZARDS

Overhead power lines do not exist within the work area and as such, will not present a hazard to equipment and personnel. If the city of Alameda has installed power lines since the last field activities occurred, adequate clearance will be maintained to prevent equipment contact with power lines and/or arcing. For lines rated 50 kilovolts (kV) or below, the minimum clearance between the lines and any part of a crane or load will be 10 feet. For lines rated more than 50 kV, the minimum clearance between the lines and any part of the crane or load will be 10 feet plus 0.4 inch for each kV more than 50 kV. TtEC requires a minimum clearance of 15 feet.

4.11 EXCAVATION SAFETY

Any excavation or trenching operation that is 4 feet or more in depth will be performed in accordance with EM 385-1-1 (USACE, 2003) and TtEC EHS Procedure 6-3, Excavation and Trenching. A TtEC excavation permit must be completed by a competent person before excavation commences, and at least each day thereafter. This permit requires daily inspections of the operation and adjacent areas by a competent person. Specific situations addressed in these inspections are possible cave-ins, standing water in excavations, indications of failure of protective systems (benching, sloping, or shoring), hazardous atmospheres, and other unsound conditions. If the competent person finds evidence of any of these situations, exposed employees will be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

In addition to the excavation permit, for work in California, a Cal-OSHA Activity Notification Form for Holders of Annual Excavation Permits must be filed with Cal-OSHA for any excavation 5 feet or greater in depth into which workers will enter. TtEC has an annual permit for excavations in the state of California. It should be noted that Underground Service Alert (Dig Alert, 800-642-2444), must be notified before any excavation work begins regardless of depth. This notification will have to be renewed monthly during field activities. Exploratory techniques, such as "pot-holing" will be performed to ensure that any excavations near utilities can be performed safely. Procedures to suppress the generation of dust will be performed when soil is lifted or loaded, and dust suppression measures may use water, or the use of other measures, which will make the soil less likely to dust. For example, loaders dumping soil into a dump truck or a stockpile may have to lower the bucket as close as possible to the truck or stockpile before dumping to reduce the drop height of the soil and, thereby, reduce the amount of dust generated

General requirements governing activities in and around excavations and trenches, as well as the requirements for the selection and use of protective systems are provided as follows:

- All excavations 20 feet or greater in depth below ground surface (bgs) must be designed and approved by a registered professional engineer in the state of California.
- Surfaces surrounding open trenches and excavations will have all hazards removed.
- All utilities will be located and cleared prior to initiating digging. Commercial geophysical vendors will be used where possible for this purpose,
- When the excavation is open, utilities, if present, will be supported and protected from damage. Clearance and support methods will be documented on the daily inspection checklist.
- EM 385-1-1 (USACE, 2003), Section 25, requires the installation of perimeter protective systems for all open excavations. Class I perimeter protection, the most protective system that requires installation of fences and barricades, which would prevent members of the public (people other than workers) from entering or falling into the excavation, will not be required for this project since the three sites are fenced and public access is restricted. (Consult the EM 385-1-1 [USACE, 2003] for the types of protective system required for various situations.)
- Where structural ramps are used for egress, they will be installed in accordance with 29 CFR, Part 1926.651(c)(1).
- Stairways, ladders, or ramps will be provided as means of egress in all trenches 4 feet or more in depth. Travel distance will be no more than 25 feet between means of egress.
- Employees exposed to vehicular traffic will wear high-visibility vests.
- No employees will be permitted under loads being lifted or unloaded from vehicles.
- When vehicles and machinery are operating adjacent to excavations, warning systems such as stop logs or barricades will be used to prevent vehicles from entering the excavation or trench. Under no circumstances will vehicles, equipment, materials, or supplies ever be placed closer than 2 feet from the edge of any excavation. A professional engineer may have to calculate the distances of heavier equipment for

placement away from the edge so as to prevent collapse of the excavation wall caused by the weight of the equipment.

- Scaling or barricades will be used to prevent rock and soils from falling on employees.
- Excavated and loose materials should be kept at least 3 feet from the edge of excavations, but at a minimum of 2 feet from the edge of the excavation in accordance with OSHA requirements.
- Walkways or bridges with standard railings will be provided where employees cross over excavations or trenches.
- Barriers will be provided to prevent personnel from inadvertently falling into an excavation. Workers toiling within 6 feet of the edge of the excavation must be protected by fall protection where there is a vertical drop potential greater than 6 feet (guardrails or personal protection).

4.11.1 Hazardous Atmospheres in Excavations

Where atmospheres containing less than 19.5 percent oxygen, or where other types of hazardous atmospheres may exist, the following requirements will be implemented:

- Atmospheric testing will be done prior to employees entering excavations 4 feet or greater in depth.
- Testing methods will be listed on the daily inspection checklist and results documented daily in field logs.
- Control measures (e.g., ventilation, PPE) will be used to control employee exposure to hazardous atmospheres below published exposure limits.
- Ventilation will be used to maintain flammable and combustible vapors at below 10 percent of their lower explosive limit (LEL).
- Testing will be repeated as often as necessary to ensure that safe levels of airborne contaminants are present.
- Emergency equipment will be provided and attended when the potential for a hazardous atmosphere exists. This equipment will include, but not be limited to emergency breathing apparatuses, harnesses, lifelines, and basket stretchers. Required equipment will be listed on the daily inspection checklist and reviewed daily.

4.11.2 Protection from Water Hazards

When water has collected or is collected in excavations and trenches, the following requirements will be applied:

- Employees will not work in excavations in which water has, or is, accumulating without the use of additional protection such as special support systems or water removal.

- A competent person will monitor water removal.
- Barriers such as ditches and dikes will be used to divert runoff from excavations and trenches.
- Trenches will be re-inspected prior to re-entry after water accumulation due to heavy rainfall or seepage.

4.11.3 Stability of Adjacent Structures

When excavating or trenching near an adjacent structure, for example, removal of radiological anomalies near an existing structure, the following practices will be implemented:

- Support systems such as shoring, bracing, or underpinning will be provided where the stability of buildings, walls, or other structures are endangered by excavation.
- Excavation of bases or footings for foundations will be prohibited unless support systems are used, the excavation is in stable rock, a professional engineer has determined that the structure is sufficiently removed from the site so as not to pose a hazard, or a professional engineer determines that the excavation will not pose a hazard to employees caused by the structure.
- Support systems will be used when it is necessary to undermine sidewalks, pavements, and appurtenant structures.
- Surcharge load sources and adjacent encumbrances will be listed with their evaluation date on the daily inspection checklist.

4.11.4 Daily Inspections

Inspections will be performed daily on all excavations, adjacent areas, and protective systems before personnel enter the trench. The checklist provided in TtEC EHS Procedure 6-3, Excavation and Trenching, procedure or an equivalent inspection form will be used.

4.11.5 Soil Classification

To perform soil classification, the competent person will use a thumb test, pocket penetrometer, or shear vane to determine the unconfined compressive strength of the soils being excavated. In soils with properties that change (one soil type mixed with another within a given area), several tests may be necessary. When different soil types are present, the overall classification will be that of the type with the lowest unconfined compressive strength. Classifications will result in a soil rating of Stable Rock, Type A, Type B, or Type C in accordance with 29 CFR, Part 1926.652, Appendix A. Soil classifications will be listed on the daily inspection checklist. The soils analysis checklist provided in the EHS procedure, or an equivalent form will be used for soil classifications.

4.11.6 Sloping and Benching

All sloping and benching will be done in accordance with 29 CFR, Part 1926.652, Appendix B and/or EM 385-1-1, 25C (USACE, 2003). Selection of the sloping method and evaluation of surface surcharge loads will be made by a competent person familiar with the requirements contained therein. Sloping and benching methods and specifications will be listed on the daily inspection checklist.

4.11.7 Protective Systems

Protective systems are required on all excavations over 5 feet in depth or in excavations less than 5 feet when examination of the ground by a competent person reveals conditions that may result in cave-ins. Selection and installation of protective systems will be done in accordance with 29 CFR, Part 1926.652, Appendices C and D, or manufacturers' data for shoring and shielding systems. Selection of a protective system will be made based upon soil classification and job requirements by a competent person. Protective systems and specifications will be listed on the daily inspection checklist. Protective systems, as discussed here, refer to protective systems within the excavation itself and not to the perimeter protective systems as mentioned above.

4.11.8 Training

Competent persons will have an adequate combination of experience and training to classify soil types and select protective systems as outlined in 29 CFR, Part 1926.652. Training and experience pertaining to qualification as a competent person will be documented and include the following:

- General safety practices related to working in or near open excavations
- Inspection requirements and techniques
- Classification of soils in accordance with 29 CFR 1926.652, Appendix A
- Uses, limitations, and specifications of protective systems in accordance with 29 CFR, Part 1926.652

Employees of TtEC, who have received the ESS training class, have had this training as part of this class. Training records will be maintained in accordance with TtEC EHS Procedure 1-9, Recordkeeping.

4.11.9 Stockpile Management

Stockpiles need to be maintained during excavation activities. They will be covered with a plastic liner to prevent wind and rain erosion and sandbags will be used to prevent wind from removing the liner. Sandbags will weigh no more than 35 pounds when wet, and workers will be instructed to follow safe lifting procedures. Plastic liners can be slippery and hazardous, especially if the plastic is wet. When the stockpiles are to be either used for backfilling or disposed of, the plastic must be removed. Workers will handle the plastic carefully so that the wind does not pick up the plastic and whip it around them. Any stockpile that is covered must have obvious surface hazard debris and trip hazards removed before placing the cover on top of the stockpile. The slope of a stockpile cannot exceed 1:1 (45°).

5.0 ACTIVITY HAZARD ANALYSES

An AHA is developed for each planned activity and operation that occurs in each major phase of work and is the focal point for safe conduct of the work. The AHA identifies the sequence of work, specific hazards anticipated, and the control measures to be implemented to minimize or eliminate each hazard. Since each task is described and evaluated, workers should be better prepared to perform work safely. The AHAs are used to augment daily safety meetings and are intended to heighten safety and hazard awareness on the job. The AHA will be covered during the preparatory phase, pre-task meetings for all definable tasks in the planned work, and the pre-task briefings will be documented in the Daily Contractor Quality Control (CQC) Report and may be combined with the daily tailgate meeting.

The SHSS will discuss the risks and precautions associated with each task identified in the TCRA Work Plan. Prior to the start of each work shift, daily "tailgate" safety meetings are held to discusses the potential chemical, physical, and environmental hazards, and applicable preventive safety measures. During a workday, if any changes or new conditions develop, the SHSS will ensure that the applicable AHA is updated and that workers review it. Attendance is mandatory for all employees involved in the specific work. Amended AHAs must be reviewed by the PESM; however, if a change must be implemented immediately and the PESM cannot be contacted, the SHSS may implement the change, forward a copy of the change to the PESM as soon as possible and leave a voicemail phone message for the PESM.

If changes to an AHA are necessary because of changing conditions or requirements, the SHSP may be modified by using the change form attached to the SHSP and approved by the PjM or Site Superintendent, the SHSS, and the PESM. The AHAs specific to this project are found in Attachment 3 and include the following:

AHA # 1	Mobilization and Site Setup
AHA # 2	Trailer Installation at Alameda Poing
AHA # 3	Clearing and Grubbing for Alameda Point
AHA # 4	Transportation and Disposal
AHA # 5	Stockpile Management
AHA # 6	Screening Soil with Trommel Screen Plant
AHA # 7	Geophysical Survey
AHA # 8	Intrusive Investigation
AHA # 9	Material Potentially Presenting an Explosive Hazard
AHA # 10	Sampling Activities at Alameda Point

AHA # 11	Surveying Activities at Alameda Point
AHA # 12	Waste Characterization, Transport, and Disposal for Alameda Point
AHA # 13	MPPEH Demilitarization
AHA # 14	Field Surveying
AHA # 15	Soil Excavation Backfill and Hauling
AHA # 16	Use of All-terrain Vehicles at Alameda Point
AHA # 17	Demobilization and Site Restoration
AHA #18	Removal of Containers/Drums

6.0 PERSONAL PROTECTIVE EQUIPMENT

PPE for site workers is selected and used based upon the existing and potential hazards anticipated, and the requirements of 29 CFR, Part 1910.120 (8 Cal. Code Regs., Section 5192). Different levels of personal protection will be provided to workers depending on specific work tasks performed. The selection of PPE requires an evaluation of chemical contaminants, concentrations of these chemical contaminants, and physical hazards that may be encountered.

This SHSP complies with 29 CFR, Part 1910.132 (8 Cal. Code Regs., Sections 3380 through 3390), which states that all PPE for eyes, face, head, and extremities, protective clothing, respiratory protection devices, and protective shields and barriers will be provided, used, and maintained in a sanitary and reliable condition. PPE is required wherever hazards posed by the work processes, the environment, chemicals, or mechanical irritants that may cause injury or impairment in function of any part of the body through absorption, inhalation, or physical contact.

Respiratory protection is of primary importance in the protection of employee health since inhalation of air contaminants is a potential major route of exposure. The TtEC respiratory protection program is administered pursuant to the requirements established by 29 CFR, Part 1910.134 (8 Cal. Code Regs., Section 5144). The SHSS is assigned responsibility as the Respirator Program Administrator for the project. Selection, use, and maintenance of PPE at the project will be in accordance with TtEC EHS Procedure 5-1, PPE, and EHS Procedure 5-2, Respiratory Protection. The SHSS may upgrade or downgrade the level of protection based on established action levels contained in the SHSP, the anticipated hazards, the evaluation of site monitoring data, and the concurrence of the PESM.

The U.S. Environmental Protection Agency level categories are as follows:

- ***Level A***: Used when the greatest level of skin, eye, and respiratory protection is needed and consists of a totally encapsulated suit with supplied breathing air.
- ***Level B***: Used when the highest level of respiratory protection is needed but a lesser level (than Level A encapsulated suit) of skin protection is required.
- ***Level C***: Used when criteria for using air-purifying respirators are met and a lesser level of skin protection is required.
- ***Level D***: Used only as a work uniform and in an area without respiratory hazards.

6.1 LEVEL D PROTECTION

Level D protection is used during site reconnaissance, mobilization, geophysical survey, baseline surveying, backfilling and compaction, and other activities that have no potential for exposure to chemical hazards. PPE for Level D includes:

- Coveralls, cotton and/or disposable
- Boots, leather or rubber, steel-toe and shank, non-slip soles
- Rubber over-boots or disposable booties (as required)
- Safety glasses or goggles, face shield when handling liquids
- Hard hat
- Gloves as required by task (leather work gloves)
- Hearing protection (as required)

6.2 LEVEL C PROTECTION

Level C protection is used during Resource Conservation and Recovery Act (RCRA) and non-RCRA soil excavation, temporary storage, loading, decontamination of equipment, and other activities where there is a potential for chemical exposure, but the anticipated exposure is below permissible exposure levels with the provided PPE. If air monitoring information dictates that a higher degree of PPE is necessary, levels of protection are increased. PPE for Level C includes:

- Full face-piece air-purifying respirator (APR)
- National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA)-approved APR cartridges (approved for use with the specific types of contaminants)
- Emergency escape respirator (optional, depending on the potential for emergency conditions)
- Coveralls (inner), cotton
- Coveralls (outer), chemical-resistant, disposable (Tyvek)
- Gloves (outer), chemical-resistant (nitrile)
- Gloves (inner), cotton or nitrile
- Boots, chemical-resistant, rubber, with steel-toe and shank, or leather, with steel-toe and shank, with chemically resistant rubber over-boot, non-slip soles
- Hard hat
- Hearing protection (optional or as required)

6.3 LEVEL B PROTECTION

Level B protection is selected and implemented when it is determined through real-time air monitoring and/or personnel sampling that the highest level of respiratory protection is necessary. This level of protection is also used when identified atmospheric contaminant(s) do not meet the selection criteria that permits the use of APRs, or when contaminants are unknown. If unknown containers are encountered during the excavation of the disposal trench, or potential radioactive anomalies, the removal and handling of these containers will require the use of Level B protection.

PPE for Level B includes:

- Pressure-demand, self-contained breathing apparatus (SCBA) or airline respirator (with attached 5-minute escape bottle)
- Coveralls (inner), cotton
- Coveralls (outer), chemical-resistant, disposable (Tyvek)
- Gloves (outer), chemical-resistant (nitrile)
- Gloves (inner), nitrile
- Boots, chemical-resistant, rubber, with steel-toe and shank, or leather, with steel-toe and shank, with chemically resistant rubber over-boot, non-slip soles
- Hard hat
- Hearing protection (optional or as required)

Subcontractors are responsible for supplying and maintaining their own PPE according to the manufacturers' procedures and guidelines, and their own policies and procedures, which must be at least as protective as required by regulations and these requirements.

6.4 PPE LEVEL MODIFICATION

Level B protection will be required when intact containers or leaking containers with unknown contents are encountered, and/or when atmospheric contaminants are unknown. Table A.6-1 lists the required PPE for tasks proposed for this project. With each level of protection, there is a degree of variability or allowed modifications that are dependent on specific tasks to be accomplished and the nature and concentration of contaminants. Different tasks on the same site, for example, may require gloves of varying materials, length, or thicknesses. Variations of a level of protection will be indicated by a qualifier ("Modified Level D") and specify the modification required. Level C and B work will always require the implementation of a heat stress monitoring program as described in this plan, and in TtEC EHS Procedure 4-6, Temperature Extremes.

7.0 AIR, NOISE, AND OTHER MONITORING

Monitoring may be performed during the course of this project, depending on the conditions of each of the sites that will be prosecuted. The SHSS will conduct monitoring to ensure that each site worker is adequately protected, which may include personal air sampling, real-time air monitoring, perimeter monitoring, noise monitoring, and heat stress monitoring.

The SHSS will have experience using the required monitoring or sampling equipment, and the PESM will ensure that each SHSS is qualified to operate all assigned instruments. The SHSS will ensure that each piece of equipment is properly maintained and calibrated.

Personal sampling requirements are based on potential airborne hazards and OSHA requirements. If personal sampling is warranted, the PESM will develop a personal monitoring strategy and protocol based on site conditions and in accordance with NIOSH methods, OSHA instructions, or good industrial hygiene practices when established methods are not available or feasible. A laboratory accredited by the American Industrial Hygiene Association will conduct all laboratory analyses of industrial hygiene samples, and the results will be compared to the ACGIH TLVs or OSHA Permissible Exposure Limits (PELs), whichever is more stringent. Results will be communicated to employees in accordance with OSHA requirements. All exposure records will be kept in accordance with 29 CFR, Part 1910.20 (8 Cal. Code Regs., Section 3204).

Ambient air monitoring to determine airborne contamination levels will be conducted during excavating and backfilling operations.

7.1 DIRECT READING INSTRUMENTS

A discussion of direct reading monitoring instruments that will be used during the course of this project is provided as follows.

7.1.1 Photoionization Detector

A photoionization detector (PID) and/or a flame ionization detector (FID) will be used to determine the presence and concentration of organic vapors. Contaminants, such as volatile petroleum hydrocarbons and benzene are detectable with the PID, while the FID would be required to detect some halogenated hydrocarbons.

Instrument:	PID/FID
Action Level:	10 parts per million (ppm) in breathing zone
Action:	Stop work, notify PESM; notify project contact person

7.1.2 Combustible Gas Meter/Oxygen/Carbon Monoxide/Hydrogen Sulfide Meter

A multi-sensor meter will be used to screen for the presence of flammable vapors, oxygen (O_2) deficient/O_2-enriched atmospheres, carbon monoxide (CO), and hydrogen sulfide (H_2S). If flammable vapors are detected at levels ten percent of the LEL or greater, work will cease and the area will be ventilated. Similarly, if O_2 levels below 20.8 percent, or above 22 percent are encountered, personnel will leave the area and the parcel will be ventilated.

Instrument:	Multi-sensor Gas Meter
Action Level:	10 percent $\geq$ LEL, <20.8 percent O_2 or >22 percent O_2
Action:	Stop work, and ventilate area; notify PESM
Sensor:	H_2S
Action Level:	5 ppm; at no time can level exceed 20 ppm.
Action:	Stop work, ventilate, and notify PESM
Sensor:	CO
Action Level:	10 ppm
Action:	Stop work, ventilate, and notify PESM

7.1.3 Particulate Monitor

A MiniRam Monitor Model PDM-3 or equivalent will be used to measure respirable airborne particulates between 0.1 to 10 micrometers in size. The MiniRam will be used as an indicator of total ambient dust in the work area and may be used to monitor when additional dust control is required. Worst-case scenarios can be assessed for the purpose of establishing a total dust action level by using half of the TLV as the action level.

Instrument:	MiniRam Aerosol Monitor Model PDM-3
Action Level:	1.5 milligrams per cubic meter (mg/m^3) for work areas 0.5 mg/m^3 for perimeter of work area (level chosen to minimize overall permissible dust release from site)
Action:	Implement dust control procedures

If dust cannot be reduced below the specified concentration, respiratory protection will be required and will consist of a full-face APR high-efficiency particulate air (HEPA) cartridges.

7.1.4 Monitoring Strategy and Protocol

The PID will be used wherever odors are detected and will continue to be used until odors can no longer be detected and organic vapor levels are below 5 ppm. Site monitoring will begin by taking background readings with the PID before work commences. The SHSS, in consultation with the PESM, will determine if further actions and/or measurements are warranted to prevent or minimize exposure of personnel. It is essential that odors, measurable levels of organic vapors and, suspected contamination be assessed by approaching the area of concern from a safe area.

The multi-sensor gas meter will be used continuously during excavation activities to ensure that no unexpected flammable vapors, gases or toxic fumes are present. It should be noted that the IR Sites 1 and 2 was used and the base landfill and as such toxic gases such as H_2S may be present. Personal sampling will follow a personal monitoring plan developed by the CIH. At least one MiniRAM will be positioned in the immediate work area during all excavation and backfilling operations.

7.1.5 Calibration and Maintenance Procedures

All direct reading instruments will be calibrated daily, or before and after each use. Calibration records will be kept detailing the date, time, span gas, (or other standard) and the name of the person performing the calibration.

The calibration gas for the PID is isobutylene. The SHSS will ensure that the instrument is kept clean and will follow manufacturer's directions for keeping the lamp clean. The SHSS will not perform any other maintenance procedures, unless approved by the PESM.

The calibration gas for the multi-sensor gas meter is usually a methane/air or a hexane/air mixture. O_2 is calibrated against normal air in a clean environment, and a low O_2 calibration gas can be used for calibrating the response of the O_2 sensor. Often, 100 percent nitrogen is used to "zero" the O_2 sensor. Alternatively, a gas mixture of H_2S (25 ppm), CO (50 ppm), Methane (50 percent LEL) and O_2 (20.9 percent) can be used to calibrate for all four gases.

For purposes of this plan, calibration of the explosimeter means a daily field check with known calibration gases. The reading on the instrument must be within 3 percent of the stated value of the gas. If it is not, then formal calibration of the instrument must follow the manufacturer's calibration procedure. The MiniRAM requires factory calibration annually. It cannot be field calibrated, but the zero value of the instrument must be checked daily. If the zero value exceeds the manufacturer's recommended value, the instrument must be cleaned. The instrument's zero is reset by following the manufacturer's instructions.

7.2 NOISE MONITORING

A noise survey meter may be used to measure the noise levels in the work area, at the work perimeter, and if used, the results will be recorded in the logbook. Workers will adhere to procedures found in TtEC Procedure EHS 4-4, Hearing Conservation Program. Employees will use hearing protective plugs or muffs whenever noise levels are greater than 84 dBA, and levels consistently over 85 dBA will be reported to the PESM to determine if additional monitoring with dosimetry equipment will be conducted and additional noise controls be instituted.

7.3 HEAT STRESS

Heat stress monitoring is used in estimating work loads and establishing work/rest protocols, based on the following:

- Wet bulb globe temperature instrumentation and calculations
- Monitoring physiological conditions and adjusting work/rest periods, or
- Use of personnel heat stress monitors.

Attachment B of TtEC EHS Procedure 4-6, Temperature Extremes, describes heat stress monitoring procedures in detail. Heat stress evaluation and monitoring will be performed for all work requiring impermeable clothing (coveralls) for Level C and B protection.

7.4 RADIOLOGICAL MONITORING

Dose rates are expected to be below the Nuclear Regulatory Commission (NRC) unrestricted area dose rate of 0.002 rem per hour. Inasmuch as the site dose rate is below 0.002 rem per hour, it is not likely that workers will receive a dose in excess of 0.1 rem. Therefore, occupational exposure monitoring, in the form of personnel dosimeters, is not required in accordance with 10 CFR, Part 20.1502. Dose rates will be periodically measured during field activities to verify that personnel exposure monitoring is not required. If it is determined that personnel dosimeters are required, then National Voluntary Laboratory Accreditation Program (NVLAP)-approved dosimeters from a NVLAP-certified provider will be used. Personnel issued dosimetry must complete an NRC Form 4. The original Form 4 will be maintained by the organization issuing the dosimetry with a copy or the original kept at the project field office.

Based on the known radiological condition at the site, the radionuclide of concern is radium-226, which is not expected to be present in releasable form during the planned field activities when airborne concentrations would exceed 10 percent of the derived air concentration (DAC) for radium-226. Therefore, workplace air monitoring will not be required. However, to err on the conservative side, personnel air sampling will be performed using lapel® air samplers to measure the airborne concentration in the breathing zone air of the workers. The lapel air monitoring will be conducted following standard industrial hygiene methods. A known amount of air will be collected in the "breathing zone" on an air filter in an "open face" cassette. Air filters will be collected daily and counted on the low-background scaler. Air filters that are assigned a net count rate above the background count rate for alpha radiation will be segregated and recounted after 72 hours (e.g., 3 days). The 72-hour recount will be performed to determine if the activity recorded was from radon daughters or from uranium.

If personnel air sampling, after correcting for radon daughters, indicates a potential radium intake greater than 0.02 annual limit of intake (ALI), a spot urine sample will be collected from the worker and sent off site for analysis to confirm the intake. A stop work order will be issued while the potential causes are evaluated and the DON (Radiological Affairs Support Office [RASO]) is notified of the potential intake.

Given the site conditions, it is not expected that workers will receive an internal exposure greater than 10 percent of the ALI. Therefore, internal dosimetry evaluations will not be performed.

Internal dosimetry investigations will be performed with possible follow-up bioassay sampling when:

- Face or nasal contamination is observed
- Personnel air sampling indicates that a worker(s) may have received an inhalation exposure in excess of 0.02 ALI
- Other reasons as determined by the RCT

An internal dosimetry investigation will include the following actions:

- A preliminary internal dose estimate based on air sampling and/or bioassay results.
- An interview with the worker, their supervisor, and/or involved RCTs to determine radiological working conditions and potential time of intake.
- Issuance of a radiological work restriction, if preliminary dose estimates are greater than or equal to 100 millirems (mrem) of the committed effective dose equivalent to limit any further exposure that may prevent obtaining valid follow-up bioassay sampling and interfere with the dose evaluation.
- Follow-up bioassay sampling (in-vitro and/or in-vivo) to confirm initial results.
- Notification of the worker and supervisor after follow-up sampling is completed and the final dose estimate completed.

The radiation dose equivalent incurred from internally deposited radionuclides will be estimated using widely accepted methods. Currently, bioassay methods accepted by the NRC and the Department of Energy are those proposed by the International Commission on Radiological Protection (ICRP Publication 30). At a minimum, such assessments will include:

- Chemical and physical form of the radionuclides

- Bioassay results and previous exposure history
- Route of intake and time and duration of exposure
- Biological models used for dosimetry
- Models to estimate intake or deposition and to assess dose
- Any recommended medical intervention

7.5 QUALITY ASSURANCE/QUALITY CONTROL

.Adherence to a proper quality assurance/quality control (QA/QC) plan is essential for a meaningful monitoring effort. The major concerns of a QA/QC plan are calibration of equipment and document control.

7.5.1 Equipment Calibration and Maintenance Procedures

The MiniRAM Monitor Model PDM-3 will not require field calibration; however, factory calibration of the dust meter must have been performed within the last year, as documented in paperwork or on a tag that comes with the instrument. The operating instructions for the meter must be followed to ensure that the instrument is zeroed properly. Any zero reading of 3.5 mg/m^3 or greater requires that the instrument be cleaned and re-zeroed as specified in the manufacturer's operating manual.

Procedures for the use of air sampling pumps and samplers will follow manufacturers' directions for calibrations. Personal air sampling will follow criteria specified in the *NIOSH Manual of Analytical Methods* (NIOSH, 1994).

Calibration procedures for radiation detection equipment are presented on the TtEC Corporate Library.

7.6 DOCUMENTATION

Strict adherence to document and data control procedures is essential for good QA/QC. Data and calibration records must be accounted for and retrievable at all times. Types of documents that are essential include notes, logbooks, maps, data sheets, equipment calibration logs, and reports, all of which must be placed in the project files. Copies of all field data reports and personal sampling records will be sent to the PESM for review.

The SHSS will ensure that all data is documented in logs or logbooks including calibration, types of calibration materials used, the manufacturer, model number of instruments used, the date and time of calibration, monitoring events, the area or personnel monitored, the atmospheric conditions and weather, unique site conditions, equipment operating in area, initials of individuals performing the monitoring, and any other information that affects the data or the actions taken based on the data.

8.0 SITE CONTROL

To minimize the transfer of potentially hazardous substances from the site, contamination control procedures will be employed. The establishment of regulated areas and designated site work zones will be one method of contamination control. Site control through access control points will reduce the possibility of:

- Personnel exposure to site contaminants.
- Contaminant translocation by personnel or equipment from the site.

Methods that will be used to facilitate site access control include:

- Scheduling operations to minimize the numbers of personnel at the site.
- Establishing site work zones around each worksite location.
- Establishing control points to regulate access to and egress from work zones.
- Implementing appropriate decontamination procedures.

The areas surrounding the proposed soil boring and sampling locations will be controlled by barricades, cones, and caution tape. The cordoned areas will be considered EZs. Entries into these areas will require personnel to have the proper PPE and training. The Site Superintendent and SHSS will implement control measures as necessary.

8.1 SITE SECURITY

Recently, the City of Alameda has implemented site security for people entering Alameda Point after hours or during the weekend. The project site is currently fenced and no public access is allowed except during especial events sponsored by the city such as car shows. Project equipment will be stored in a fenced and secured area.

Workers should always ensure that their vehicles are in good operating condition and that they have sufficient fuel since the nearest gas station is in downtown Alameda When re-entering any area for the day's work, the entire work area is to be re-inspected by the SHSS and the assigned RCT to ensure that the work area is unchanged from the previous day's work. Personnel will verify that their equipment has not been altered or vandalized. Inspections of equipment must be performed each day. If workers discover syringes, needles, drugs, unknown containers, and so forth, they will inform the SHSS so that the items can be safely removed. Workers will not attempt to remove these items on their own.

8.2 EQUIPMENT DECONTAMINATION

Heavy equipment, PPE, monitoring equipment, and sampling equipment may require decontamination. To prevent the spread of contamination, preliminary radiological surveys, consisting of a 100 percent scan of accessible areas for alpha/beta contamination will be conducted on equipment, tools, and materials prior to chemical decontamination. As equipment is moved from one work area to the next work area, the parts of the equipment that may have been contaminated, but not yet washed off, can be covered with plastic to facilitate movement of the equipment to the next work area without performing a full decontamination wash. However, it is essential that all gross contamination be removed from the equipment before moving the equipment out of a work zone. Radiological contaminants may be scraped or brushed off if they do not meet the release criteria. Pressure washing of equipment contaminated should be implemented if dry decontamination fails.

All PPE waste generated will be bagged, labeled, and stored for off-site disposal or incorporation into other waste materials. In no case will storage exceed 90 days from the start date of accumulation of the waste.

8.3 PERSONNEL DECONTAMINATION

At a minimum, site workers will be provided with adequate restroom and hand washing facilities and will be required to wash exposed areas of the skin (that is, hands and face) upon exiting potentially contaminated areas. Personnel leaving an area controlled for radiological hazards will be surveyed by a RCT prior to leaving the area. If a worker finds contamination while surveying out of the controlled area, the RSO or his designee will assist the worker in decontaminating the affected area and then resurvey the worker. An SOP for performing the personnel survey is provided in Appendix D.

Smoking, eating, or drinking will not be allowed in active work areas.

In case of an emergency, gross chemical decontamination procedures will be implemented and the person will be transported to the nearest medical facility immediately at the direction of the SHSS in accordance with the Emergency Response Plan (Section 12.0). The medical facility will be informed that the injured person is on the way and has not been fully decontaminated. The medical facilities will be notified of the potential chemicals present and of the exposure-prevention measures that can be used while treating the victim. The PjM, Site Superintendent, and the SHSS will implement site control measures at each site, which will consist of general site control and specific work location site control.

General site control measures pertain to the project site(s) overall and may include the use of perimeter fencing and posting of warning signs. The Site Superintendent and the SHSS will implement control measures as necessary, which will be oriented toward visitors and the general public. No person will be allowed on a particular site without a briefing regarding the hazards of the site. This briefing must be documented and signed by the person receiving the briefing.

Location-specific control measures include EZs, which are designed to limit the number of personnel on the site to only those essential to perform the work, and control of worker entrance and exit from individual work areas. Prior to the commencement of any on-site work, the EZ will be established by the SUXOS and SHSS. Each EZ will be clearly identified and delineated by cones, rope, fences, signs, or barricades. The SHSS will maintain a site entry log for each site that documents each person entering a work zone. The logs will be kept in the project files.

8.4 EXCLUSION ZONE

The EZ may include all areas within the boundaries of a site, or merely the areas immediately surrounding the site of intrusive activity. The size of the EZ is based on by the munitions with the greatest fragmentation distance (MGFDs) and will be determined by the SUXOS. Ingress/egress points for the EZ will be clearly identified. Barricades or cones will delineate the EZ if such a zone is established within the fenced area. It should be noted that barricades will be required for any opening in the ground that is left unattended. Only designated project team members and authorized government agency personnel will be allowed in the EZ. All personnel entering the EZ must wear the appropriate level of protection designated for the work area.

Workers will place contaminated tools, if any, and equipment on plastic sheeting in this zone to prevent contamination of the surrounding area. Postings shall be placed at the entry of the EZ to inform site personnel, visitors, and subcontractors of the requirements necessary for entry. This shall include, but not limited to, PPE requirements, contact personnel, "Danger No Unauthorized Entry" sign, "No Smoking" sign, and EZ sign-in log.

Workers working in the firing range area will wear disposable PPE while in the work area due to the previously identified large concentrations of lead in the soil. Prior to leaving this area, workers will remove coveralls and gloves and wash boots in the contamination reduction zone (CRZ).

8.5 CONTAMINATION REDUCTION ZONE

The CRZ, in proximity to the EZ, is where workers will wrap any contaminated tools and equipment with plastic when preparing to leave the area. Workers will decontaminate the equipment and themselves in this area before moving to the next work area. This area will also be used for surveying all workers and equipment coming in contact with LLRW.

8.6 SUPPORT ZONE

The support zone will be arranged considering accessibility, utility availability, wind direction, and line-of-sight to work. Included in this area will be the vehicle parking, toilets, handwashing facilities, municipal trash bin, storage trailer(s), drinking water, and a break/lunch area. Access to toilets and hand-washing facilities are also required in the vicinity of the work areas.

9.0 MEDICAL SURVEILLANCE PROCEDURES

TtEC requires that site workers participate in a medical surveillance program that meets the requirements of 29 CFR, Part 1910.120(f) (8 Cal. Code Regs., Section 5192). The medical surveillance program, managed by the TtEC medical consultant, will be instituted for the following employees:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the PELs or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.
- All employees who wear a respirator for 30 days or more a year or as required by 29 CFR, Part 1910.134 (8 Cal. Code Regs., Section 5144).
- All employees who are injured, become ill, or develop signs or symptoms due to possible over-exposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

9.1 BASELINE PHYSICAL EXAMINATION PROTOCOL

All employees who are expected to participate in on-site activities where they are potentially exposed to health or safety hazards and/or will wear respiratory protection will be required to complete a baseline physical examination. The contents of the baseline physical examination are outlined as follows:

- A completed medical, occupational, and smoking history questionnaire with an emphasis on the following systems: nervous, skin, lung, blood forming, cardiovascular, gastrointestinal, reproductive, as well as ears, nose, and throat. The examinee is required to fast for 8 hours, abstain from alcohol for 3 days before this examination, and avoid high noise exposure for 14 hours before the examination.
- A complete physical exam, including the following, at a minimum:
  - Height, weight, temperature, pulse, respiration, and blood pressure
  - Head, nose, and throat
  - Eyes (Snellen)
  - Ears (with audiometric testing in accordance with 29 CFR, Part 1910.95)
  - Chest (heart and lungs)
  - Peripheral vascular system
  - Abdomen (liver, spleen, kidney)
  - Musculoskeletal system
  - Genitourinary system
  - Nervous system

- Tests that must be completed are provided as follows:
  - Complete blood counts and chemistries, including the following:
  - White blood cell, differential cell, and platelet counts
  - Hemoglobin and/or hematocrit
  - Albumin, globulin, total protein, and total bilirubin
  - Serum glutamic oxalacetic transaminase and serum glutamic-pyruvic transaminase
  - Lactic dehydrogenase
  - Alkaline phosphatase and gamma glutamine trans peptidase
  - Calcium
  - Phosphorous
  - Uric acid
  - Creatinine
  - Urea nitrogen
  - Cholesterol and triglycerides
  - Glucose
- Urinalysis (clean catch), including the following:
  - Color and character
  - Specific gravity
  - pH
  - Protein
  - Acetone
  - Glucose
  - Microscopic examination
- Chest x-ray (14- by 17-inch post-anterior and lateral performed for the baseline exam).
- Pulmonary function test to include, at a minimum, the following:
  - Forced Vital Capacity (FVC)
  - Forced Expiratory Volume, one second (FEV10)
  - The FEV10 FVC ratio
  - A minimum of three good tracings
  - 12-lead resting echocardiogram

9.2 MEDICAL CLEARANCE

All workers who must enter EZs or who meet the criteria listed above must provide the SHSS with a written opinion from a licensed physician attesting to the employee's fitness for duty. A physician's written opinion of the employee's ability to wear a respirator will also be required when there is a reasonable possibility that a respirator may be required for site work. The physician's written opinion must be dated within the previous 12-month period, or an alternate time period as determined by the physician, for continued work. Additional medical surveillance requirements specific to the site or site contaminants may be required and will be defined in the SHSP. All workers will be offered a tetanus immunization at their baseline or periodic physical.

9.3 RECORDKEEPING

The SHSS will maintain a file for each person on site, which will contain a copy of the physician's statement of employee's fitness for duty, the employee's ability to wear a respirator, and any work restrictions. The SHSS will ensure that the employee and project supervisors comply with medical work restrictions, if any. The SHSS will also ask each employee to complete a form to indicate any known allergies, prescription medications, and any other medical information that will allow the SHSS to respond to a medical emergency in an appropriate manner. Personnel will notify the SHSS regarding any medications, including over-the-counter drugs that they are using on each day of work. The SHSS, in consultation with the PESM and/or a medical consultant, will determine if any medications may have an effect on a worker that would impair the ability of the worker to perform work safely. At no time will the SHSS maintain the copy of any actual medical records. These records are maintained by the TtEC medical consultant.

10.0 SAFETY CONSIDERATIONS

All workers must comply with the TtEC Project Rules Handbook, both Volume I and Volume II. Some of the rules contained in those documents are provided as follows:

10.1 FORBIDDEN PRACTICES

The following practices are expressly forbidden during field operations:

- Entrance onto the site or into designated EZs without formal authorization, compliance with medical monitoring and training requirements, and/or compliance with this SHSP.
- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material in any area designated as contaminated.
- Approach or entries into areas or spaces where toxic or explosive concentrations of gases, vapors, or dusts exist without prior approval of the SHSS and/or use of PPE.
- Facial hair, which interferes with the satisfactory fit of the mask-to-face seal of respirators, is prohibited for personnel required to wear respiratory protection equipment.
- The use/wearing of personal stereo headphones. Their use may preclude reception of audible warning signals and/or hazard communication.
- The use of cell phones during work hours, unless an employee is on break or the cell phone is being used for job-related purposes. Cell phones will not be used at any time workers are driving or operating any equipment or using any tools or mechanical devices. Cell phones are not permitted for use while driving in any company vehicle on or off the sites.

10.2 REQUIRED PRACTICES

The following practices are required:

- Personnel and equipment in the EZ will be minimized and limited only to those personnel who are essential for the work.
- Equipment will be bonded and grounded, spark-proof and explosion-resistant, as appropriate to minimize or prevent the ignition of flammable materials in the work zone.
- A minimum of two employees, in constant communication (either visual or voice) with each other, will be required to perform any work within the EZ.

10.3 VEHICLE AND EQUIPMENT OPERATIONS

Prior to the use of all vehicles and equipment, operators will conduct a safety inspection and record the findings on the Safety Inspection Equipment Checklist. Dust suppressants will be used to the extent possible to control airborne dust generation. Additionally, vehicular traffic speed on non-paved roads will be restricted to 15 miles per hour. Motor vehicles and material handling equipment assigned to this project will conform to the requirements of 29 CFR, Parts 1926.601, and 1926.602 (8 Cal. Code Regs., Sections 1590 through 1596). The drivers of transport vehicles will be responsible for passenger use of the safety belts, and personnel are not allowed to ride in the bed of pickup trucks, unless there is an approved restraint system installed and used. The Site Superintendent is responsible for maintaining a clean jobsite, free from hazards, and for providing safe access and egress from the site. Traffic cones and/or high-visibility barrier tape will be used, where appropriate, for traffic control into/out of EZs. Personnel will wear reflective, high-visibility safety vests or clothing whenever working in and around vehicles, on all roads and on all sites.

Other requirements include the following:

- Whenever an operator leaves the operator's position in a piece of EMM, the equipment will be turned off, unless it must be kept running to perform required maintenance or for safety inspection. (In which case, the operator will ensure that the equipment cannot move by placing equipment in "park," by setting the emergency brake or another type of brake, or by placing blades or pans to the ground or any other manufacturer-recommended method to keep the vehicle from moving.)
- Blades and buckets on heavy equipment will be lowered during transport. Blades and buckets will be placed on the ground whenever the operator leaves the machine.
- Construction equipment (heavy equipment) has the right-of-way in field activities.
- All heavy equipment will have a reverse signal alarm (90 dBA) that operates automatically with backward movement.
- All equipment will have brakes and brake lights. Equipment operated in hours of darkness must have operating headlights.
- Personnel will not ride on, or be on any equipment while it is in motion, unless there is a seat or stand with restraints (e.g., seat belts) designed for personal conveyance.
- Seat belts and restraints will be used at all times when any equipment is in motion.

10.4 ADDITIONAL SAFETY CONSIDERATIONS

The following is a list of precautions to minimize the possibility of injury-related accidents from occurring during field operations.

10.4.1 General Information

The following are general information precautions:

- Consider the impact your actions might have on co-workers. If your planned activities may be hazardous to other personnel on the site, postpone, or amend your intentions.
- Ask the SHSS if you do not know how, or are in doubts as to the safe way of doing your job.
- Running is not allowed on the project sites except in extreme emergencies.
- Throwing objects at personnel or equipment is prohibited.
- Minimum clothing requirements on construction sites are long pants, a shirt that covers the shoulders, and good work shoes. Torn, ragged, or frayed items should not be worn because they may snag on obstructions or machine parts, or otherwise cause trips or falls.
- Know where emergency exits are, how to gain access to them, and do not block them with material or equipment.

10.4.2 Housekeeping

Some housekeeping measures are provided as follows:

- Clean work and storage areas, encourage better incident prevention and make work easier to complete.
- Dispose of trash and scrap in proper containers and recycle when possible.
- To expedite access and prevent damage, store tools, material, and equipment in their proper locations in an orderly manner.
- Keep stored material, scrap, and other tripping hazards out of roads, walkways and away from emergency equipment.
- To prevent tripping or damage, cords, cables, and hoses crossing roads or walkways must either be covered to prevent tripping or damage, or be supported overhead, at least 7 feet above walkways and 14 feet above roads.

10.4.3 Fire Prevention

Fire prevention precautions are provided as follows:

- Control "open flame" tools and equipment.
- Protect nearby combustible materials from heat, flames, sparks, and slag by moving or covering them.
- Keep flammables in closed containers or safety cans.
- Ensure that all site workers have training on the use of portable fire extinguishers.

10.4.4 Personal Protective Equipment

PPE guidelines are provided as follows:

- **Head** – Hard hats are required on construction sites at all times, and are also required at other locations where overhead hazards exist. Bump hats are not permitted.
- **Eyes and Face** – Spectacle-type safety glasses are required when striking steel on steel, grinding, drilling, sawing, or vibrating concrete, (etc.), or when working near someone else who is creating flying particles.
- **Boots** – Minimally, workers will wear steel-toe boots (not shoes). Boots must be at least ankle-height, with steel-shank and non-slip soles and constructed of leather or other chemically resistive material. Suede, cloth and rubber are not acceptable.
- **Safety Vests** – For the protection of workers, and to make them more visible, workers must wear safety orange or lime green vests as required by code. During hours of darkness, these vests must have reflective tape.
- **Fall Protection** – Safety harnesses and a fall restraint system, (e.g., lanyards, attached to an approved support point) are required when working from any support or surface where the possibility of falls 6 feet or greater exists, or where guardrails are not installed. Lanyards must be tied off as short as possible (less than 36 inches of fall) to a solid, approved support.

10.4.5 Hand Tools

Hand tool precautions are provided as follows:

- Every tool is designed for a specific use. Do not misuse them and inspect them daily for defects.
- Keep tools in proper working condition - clean, sharp, oiled, dressed, and adjusted.
- Mushroomed chisel and drills cause dangerous flying objects. Keep them dressed.
- Never hit hardened steel with hardened steel, such as hitting a hatchet with a hammer.
- Do not use "cheaters" to increase capacity, rather, obtain a larger-sized tool.
- Carry tools in proper sheath, belt bag, or box with points down.
- Do not carry pointed or sharp tools in pockets.
- Eye protection is required for protection from flying particles.
- Do not use damaged tools. Mark them, tag them as out of service, and give them to the Site Superintendent or SHSS.

10.4.6 Power Tools

Power tool precautions are provided as follows:

- Know how to shut off the power tool being used before turning it on. Power tools with "locked on" switches are prohibited.

- Eye protection is required for protection from flying fragments.
- Power-activated tools will be inspected daily before use for proper operation of their safety devices.
- The SHSS must authorize the operation of power equipment.
- All power tools designed to accommodate guards will have them installed and functioning prior to use.
- Power supplies must be properly attached both to the tool and to the source. Electric tools must be grounded (or "double insulated").
- Check the immediate area for other people before operating a power tool. Warn people nearby that the tool will be used.
- Be prepared for the jamming of rotating tools by maintaining good footing and balance, and watch out for nearby obstructions. Check yourself for loose clothing.
- Shut off and bleed down air hoses before disconnecting air tools. Never point an air hose toward another person or yourself.
- Power tools must be GFCI-protected or double-insulated.
- Avoid using power tools in wet locations (air-powered tools may be used).
- Protect all cords and plugs from damage. Ensure that the power cord is well away from the operating portion of the power tool.
- All power tools must be turned off before disconnecting from power source. If a circuit breaker is tripped or the tool stops operating, turn off the power switch before disconnecting the power source.
- Disconnect power cords from source before coiling. Never leave a power cord plugged in.
- Refer to Section 4.4 regarding the use of extension cords.
- Store in safe place when not in use. Protect from weather, dirt, and water.

10.4.7 Material Hoists

Material hoist precautions are provided as follows:

- Never use material hoists for lifting people.
- Secure materials to prevent them from shifting.
- Always use tag lines.
- Ensure that rigging is performed by a person competent in rigging techniques.
- Inspect all rigging before use.

10.4.8 Cranes

Crane-use precautions are provided as follows:

- General
  - Know the crane capacity and the weight to be lifted before lifting.
  - Be sure air space and walkway are clear before moving bridge or trolley.
  - A competent person must inspect all rigging and the crane before use and certify that the crane is safe and positioned properly.
  - All cranes will be equipped with an anti-two blocking (A2B) device that will disengage the function that is causing the two-blocking, or an A2B damage prevention feature. They will be tested and certified functional by a competent person prior to operating the crane/derrick.
- Mobile
  - Use outriggers with rubber-tired cranes to provide solid footing.
  - Barricade counterweight swing area.
  - Keep boom, lines, and loads at least 15 feet away from electric power lines. (The minimum distance increases above 50,000 volts.) Power lines must be de-energized to work closer than the minimum distance.
  - The operator will avoid swinging loads over the heads of site personnel.
  - Use only one signal person to act as a spotter for the crane operator.
  - Equipment will be inspected before each use, and all deficiencies corrected before further use.

10.4.9 Forklifts

Forklift precautions are provided as follows:

- Forklift operators must be authorized by the Site Superintendent.
- Keep forks spread as far apart as possible.
- Check stability of load before moving it.
- Look in direction of travel before and during movement.
- Watch out for overhead hazards.
- Back down grades when carrying a load.
- No riders are allowed, unless a passenger seat with a seat belt is provided.
- Forks are not to be used as an elevator or a work platform.
- Lower forks to the ground before leaving the equipment.
- Do not drive along the edge of raised docks, platforms, or ramps.
- In California, operating rules must be posted.

10.4.10 Mechanical Material Handling Equipment

Mechanical material handling equipment precautions are provided as follows:

- Know the weight of the load to be moved.
- Know the capacity of the equipment planned to move the load.
- Use tag lines to control the load but keep the tag lines free of your body and free of obstructions during movement of the load.

10.4.11 Manual Material Handling

Manual material handling precautions are provided as follows:

- Leg muscles are stronger than back muscles, ergo; lift with your legs not your back. Bend the knees, keep the back straight, tighten the abdomen, and use the legs to make a smooth, controlled lift.
- Plan before lifting; consider the weight, size, shape, path of travel, and placement location; and get help if necessary.
- Protect your hands and fingers from rough edges, sharp corners, and metal straps. Keep hands and fingers out of pinch points between the load and other objects.

10.4.12 Overhead Work

Overhead work precautions are provided as follows:

- No one is to be unprotected under overhead work.
- Erect barricades, signs, or other devices to warn people of the work overhead.
- Respect barricades or signs put up by others.
- Covered walkways are required where people must pass under overhead work.

10.4.13 Portable Ladders

Portable ladder precautions are provided as follows:

- General - All Portable Ladders
  - Inspect for defects. When defects are found, the ladder is to be immediately withdrawn from use.
  - Set ladder feet on a solid foundation.
  - Only one person is allowed on a ladder at one time.
  - Use ladders for climbing; not for material skids, walkways, or workbenches.
  - Face the ladder while climbing up or down, and while working from it. Use safety harness or fall protection when falls are possible.
  - Both hands are needed for climbing. Use a hand line for material.

- Metal ladders will not be used.
- Store ladders safely to prevent damage from vehicles, materials, etc.

- Straight and Extension Ladders
  - The correct slope for ladder use is 1:4.
  - Secure ladder from slipping. Use non-slip feet on bottom and tie off with rope at top.
  - Extend ladder 3 feet above the top landing if the ladder is to be used for access to the landing.
  - Extension ladders cannot exceed 30 feet.
  - Do not take extension ladders apart to make two ladders.
  - Keep hands off rungs while extending or lowering extension section. Be sure latches are in place before climbing.
- Stepladders
  - Open fully and lock the spreaders.
  - Do not use as a straight ladder.
  - Do not stand or step on top platform.
  - Keep loose tools off steps and top platform.
  - Tie off stepladder if longer than 12 feet.
  - Stepladders cannot exceed 20 feet in height.

10.4.14 Compressed Gas Cylinders

Compressed gas cylinder precautions are provided as follows:

- Always keep cylinders upright and tie off vertically with strong wire, rope or chain, or keep them chained in cylinder cart.
- Do not drop or roll the cylinders.
- Use a rack for lifting cylinders to and from upper elevations. Never lift a cylinder by the control valve or a valve cover.
- Always replace valve covers when gauges are removed. Valve covers must be placed on all cylinders before they are moved.
- Store O_2 cylinders 20 feet away from other cylinders, or in a location that is separated by an approved, solid divider.
- Do not store any cylinders inside an occupied building.
- Keep oil and grease away from oxygen valves.
- Cylinders are to be kept at a safe distance, or shielded from welding and cutting operations.
- Cylinders are not to be placed where they can contact an electrical circuit.

- Acetylene cylinders must always be stored upright.
- Use only regulators specifically approved for the type of gas in the cylinder (read the front of the gauges for this information). Never modify regulators or use adapters.

10.4.15 Welding and Burning

Welding and burning precautions are provided as follows:

- Electric welding
  - Keep leads out of walkways.
  - Shield arcs to protect others from direct arc rays.
  - Wear proper shade number of protective lenses (welding goggles or helmets).
  - Remove rod from electrode holder before laying it down. Put rod butts in a container, not on the floor.
  - Ensure that the welding machine is properly grounded.
  - Turn off the welding machine when welding is completed.
- Gas
  - Keep hoses out of walkways.
  - Wear proper shade number of protective lenses (welding goggles or helmet).
  - Check area sides and below for possible fire hazards.
  - Remove gauges at end of shift and replace cap on cylinder. Use toolboxes to store hose and ventilate gauges.
  - Separate oxygen and other gases for weekends and other times when bottles are not in regular use.
  - Use soapy water to check for leaks.
  - Before using fuel gas cylinders:
    - Always crack cylinder valve before connecting gauges to remove dirt.
    - Open cylinder valve slowly and leave wrench in position while cylinder is in use.
  - A regulator will always be used on fuel gas cylinders.
  - The cylinder valve will always be closed before removing regulator.
  - When fuel gas cylinders connected to gauges develop a leak, they will be repaired, removed from service and transported away from the work area.

10.4.16 Electricity

Electricity precautions are provided as follows:

- Refer to Section 4.4 for additional details on electrical safety.

- All electrical work will be performed by qualified electricians familiar with the NEC and other applicable codes.
- Temporary lighting circuits require guards over the bulbs. Metal guards must be grounded.
- Keep extension cords out of water and at least 7 feet above walkways.
- Disconnect switches must be labeled to show the equipment or service they feed and must be checked before operating.
- Always shut down electrical equipment before servicing, repairing, or investigating questionable functioning.

10.4.17 Decontamination

Contact with contaminants is not anticipated, but may occur during the excavation of the disposal trench. Radiological anomalies may be encountered as well as during the excavation and screening of the former Firing-range Berm soils. If that case is realized, personnel and equipment used for the excavation may require decontamination. Decontamination precautions are provided as follows:

- Personnel
  - Do not walk through areas of obvious or known contamination.
  - Do not handle or touch contaminated materials directly.
  - Make sure PPE is free of cuts or tears prior to donning.
  - Fasten all closures on suits, covering with tape, if necessary.
  - Particular care should be taken to prevent skin injuries.
  - Do not carry cigarettes or gum into contaminated areas.
- Heavy Equipment
  - Take care to limit the amount of contamination that comes in contact with heavy equipment.
  - If contaminated tools are to be placed on non-contaminated equipment for transport to the decontamination pad, use plastic to keep the equipment clean.

10.4.18 Illumination

All scheduled outdoor work should be planned to occur during daylight hours only, if possible (½ hour after sunrise to ½ hour before sunset). If work must be performed during hours of darkness or inside buildings, the project will ensure that additional lighting is provided to meet the requirements of 29 CFR, Part 1910.120 (8 Cal. Code Regs., Section 5192).

10.5 ERGONOMIC CONSIDERATIONS

Routine activities may involve tasks that, by their nature, may subject personnel to unexpected ergonomic stresses. Examples of ergonomic stresses include the following:

- Muscular sprains and strains
- Musculoskeletal trauma from impacts or vibrations
- Fatigue due to extended work schedules

Caution and workload awareness should be exercised by all site personnel during project activities. Tasks that involve manual manipulation of sampling devices, chemical storage drums, and shoveling, and/or prolonged exposure to vibrating mechanical equipment should be monitored by the individuals involved with them to preclude the adverse effects of ergonomic stress. Tasks should be rotated among the workers to minimize the effects of repetitive trauma.

TtEC procedure EHS 3-1, Ergonomics, provides an in-depth discussion of factors and conditions affecting ergonomics.

11.0 DISPOSAL PROCEDURES

The Waste Management Plan, outlined in the TCRA Work Plan describes the handling of RCRA, non- RCRA, and non-hazardous wastes from the project site and the management of all decontamination liquids, disposable clothing and supplies that have come in contact with contaminated materials. A temporary waste storage area will be established in a central location where waste will be stored.

All disposable PPE will be treated as contaminated waste and disposed of properly. Contaminated clothing will be placed in a drum lined with a polyethylene bag, and wastewater generated on site will be stored until ready for testing and disposal. All waste containers will be properly labeled and stored in compliance with regulatory requirements. Contents of the containers will be sampled by trained sampling technicians and sent to an approved laboratory for analysis, which will determine how the material will be disposed. If vehicle decontamination is required, decontamination water will be captured and contained through the use of drainage sumps equipped with submersible pumps and/or vacuum units.

TtEC will arrange for the proper disposal of all decontamination fluids, contaminated debris, soil and other waste in accordance with contract requirements. The storage duration for accumulated waste will not exceed 90 days from the date the accumulation started. Subcontractors used for the transport and disposal of waste must be pre-approved through both a TtEC internal review process and by the DON.

12.0 EMERGENCY RESPONSE PLAN

There are limited emergency services in the nearby communities. This plan describes response activities as they apply to the project sites.

12.1 RESPONSIBILITIES

The Site Superintendent is the primary emergency coordinator for the project on site and may be assisted by the SHSS or PjM when notified of the need for emergency assistance. In the absence of both the Site Superintendent and the PjM, the SHSS will act as the emergency coordinator. The emergency coordinator will assume the lead and direct, and/or delegate personnel and resources necessary to manage the emergency. Key responsibilities of the emergency coordinator include:

- Initiate evacuation, if needed.
- Initiate emergency response agency notification.
- Evaluate and assess the emergency situation to ensure that response activities are commensurate with the level of the emergency and are implemented pursuant to this plan.
- Interface and coordinate with outside agencies responding to on-site emergencies.

12.2 COMMUNICATIONS

Site personnel will continually maintain verbal communication during the course of the project. The following communication systems will be available during site activities:

- Cellular telephones or access to a land phone for emergency purposes
- Hand-held radios, as needed
- Compressed air horn (signals emergency evacuation only) at the site
- Diagrammed and posted hand signals, if used
- Posted location of evacuation assembly area(s)
- Posted route to the nearest hospital from the project site
- Posted emergency phone numbers

12.3 ACCIDENT/INCIDENT REPORT

After the emergency event is over, or during the course of the emergency when possible, the SHSS will notify the PESM by telephone. Accidents or incidents require the Site Superintendent and/or SHSS to immediately investigate the cause, notify the PESM, and promptly complete the following:

- TtEC Incident Report Form. Details of the incident will be documented within 24 hours and copies of the report forwarded to the DON RPM and the PESM. Reports of serious incidents will also be faxed to the RPM by the Site Superintendent or PjM.
- Incident Investigation Report. The Incident Investigation Report will have the same distribution as the Incident Report Form and will be completed within 3 days of the incident.

Any recommended additional hazard control measures must be discussed with, and approved by the Site Superintendent, SHSS, and PESM prior to implementation. Any occupational injuries and illnesses will be recorded, if applicable, on an OSHA Form No. 300. The SHSS will immediately report any serious injury or illness, or death of an employee (occurring in a place of employment or in connection with any employment) by telephone to the nearest District Office of the Division of Occupational Safety and Health (Cal-OSHA). (Immediately means as soon as practically possible, but not longer than 8 hours after the incident.) Records of all site accidents and first aid treatments will be maintained by the SHSS. Also, notify the DON representative for any injury that is more than first aid or for any incident where property damages are $2,000 or more.

12.4 PRE-EMERGENCY PLANNING

Prior to performing any work, the Site Superintendent or PjM, and the SHSS will verify all emergency action plans by ensuring that planned support facilities are available and that emergency contact numbers are valid. As work proceeds, the SHSS will make certain that plans specified in this section of the SHSP remain valid, that they can be implemented at all times, and that plans are modified as necessary to accommodate changes. The SHSS will coordinate all changes with the PESM. Upon arrival at the site, the SHSS will ensure that the following actions are taken or conditions exist:

- Ensure that all personnel know the system(s) for communicating during emergency situations, and how to use a radio or phone to summon emergency assistance.
- A vehicle must be available to transport personnel to safe locations or hospitals.
- All personnel on this project will know how to use a portable fire extinguisher.
- All personnel will know the location of all emergency equipment and supplies.
- Ensure that emergency equipment is available in work areas and that the equipment is inspected as required by regulations and TtEC policies as follows:
  - Fire extinguishers – monthly, annual refill and servicing, and hydrotested every 7 years
  - First aid kits – weekly (per EM 385-1-1)

- Eyewashes – weekly, if preservative is used, eyewash water may be changed every 4 months; otherwise, water must be changed weekly. Only potable water may be used for eyewashes.

12.5 EMERGENCY MEDICAL TREATMENT

The following procedures should be observed if an accident with injury occurs:

12.5.1 First Aid

Only qualified personnel will provide first aid to stabilize individual(s) needing assistance. Top priority will be given to life support techniques that include CPR and the treatment of life threatening problems (e.g., airway obstruction, shock). At least two persons certified in first aid techniques and CPR will be on each worksite at all times, and TtEC EHS Procedure 4-1, Bloodborne Pathogens, will be followed when first aid/CPR are administered. The SHSS will be current in first aid and CPR. Professional medical assistance will be obtained at the earliest possible opportunity. The nearest hospitals and clinic to the project site are shown in Figure A.12-1.

12.5.2 Minor Injury

The procedures for minor injuries are provided as follows:

- Contact a supervisor or compatriot.
- Have a person qualified in first aid treat the injury.
- Record the injury and include name of injured person, the nature of injury, and the treatment given.

12.5.3 Medical Emergency

In the event of a medical emergency where an actual or suspected serious injury has occurred, the following procedures will be implemented:

- Survey scene and evaluate whether the area is safe for entry.
- Remove the exposed or injured person(s) from immediate danger.
- Render first aid if necessary. Decontaminate affected personnel after critical first aid is given, if required.
- Call 911 from a land line or (925) 447-4257 from a cellular phone. This will notify California Highway Patrol, which will notify the county Emergency Medical Service provider.
- Request assistance from Emergency Medical Service and/or additional assistance. Identify location by number of nearest road, request medical assistance, and provide name and telephone number.

- Obtain paramedic services or ambulance transport to local hospital. This procedure will be followed even if there is no visible injury.
- Dispatch a person with a vehicle to the entrance of the project site to escort the responders.
- Evacuate other personnel in the work area to a safe location until the Site Superintendent determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work will not commence until all hazard control issues are resolved.
- Notify ROICC of incident and fill out accident reporting forms and associated documents.

12.5.4 Fatal Injury

If a fatal injury occurs, the following additional steps will be followed:

- Notify the Site Superintendent, PjM and PESM immediately.
- The PESM will initiate contact with Cal-OSHA and other appropriate agencies.
- Notify ROICC.
- All work activities on the project must be stopped for 24 hours.
- Assist Cal-OSHA as directed.

12.6 EMERGENCY SITE EVACUATION PROCEDURES

In the event of an emergency situation such as fire or explosion, the SHSS or Site Superintendent will activate an air horn for approximately 15 seconds indicating the initiation of evacuation procedures, which include the following actions:

- All personnel will evacuate and assemble near the site trailer or other safe area as identified by the SHSS. Prior to start of work at any project site, the SHSS will identify the location of the evacuation assembly area for that project site, which should be upwind of the site, based on prevalent wind direction. The SHSS will brief site personnel each day as to the location of the evacuation assembly area, if it changes.
- For efficient and safe site evacuation and assessment of the emergency situation, the Site Superintendent or SHSS will have authority to initiate proper response actions if outside services are required.
- Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given.
- The SHSS must ensure that access for emergency equipment is provided and that all equipment that may cause combustion has been shut down once the alarm has been sounded.

- As soon as possible, and while the safety of all personnel is confirmed, emergency agency notification will commence.
- After assembly at the local site assembly point, depending on the nature of the emergency, workers may be instructed to re-assemble at another location.

Prior to commencing work at each project worksite, the SHSS will establish safe egress routes from each site to the evacuation assembly areas, prepare a drawing or map that identifies the egress routes, and post them. A map that shows the route to the nearest clinic and the nearest hospital will also be prepared and posted.

12.7 FIRE PREVENTION AND PROTECTION

Fire prevention and protection measures require pre-planning, and the minimum requirements for the project are provided as follows:

- At least one 20-pound dry chemical ABC fire extinguisher will be located at each project site.
- A mounted fire extinguisher is required in every vehicle including heavy equipment.
  - Extinguishers mounted on heavy equipment will be a minimum 5-pound ABC dry chemical fire extinguisher.
  - Fire extinguishers inside the cab of pickup trucks will be 2 ½ -pound dry chemical ABC.
  - Fire extinguishers in the cabs of all vehicles must be mounted or secured.
- Employees will follow safe work practices to include proper storage of flammable and combustible materials.
- Smoking is permitted only in those areas designated specifically by the PjM, Site Superintendent or SHSS.
- Personnel will follow hot work procedures to ensure that work is performed in a safe environment.
- In the event of a fire or explosion, summon the Fire Department immediately, take a head count, and implement evacuation procedures.

12.8 SPILL CONTROL AND RESPONSE

All spills, leaks, and fires involving oil or hazardous substances must be reported to the RPM and the PESM. The person reporting the leak or spill is required to provide the following information:

- His/her name
- Location of spill and address, if known
- Number of injured personnel and nature of injuries, if known
- Substance spilled

- Amount spilled (estimate)
- Extent of spill
- Rate that substance is currently being released (estimate)
- Time spill occurred (estimate)
- Any other pertinent information

The RPM, in coordination with the PjM, will manage notifications to regulatory agencies, if the reportable quantity (RQ) threshold is breached. Additionally, all spills will be reported to the TtEC Environmental Compliance Manager or the PESM. Project personnel will not report spills directly to any agency, unless specifically requested by the RPM or the Contracting Officer.

A minor spill does not pose an immediate threat to human health or the environment, does not cause minimal property damage, and does not exceed the RQ for that material. In the event of a minor spill, the appropriate response actions are:

- Notify the Site Superintendent.
- Notify the RPM and the PjM and supply the responders with as much information as possible.
- Identify protective clothing or equipment required to respond.
- Contain the spill.
- Neutralize and/or solidify any product.
- Transfer material into 55-gallon drums.
- Document incident.

12.8.1 Release Prevention and Minimization Measures

Procedures to prevent and/or minimize releases of hazardous materials are provided as follows:

- Ensure that personnel involved with hazardous materials are trained in the proper procedures and precautions for their handling, storing, transportation and disposal.
- Do not conduct operations involving hazardous materials when weather is forecasted that could cause significant risk to surrounding area if a spill should occur.
- Transfer all materials in or over a bermed or "protected" area. A protected area is one that is covered with an impermeable material, such as polyethylene.
- Erect dikes around temporary storage tanks containing hazardous wastes or potentially hazardous wastes to contain releases.
- Maintain a supply of basic spill response materials and protective equipment on site to include:
  - Absorbent sheets, pillows, booms or absorbent material

- Open top 55-gallon drums or other containers with lids
- Booms, shovels, and other tools, such as squeegees

12.9 SIGNIFICANT VAPOR RELEASE

Any project activity that releases significant amounts of vapor must be reported immediately, as described in the spill release procedure. Every attempt to mitigate the release must be taken if it can be safely performed. Vapor releases occurring during excavations, for example, may be controlled by simply replacing cover on the excavation. Downwind evacuation procedures, if required, will be coordinated by the project emergency coordinator(s).

12.10 EARTHQUAKE RESPONSE

Actions to take if an earthquake should occur during the course of site activities are provided a follows:

- Stop working, remain calm and do not panic.
- Do not use or do anything that could be a source of ignition (smoking, cutting, or welding).
- Avoid power lines, power poles, and windows.
- If in a vehicle, stay in the vehicle until the earthquake is over.
- If in a building, take cover under a heavy piece of furniture or leave the building if possible.

Actions to take after the earthquake are:

- Prepare for aftershocks. Stay out of severely damaged buildings.
- Meet for a head count at a location designated by the Site Superintendent or SHSS.
- Check for injuries. Do not move seriously injured personnel, unless remaining where they are would create danger of further injury.
- Check vehicles, equipment, and buildings for any obvious damage. Do not enter any buildings until their structural integrity has been evaluated.
- If the site trailer (or other building being used) is connected to utilities, check utility lines for damage. Switch off power, water and gas until a utility official has inspected the buildings and operational area and determined it is safe.
- If driving, watch carefully for hazards created by the earthquake (undermined roads, weak bridges, or overpasses, fallen power lines or poles, etc.).

12.11 EMERGENCY EQUIPMENT

The following emergency equipment will be brought onto the site or will be stationed near each worksite in a designated area:

- Fire extinguisher, minimum one 20-pound dry chemical ABC type
- Industrial first aid kit
- Portable eye wash, capable of supplying 15 minutes of water and protected from direct sunlight
- Air horn
- Spill control material consisting of absorbent pillows or absorbent material and shovels, plastic sheeting, and 55-gallon drum(s)

The following equipment will be available at the site trailer for use in an emergency situation:

- Industrial first aid kit, inspected weekly
- Blanket

12.12 EMERGENCY INFORMATION POSTINGS

Emergency contact names and phone numbers will be posted at every project site (Table A.12-1). A map showing egress routes, evacuation assembly areas, and the route to the clinic and the hospital will also be posted (Figure A.12-2). At some remote locations, posting may not be practical. In this case, the contact names, phone numbers and maps will be placed on the dashboard of every vehicle.

13.0 TRAINING

In accordance with TtEC corporate policy and pursuant to 29 CFR, Part 1910.120 (8 Cal. Code Regs., Section 5192), hazardous waste site workers will, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for HAZWOPER, unless excepted by the above reference. At a minimum, the training will have consisted of instruction in the topics outlined in the aforementioned reference. Personnel who have not met the requirements for initial training will not be allowed to perform any site activities that may expose them to chemical or physical hazards.

An employee's prior experience and/or training for equivalency may be considered to meet the training described above. The PESM will make the determination if previous experience and/or training meet the initial training requirements.

The UXO Technicians used for this project meet the required personnel/work standards found in the USACE Data Item Description OE-25, Personnel/Work Standards, and will be supervised by the SUXOS. The Site Superintendent will provide the DON Contracting Officer or designee with written certification of completion of the required training and maintain copies of required training records at the worksite.

13.1 MANAGER/SUPERVISOR TRAINING

In accordance with 29 CFR, Part 1910.120 (8 Cal. Code Regs., Section 5192), on-site managers and supervisors directly responsible for, or who supervise employees engaged in HAZWOPER, will receive the training discussed above, and at least 8 additional hours of specialized training on managing hazardous materials operations by the time of job assignment.

13.2 ANNUAL 8-HOUR REFRESHER TRAINING

Annual 8-hour refresher training will be required of all site field personnel to maintain their qualifications for fieldwork. The following topics will be reviewed during the refresher training:

- Toxicology
- Respiratory protection—including air-purifying devices and SCBA
- Medical surveillance
- Personal protective clothing
- Additional topics deemed necessary by the SHSS or PESM

13.3 SITE-SPECIFIC TRAINING

Prior to commencement of field activities, the SHSS will provide site-specific training to all personnel assigned to the site. This training will specifically address the activities, procedures, monitoring, and equipment for site operations, and will also include site and facility layout, specific hazards, emergency services, hazard communication, and all provisions contained within the SHSP. This training will also allow project personnel to clarify anything they do not understand about the project and to reinforce their responsibilities regarding safety and health for their particular activity. Additional training, if required for the completion of field tasks, will be identified and provided for personnel as the work progresses.

13.4 ASBESTOS AND LEAD AWARENESS TRAINING

There is potential to encounter asbestos, material containing asbestos or lead during the excavation of debris fields, anomalies or anomalous areas during the course of this project. All workers on this project must receive asbestos and lead awareness training prior to performing any work activity on the project. The training will be prepared by the TtEC SHSS. Documentation of this training must be in each employee's training record.

13.5 MPPEH AWARENESS TRAINING

Those personnel on site who are not UXO personnel will have an awareness training class so that they can recognize potential munitions of concern and are able to recognize when they should notify a UXO-qualified person.

13.6 RADIATION SAFETY AWARENESS

All personnel on site will receive training as required by the RWP.

13.7 ON-SITE SAFETY BRIEFINGS

Project personnel and visitors will be given daily, on-site health and safety briefings by the SHSS, or designee, to assist site personnel in safely conducting their work activities. This training will be conducted prior to the start of new work activities; will use AHAs applicable to the planned work; and will include information on new operations to be conducted, changes in work practices, or changes in the site's environmental conditions. The briefings will also provide a forum to facilitate conformance with safety requirements, and identify performance deficiencies related to safety during daily activities or as a result of safety inspections.

13.8 FIRST AID AND CPR

The SHSS will identify individuals that require first aid and CPR training. At a minimum, the SHSS will have received first aid and CPR training, and at least two persons trained and current in certification of first aid and CPR will be present at every worksite. The training will be consistent with the requirements of the American Red Cross Association.

14.0 LOGS, REPORTS, AND RECORDKEEPING

The following is a summary of required health and safety logs, reports, and recordkeeping for this contract.

14.1 SITE HEALTH AND SAFETY PLAN CHANGE APPROVAL FORM

A Site Health and Safety Plan Change Approval Form will be completed for all changes to the SHSP. This form requires the signatures of the PjM or Site Superintendent, the SHSS, and the PESM. Upon request, the PESM will send a copy of this form to the DON CIH for review within 5 workdays if the change is substantive, and in the opinion of the CIH, requires additional review by the DON CIH. Substantial changes to the SHSP may require a Field Change Request (FCR) according to the QC Plan to initiate a significant change to the SHSP. PESM approval of each FCR is required. Copies of the FCR affecting the SHSP are sent to the DON CIH. Project forms are included as Attachment 2 of this SHSP.

14.2 MEDICAL AND TRAINING RECORDS

Full medical and training records are normally kept by the employer. Proof of the most recent training and medical qualification must be provided to the SHSS by the employee. The SHSS will keep a file containing appropriate training and medical qualifications for site workers. Medical records will be maintained in accordance with 29 CFR, Part 1910.20 (8 Cal. Code Regs., Section 3204). The examining physician retains custody of the complete medical record. Employee records have only the physician statement of medical qualification for duty and the employee's fitness to wear a respirator, if required.

14.3 ON-SITE LOG

A log of personnel (including job title, level of protection, and work location) will be updated on site each day by the SHSS or designee. Originals will be kept in the project file.

14.4 EXPOSURE RECORDS

Any personal monitoring results, laboratory reports, calculations, and air sampling data sheets are part of an employee exposure record. These records will be kept in accordance with 29 CFR, Part 1910.20 (8 Cal. Code Regs., Section 3204). For TtEC employees, the originals will be sent to the medical records coordinator. For subcontractor employees, the originals will be sent to the subcontractor employer and a copy kept in the project file.

14.5 ACCIDENT/INCIDENT REPORTS

A TtEC accident/incident report must be completed following any event involving emergency first aid, lost time, or property damage in accordance with TtEC EHS Procedure 1-7, Incident Reporting and Investigation. The originals will be sent to the TtEC records coordinator for maintenance and distribution by TtEC. Copies will be distributed to the PESM, Site Superintendent, subcontractor employees, if appropriate, and the DON Contracting Officer. A copy of the completed forms will be kept in the project file.

14.6 OSHA FORM 300

An OSHA Form 300 (Log of Occupational Injuries and Illnesses) will be kept at the project site. All recordable injuries or illnesses will be recorded on this form. At the end of the project, the original will be sent to the TtEC records coordinator to be filed. Subcontractor employers must also meet the requirements of maintaining an OSHA Form 300. The TtEC accident/incident report meets the requirements of the OSHA Form 301 (Supplemental Record) and must be maintained with the OSHA Form 300 for all recordable injuries or illnesses.

14.7 HEALTH AND SAFETY FIELD LOGBOOKS

The SHSS will complete and maintain a daily logbook at the site and will document important events as they occur. Information required to be entered into the logbook on a daily basis is provided as follows:

- Initials of persons making entry
- Date
- Time of each entry (military time)
- Location
- General weather description
- Names and job titles of all personnel in the work group
- Level of protection
- Health and safety monitoring equipment used
- Weather conditions
- Work/rest schedule (if appropriate)
- A description of the activities as they are occurring
- Any pertinent health and safety observations
- Sample number (if appropriate)

The logbook will be signed at the end of each day or work shift and all entries will be made in black ink. No pages will be removed from the logbook and each page will be numbered. Any corrections will be made with a single line through the entry, and initialed.

Copies of the logbooks will be submitted to the Site Superintendent as necessary. The original logbooks will become part of the exposure records file and will be maintained by the TtEC records coordinator.

14.8 MATERIAL SAFETY DATA SHEETS

MSDSs for each hazardous chemical used, or stored at the site will be obtained and kept on file at the project site by the SHSS. An MSDS for each contaminant will also be maintained.

14.9 CLOSEOUT SAFETY REPORT

A final closeout safety report, included as part of the Post-construction Closeout Report, will be provided to the PESM summarizing the safety performance achieved during the site work. Specific elements of the report will include the following:

- A description of significant events, exposures, accidents, illnesses, and actions taken to prevent their occurrence
- A summary of monitoring results including air, noise, radiation, and heat stress samples
- A description of any state or federal inspections involving the health and safety of site workers (accompanied by the applicable EHS 1-10 form)

14.10 REQUIRED POSTINGS

The following postings are required at the jobsite:

- Department of Labor
    1. Minimum Wage
    2. Polygraph Protection Act
    3. Equal Employment Opportunity
    4. Job Safety and Health
    5. Family Leave
    6. Uniformed Services Employment and Reemployment Rights Act
- Cal-OSHA
    1. Safety and Health Protection on the Job
    2. Discrimination in Employment

3. California Workers Compensation (Sign begins: "If a work injury occurs...")
4. Emergency Phone Numbers
5. Notice of Unemployment and Disability Insurance
6. Access to Medical and Exposure Records
7. Hearing Protection Standard
8. A posting of what day is payday and a multi-page document regarding minimum wage (California law)
9. Operating Rules for Forklifts (if forklifts are used on project)
10. California's Accident and Injury Illness Prevention Program: a management policy on Health and Safety

- Contract Requirements

   1. Posting of HOTLINE POSTER
   2. Drug Policy Poster
   3. Posting of Prevailing Wages

- Company (TtEC) Required Postings

   1. Policy on Sexual Harassment
   2. Policy on Equal Employment Opportunity
   3. Accident/Injury Reporting
   4. Environmental Safety and Quality Poster (ISO 14001)
   5. Recycling and "Use Double-Sides" Posters
   6. TtEC Zero Incident Performance Poster
   7. TtEC Work Rules

15.0 FIELD PERSONNEL REVIEW

All personnel are required to be trained on the contents of this SHSP. Upon completion of this training and review, all project personnel will acknowledge this training by signing a review form acknowledging training.

16.0 REFERENCES

American Conference of Governmental Industrial Hygienists (ACGIH). Most current publication. *Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices.*

Bechtel Environmental, Inc. (BEI). 2005. *Work Plan for Remedial Investigation IR Site 32, Northwest Ordinance Storage Area,* Alameda Point, Alameda, California.

Department of the Navy (DON)/Marine Corps. 2000. *Navy/Marine Corps Installation Restoration Manual.* August.

Ecology and Environment (E&E). 1983. *Initial Assessment Study of Naval Air Station, Alameda, California, Final Report.* Prepared for Navy Assessment and Control of Installation Pollutants and Naval Energy and Environmental Support Activity, Port Hueneme, California.

International Commission on Radiological Protection. 1989. *ICRP Publication 30: Limits for Intakes of Radionuclides by Workers: Part 4 (An Addendum)* Annals of the ICRP V 19(4).

National Institute of Safety and Health (NIOSH). 1994. NIOSH Manual of Analytical Methods. 4th Edition. Peter M. (EDT) Eller. December.

Tetra Tech EC, Inc. (TtEC). Most recent. Corporate Health and Safety Program Manual.

__________________. Most recent. TtEC Project Rules Handbook, Volumes I and II.

U.S. Army Corps of Engineers (USACE). 2003. *Safety – Safety and Health Requirements.* EM 385-1-1. November.

U.S. Department of Health and Human Services. 1985. *Occupational Safety and Health Guidance for Hazardous Waste Site Activities.*

Note:

Where no date is given in the references above, it is assumed that the reference used will be the most recent publication.

TABLES

TABLE A.4-1

CHEMICAL AND RADIOLOGICAL HAZARDS ASSESSMENT

Chemical Name	ALI/AL/PEL/TLV	Routes of Exposure	Symptoms of Exposure	Target Organs
Radium-226	2 μCi/yr (Oral)[a] 0.6 μCi/yr (Inhalation)[a]	Inhalation ingestion	Evidence of contamination on personnel or elevated air sample result.	Bone
Gasoline	PEL – 300 ppm (Cal-OSHA) TLV – 300 ppm	Skin absorption, inhalation, ingestion	Acute: nose, throat, lung irritation; headaches; blurred vision; vomiting; dizziness; fever; slurred speech; unconsciousness. Chronic: appetite loss, nausea, weight loss, insomnia, sensitivity in digital extremities.	Skin, eye, respiratory, and CNS
Diesel fuel	PEL – none established TLV – none established	Skin contact, inhalation, ingestion	Acute: eye irritation; skin irritation; nose, throat, lung irritation; nausea; vomiting; diarrhea; restlessness; drowsiness; loss of coordination. Chronic: repeated contact with skin causes dermatitis.	CNS, skin, respiratory system
PAHs, coal tar pitch volatiles (chrysene, pyrene, phenanthrene, etc.) from residuals of diesel fuel	PEL – 0.2 mg/m^3 TLV – 0.2 mg/m^3	Inhalation, ingestion, contact	Acute: skin contact may cause irritation, redness, burning, itching, dermatitis, and burns. Photosensitization may occur (rash worsens with exposure to sunlight). Inhalation irritating to respiratory tract. Eye contact may cause conjunctivitis, keratitis, or corneal burns. Ingestion may result in nausea, vomiting, abdominal pain, respiratory distress and shock. Exposure to large doses, especially by ingestion, may be fatal. Chronic: dermatitis, skin cancer, lung cancer.	Respiratory system, skin, bladder, kidneys (lung, kidney and skin cancer)
Benzene	PEL – 1 ppm TLV – 0.5 ppm STEL – 5 ppm	Inhalation, ingestion, contact	Carcinogen. Acute: irritation of eyes, nose, respiratory tract, breathlessness, euphoria, nausea, drowsiness, headache, dizziness, and intoxication. Severe exposure can cause convulsions and unconsciousness. Skin contact may cause dermatitis. Chronic: blood disorders including leukemia.	Blood, CNS, bone marrow, eyes, skin, upper respiratory tract

TABLE A.4-1

CHEMICAL AND RADIOLOGICAL HAZARDS ASSESSMENT

Chemical Name	ALI/AL/PEL/TLV	Routes of Exposure	Symptoms of Exposure	Target Organs
Toluene	PEL – 50 ppm (Cal-OSHA) TLV – 50 ppm STEL – 150 ppm	Inhalation, skin contact	Acute: respiratory irritation, fatigue, weakness, confusion, dizziness, headache, dilated pupils, watering eyes, nervousness, dermatitis, insomnia, parasthesis, vertigo, narcotic coma, death. Chronic: mucous membrane irritation, headache, vertigo, nausea, appetite loss, intolerance to alcohol. Encephalopathies, liver enlargement and kidney dystrophy.	CNS, liver, kidney, skin
Ethylbenzene	PEL – 100 ppm TLV – 100 ppm STEL – 125 ppm	Inhalation, skin and eye contact	Acute: eye and nose irritation, chest constriction. High concentrations: narcosis, cramps, death. Chronic: dermatitis, fatigue, sleepiness, headache, leukopenia.	Eyes, respiratory system, CNS, skin, blood.
o-Chlorobenzalmalonitrile	PEL – 0.05 ppm TLV – None established Ceiling – 0.05 ppm	Inhalation, skin	Acute: highly irritating to eyes, nose, and skin.	Eyes and skin
Xylene	PEL – 100 ppm TLV – 100 ppm STEL –150 ppm	Inhalation, skin and eye contact, ingestion	Acute: dizziness, nausea, vomiting, abdominal pain, eye, nose, throat irritation; pulmonary edema, drowsiness, unconsciousness. Eye contact can cause conjunctivitis and corneal burns. Chronic: dermatitis, peripheral and central neuropathy, liver damage.	CNS, eyes, GI tract, liver, kidneys and skin
Methane	PEL – None established TLV – None established	Inhalation, skin	Acute: irritability, headache, unconsciousness, death. Simple asphyxiant.	Eyes, respiratory system, CNS, blood
Lead	PEL – 0.05 mg/m^3 TLV – 0.05 mg/m^3 AL – 0.030 mg/m^3	Inhalation, ingestion	An animal carcinogen. Acute: seizures, coma, death (very high doses). Chronic: appetite loss, nausea, metallic taste, constipation, anxiety, weakness, insomnia, muscle and joint pain, irritability, headache, numbness, kidney damage.	Systemic poisoning; CNS, kidneys, reproductive system, blood, GI system

Notes:

[a] Limit from Appendix B of 10 Code of Federal Regulations 20

µCi/yr – microcurie per year
AL – action level
ALI – annual limit of intake
Cal-OSHA – California Occupational Safety and Health Administration

CNS – central nervous system
GI – gastrointestinal
mg/m^3 – milligram per cubic meter
PAH – polynuclear aromatic hydrocarbon

PEL – permissible exposure limit
ppm – parts per million
STEL – short-term exposure limit
TLV – Threshold Limit Values

TABLE A.6-1

PERSONAL PROTECTIVE EQUIPMENT

Task	EPA Level	Respiratory Protection	Head	Hand	Clothing	Boots	Face	Eye	Hearing	Additional
Site setup, surveys (land, geophysical and radiological)	D	None required, unless dust exceeds action level	Hard hat	Leather work gloves, as needed	Work uniform or Tyvek® coveralls to keep clean	Steel-toe, leather	N/A	Safety glasses	Protection when noise levels exceed 85 dBA	Reflective safety vests
Hand-auger/soil sampling	D	None required, unless probe releases vapors above action limits	Hard hat	Leather work gloves or puncture/cut-resistant gloves; Nitrile gloves when sampling	Work uniform or Tyvek coveralls to keep clean	Steel-toe, leather	N/A	Safety glasses	Protection when noise levels exceed 85 dBA	Reflective safety vests, USCG life preservers when working near water
Clearing of vegetation	D	None required, unless dust exceeds action level	Hard hat	Leather work gloves, as needed	Work uniform or Tyvek coveralls to keep clean	Steel-toe, leather	N/A	Safety glasses	Protection when noise levels exceed 84 dBA	Fall protection for work above 6-foot level; reflective safety vests
Any intrusive work in areas where soil lead contamination exceeds 1,000 mg/kg	C	NISOH-approved dust masks unless dust control is effective	Hard hat	Nitrile gloves Leather work gloves as needed	Tyvek or Durafab® equivalent disposable coveralls	Steel-toe leather with boot covers (disposable) or PVC boot that can be washed upon leaving work area	N/A	Safety glasses unless full face respirator is worn	Protection when noise levels exceed 84 dBA	Reflective safety vest
Excavation, screening, and stockpiling	D	None required, unless dust exceeds action level	Hard hat	Leather work gloves, as needed	Work Uniform or Tyvek coveralls	Steel-toe boots	N/A	Safety glasses	Protection when noise levels exceed 84 dBA	Fall protection for work above 6-foot level; reflective safety vests

TABLE A.6-1

PERSONAL PROTECTIVE EQUIPMENT

Task	EPA Level	Respiratory Protection	Head	Hand	Clothing	Boots	Face	Eye	Hearing	Additional
Removal of unknown buried containers	B	Full-face respirator with supplied air	Hard hat	Silver Shield® gloves with nitrile gloves over and under.	Saranex Tyvek coveralls with hoods	PVC, steel-toe, steel-shank boots	N/A	N/A	Protection when noise levels exceed 84 dBA	Fall protection for work above 6-foot level; reflective safety vests
Backfilling	D	None required, unless dust exceeds action level	Hard hat	Leather work gloves as needed	Work uniform or Tyvek coveralls	Steel-toe, boots	N/A	Safety glasses	Protection when noise levels exceed 84 dBA	Fall protection for work above 6-foot level; reflective safety vests
Decontamination	D mod	None required, unless dust exceeds action level	Hard hat	Nitrile gloves, leather gloves as needed	Tyvek coveralls for dry materials, Polyethylene-coated Tyvek coveralls	Steel-toe boots for dry materials, Tyvek booties. For wet materials, use PVC, latex or rubber boot covers	N/A	Safety glasses	Protection when noise levels exceed 84 dBA	Fall protection for work above 6-foot level; reflective safety vests
Waste management	D mod	None required, unless dust exceeds action level	Hard hat	Nitrile gloves, leather work gloves	Tyvek coveralls	Steel-toe boots, Tyvek® booties unless liquids are present	N/A	Safety glasses	Protection when noise levels exceed 84 dBA	Fall protection for work above 6-foot level; reflective safety vests

Notes:

dBA – decibels, A-scale
EPA – U.S. Environmental Protection Agency
mg/kg – milligrams per kilogram
N/A – not applicable
NIOSH – National Institute for Occupational Safety and Health
PVC – polyvinyl chloride
USCG – United States Coast Guard

TABLE A.12-1

EMERGENCY INFORMATION

REPORT ALL FIRES, SERIOUS INJURY, OR UNCONTROLLED SPILLS IMMEDIATELY: 911 (CALL WILL ROUTE TO CALIFORNIA HIGHWAY PATROL IN VALLEJO ON A CELL PHONE)

Hospital:	Alameda Hospital (510) 522-3700 2070 Clinton Avenue Alameda, CA			
Directions:	Starting at the front of the base, turn left on Ranger Avenue. Turn right on Lexington and left on Navy Way. Take Navy Way to Main Street and turn right. Continue to Central Avenue. Central Avenue becomes CA/61. Continue on to CA/61 to Chestnut Street and turn left onto Clinton.			
Clinic:	Concentra Medical Center (510) 465-9565 384 Embarcadero W Oakland, CA			
Directions:	From Atlantic, turn left onto SR-61 (Webster Street) for 0.6 miles. Bear right onto Posey Tube for 0.6 miles and continue north on Harrison Street for about 150 yards. Turn left onto 6th Street for about 200 yards, left onto Broadway Street for 0.3 miles, and right onto West Embarcadero for 80 yards to Concentra Medical Clinic.			
Fire/Police/EMS:	911 This number will connect you to emergency dispatch. ***911 calls from a cell phone do not go directly to base emergency services, but through the California Highway Patrol.*** **If using a cell phone, call Alameda Fire Dispatch directly at (925) 447-4257.**			
TtEC Contacts:	Project Manager Abram Eloskof (949) 756-7521	PESM (CIH) Roger Margotto (619) 471-3503 cell: (619) 988-0520	Project SHSS Richard Quinn	CHP Cliff Stephan cell: (509) 430-4655
RPM:	Andrew Baughman, (619) 532-0902			
ROICC:	Gregory Grace, (510) 749-5940			
RASO	Matthew Slack, (757) 887-4692			
Poison Control Center:	California Poison Control System, Central Office University of California, San Francisco School of Pharmacy, Box 1262 San Francisco, CA 94143 Emergency Phone: (800) 876-4766 [All of CA]			

TABLE A.12-1

EMERGENCY INFORMATION

CHEMTREC:	(800) 424-9300
National Response Center:	(800) 424-8802
RCRA Hotline:	(800) 424-9346

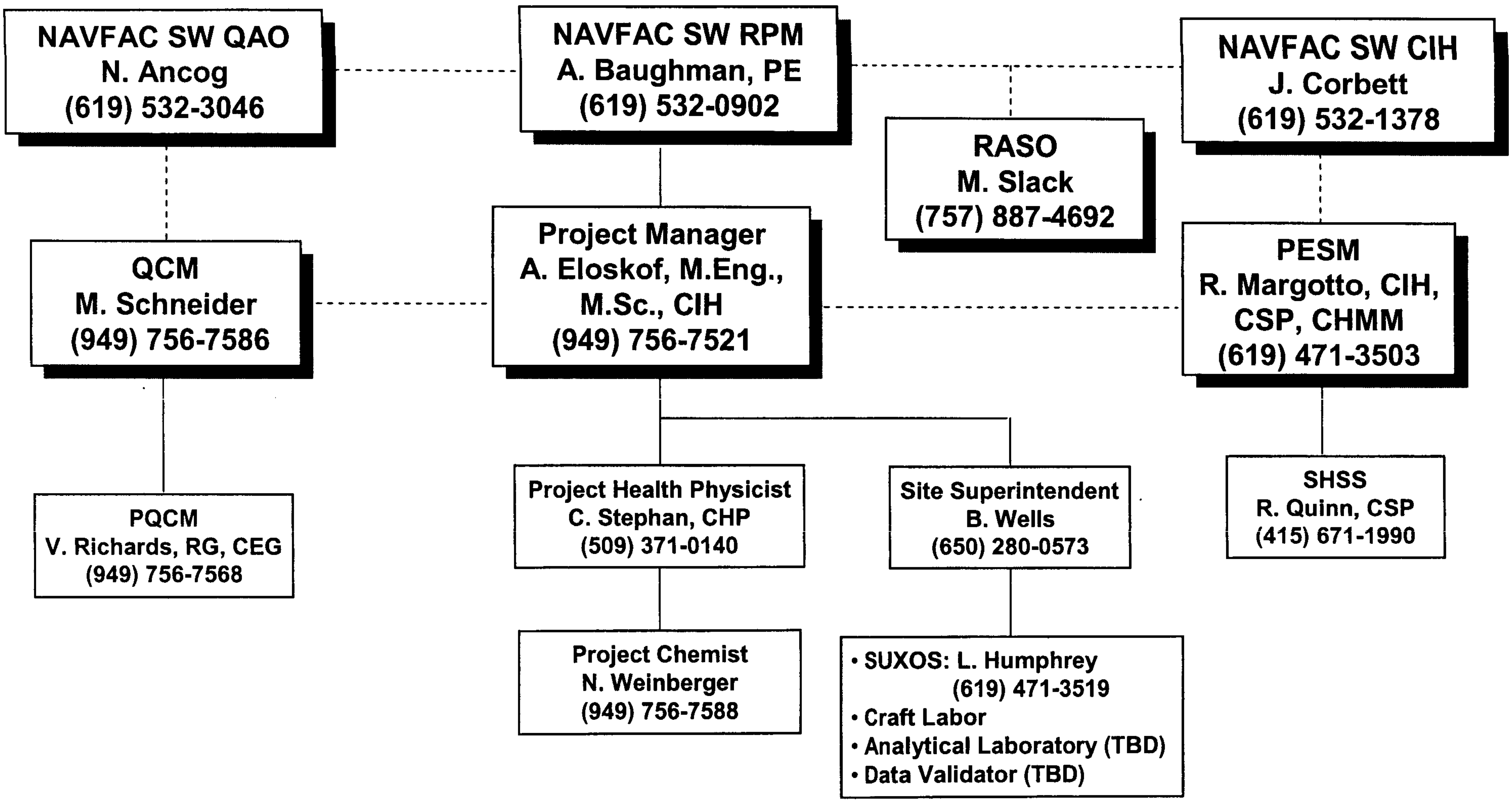
Notes:

CHEMTREC – Chemical Transportation Emergency Center
CHP – Certified Health Physicist
CIH – Certified Industrial Hygienist
EMS – Emergency Medical Services
PESM – Project Environmental Safety Manager
RASO – Radiological Affairs Support Office
RCRA – Resource Conservation and Recovery Act
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
SHSS – Site Health and Safety Specialist
TtEC – Tetra Tech EC, Inc.

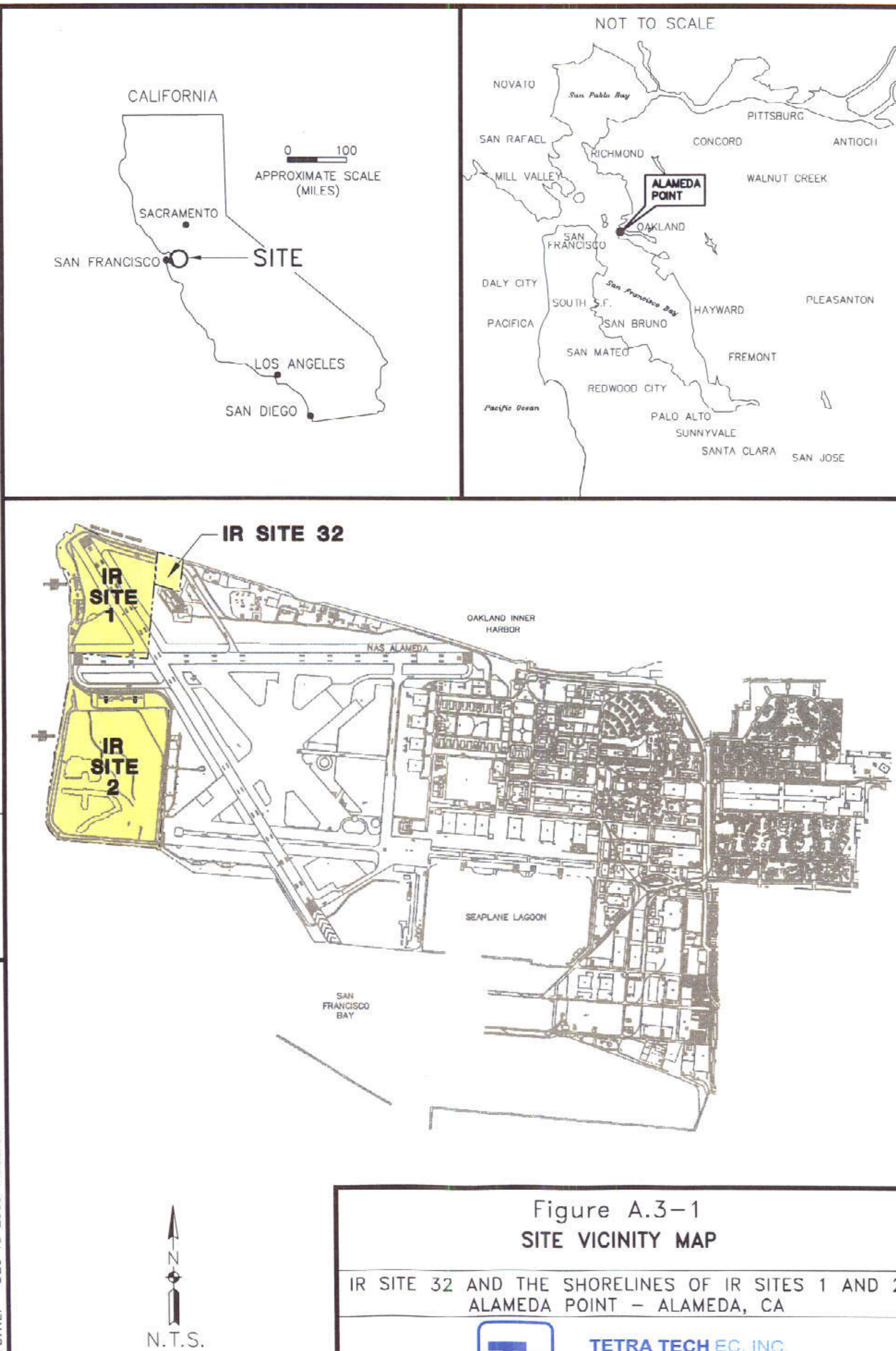
FIGURES

Figure A.2-1

Project Organization Chart



Legend
------- = In regular contact and coordination
——— = Directly reports to above



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CTO: #0015

APPROVED BY: AE

CHECKED BY: JA

REVISION: 0

DRAWN BY: MD

DATE: 01/31/07

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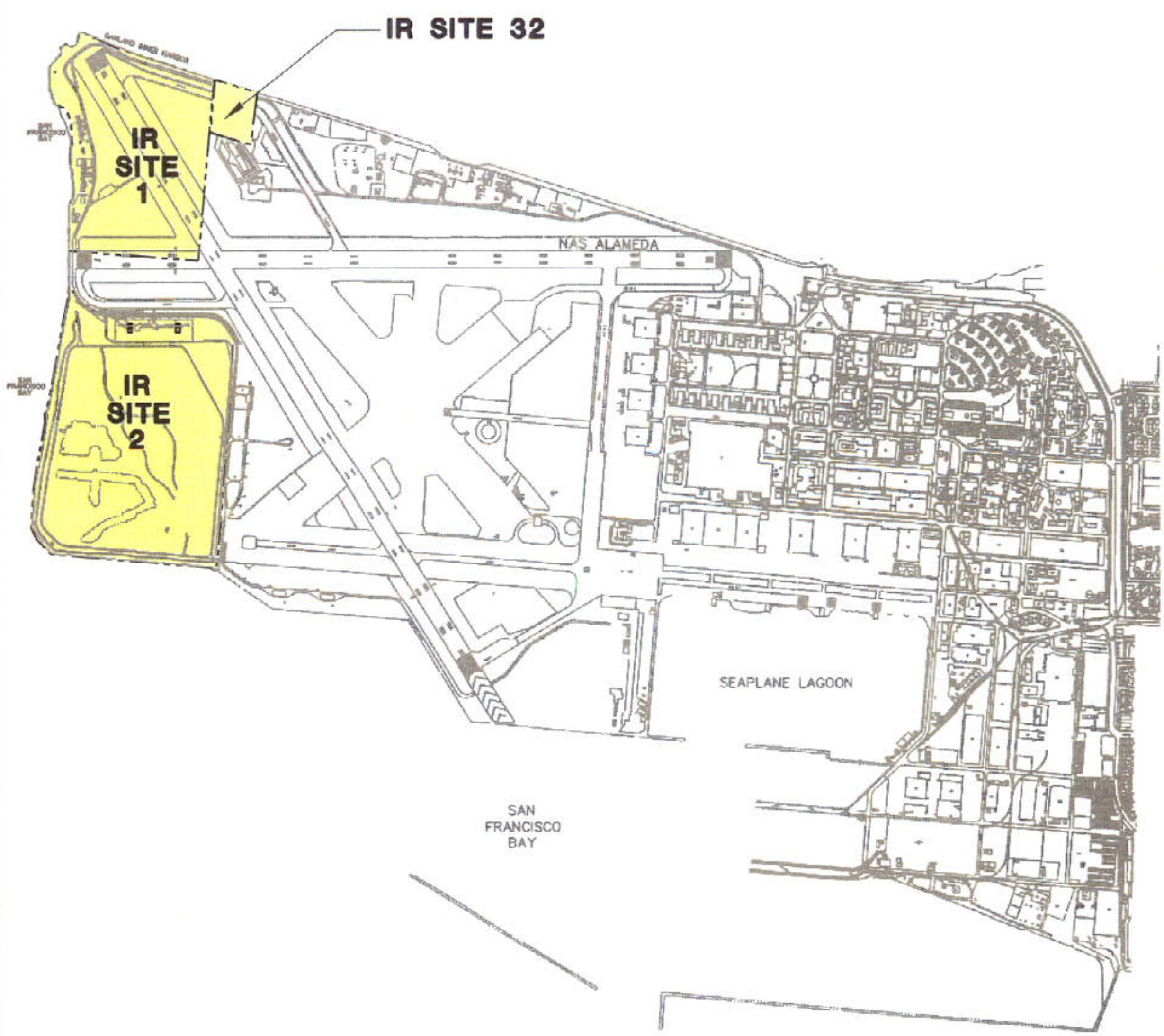
Figure A.3-1
SITE VICINITY MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT - ALAMEDA, CA

TETRA TECH EC, INC.



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N.T.S.

Figure A.3-2
IR SITES 1, 2 AND 32
LOCATION MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWN BY: MD	CHECKED BY: JA	APPROVED BY: AE	DCN: ECSD-RACIV-07-0232	DRAWING NO:
DATE: 01/31/07	REVISION: 0		CTO: #0015	070232A32.DWG

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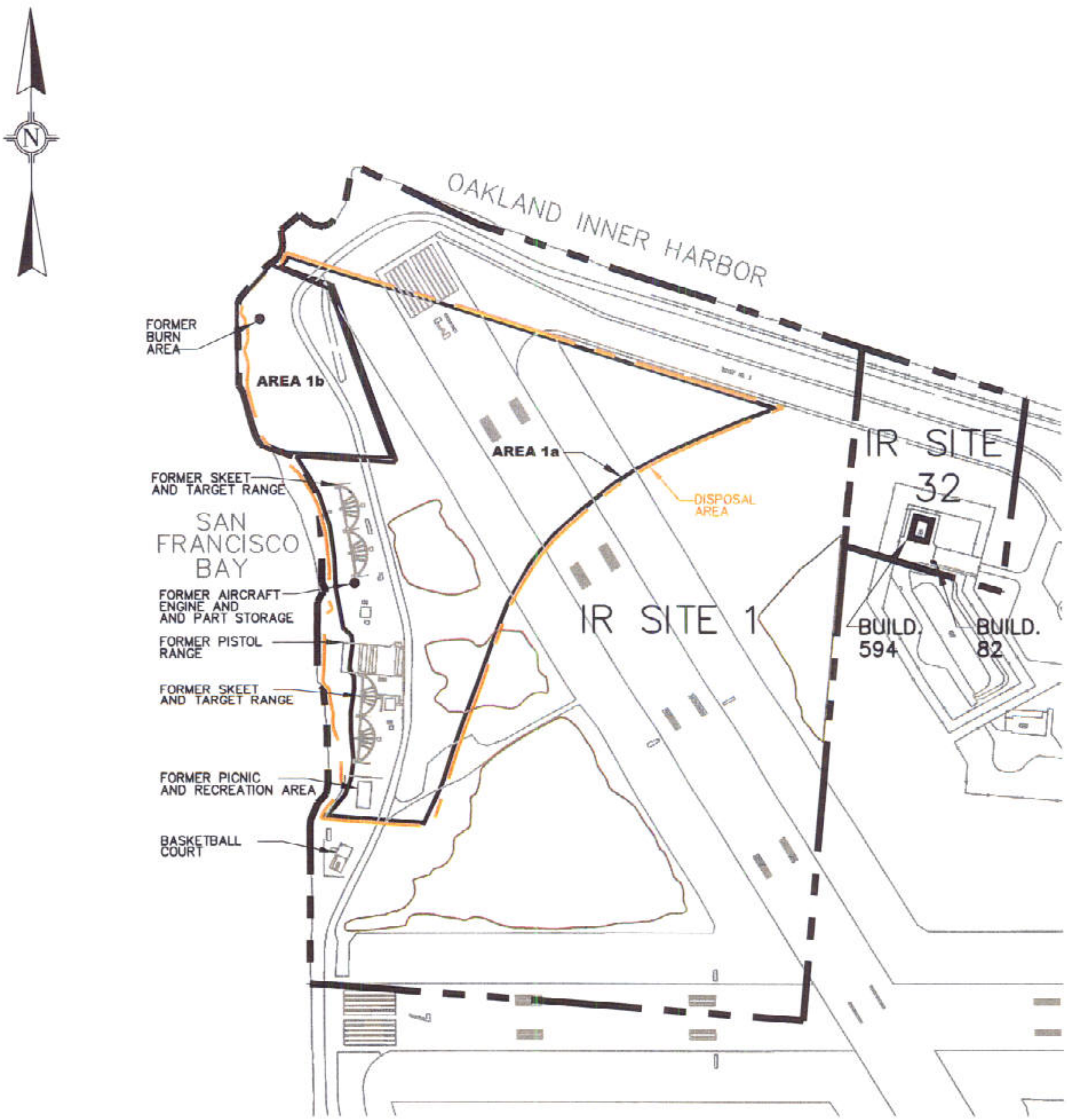
REVISION: 0
DRAWN BY: MD
DATE: 01/31/07



LEGEND

IR SITES 1 AND 32 BOUNDARY
DISPOSAL AREA BOUNDARY
SEASONAL WETLAND BOUNDARY

SOURCE:
OU-3 REMEDIAL INVESTIGATION REPORT, FINAL BY TETRA TECH EM INC., PUBLISHED IN RANCHO CORDOVA IN 1999.

500 250 0 500
SCALE IN FEET

Figure A.3-3
IR SITES 1 AND 32
SITE DETAIL MAP
IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT - ALAMEDA, CA

TETRA TECH EC, INC.

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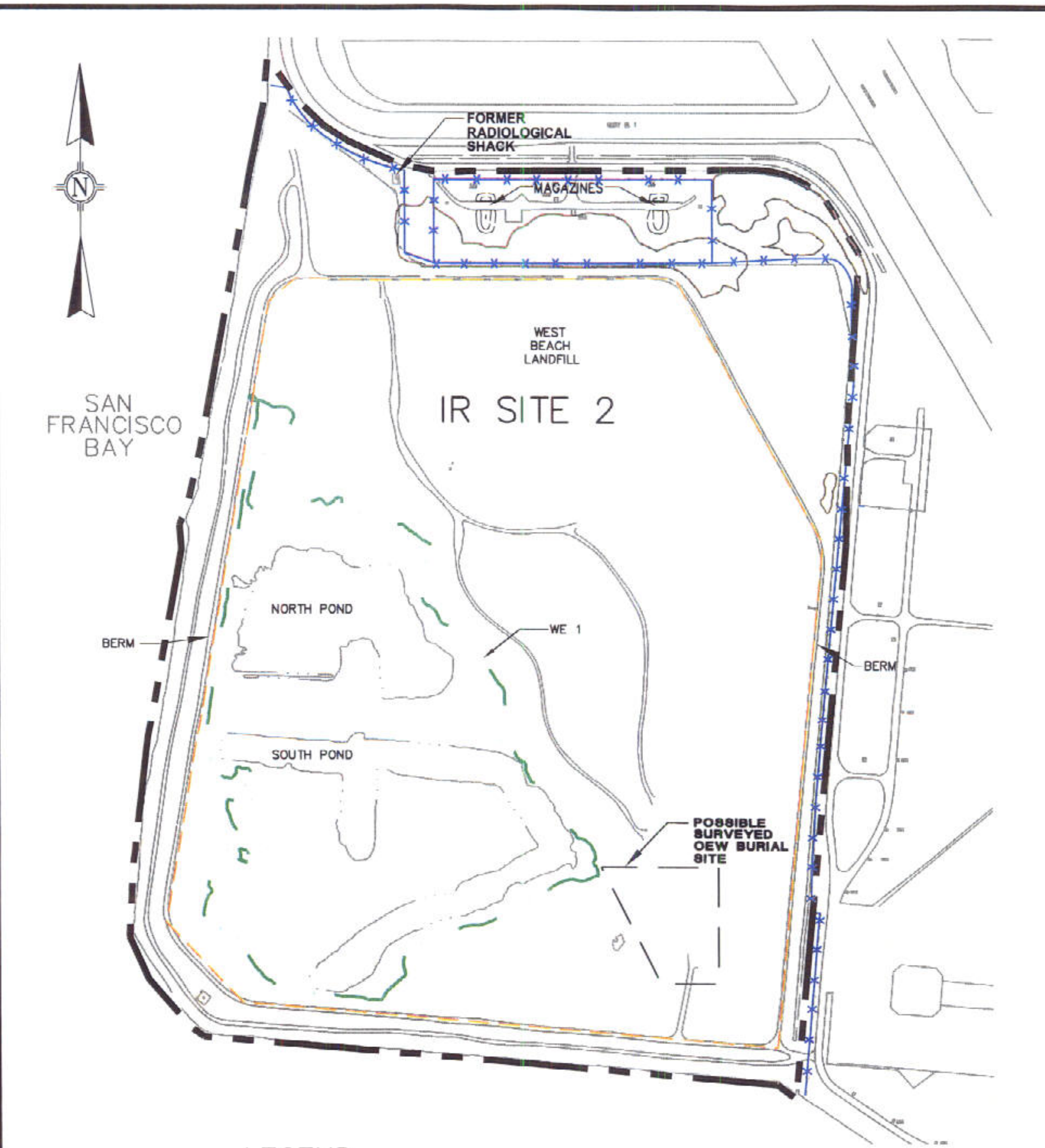

LEGEND

IR SITE 2 BOUNDARY
FENCE LINE
PERMANENT WETLAND BOUNDARY
SEASONAL WETLAND BOUNDARY
BERM
WE WETLAND
OEW ORDINANCE AND EXPLOSIVE WASTE

500 250 0 500
SCALE IN FEET

Figure A.3-4
IR SITE 2
SITE DETAIL MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

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DCN: ECSD-RAC-07-0232
CTO: #0015
APPROVED BY: AE
CHECKED BY: JA
REVISION: 0
DRAWN BY: MD
DATE: 01/31/07

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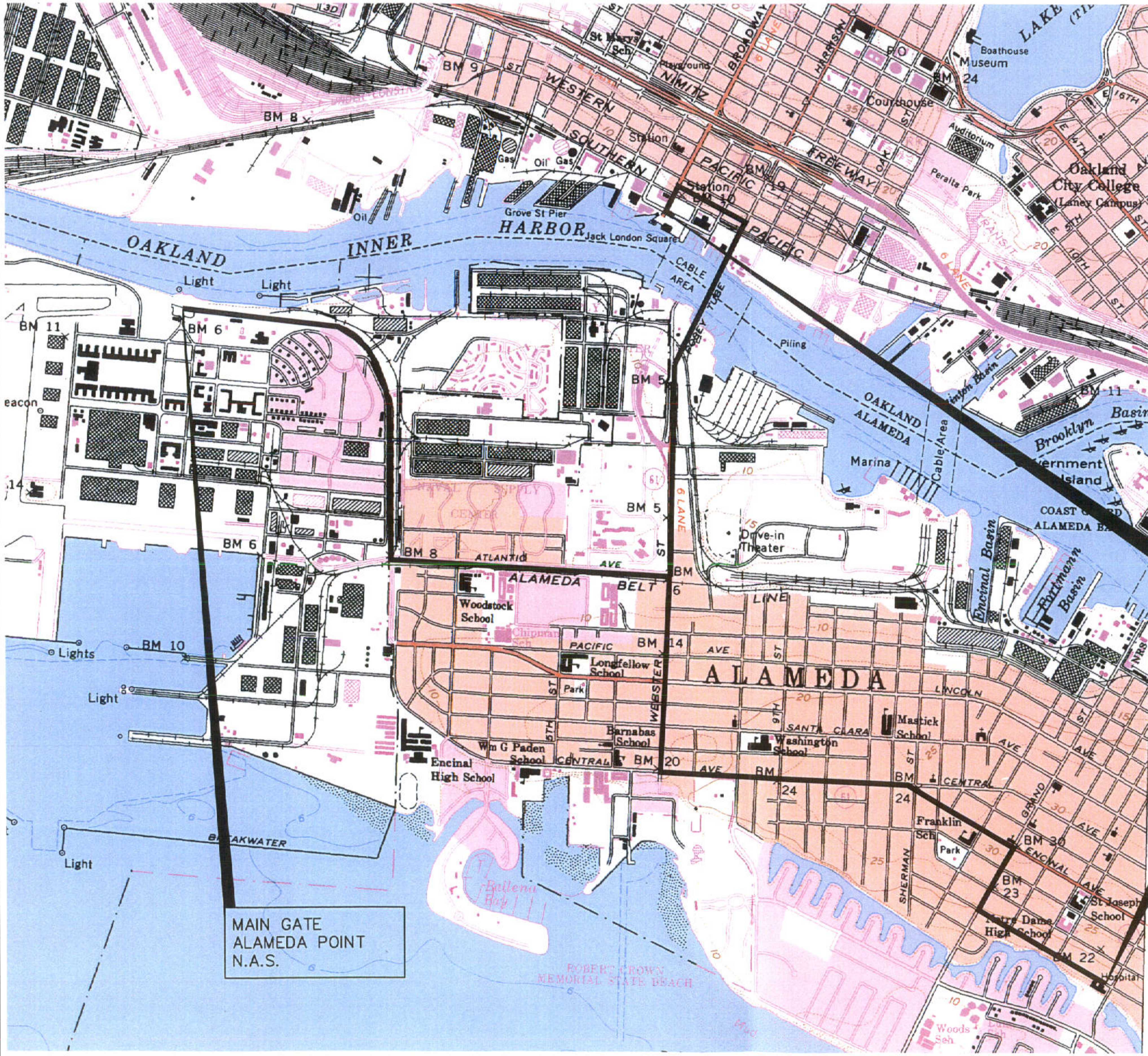
HOSPITAL DIRECTIONS:

Exit Main Gate onto Main Street heading west and continue on street as it turns south. Continue south, turn left at Atlantic and head east. Turn right on Webster and head south to Central. Turn left onto Central Avenue heading east to Encinal Avenue. Make slight right onto Encinal Avenue heading southeast to Grand Street. Turn right on Grand Street heading south to Clinton Avenue. Turn left onto Clinton Avenue heading southeast to Alameda Hospital (2070 Clinton Avenue).

CLINIC DIRECTIONS:

Exit Main Gate onto Main Street heading west and continue on street as it turns south. Continue south, turn left at Atlantic and head east. Turn right on Webster and continue north through Posey Tunnel. Exit tunnel and continue north to 8th Street (first one-way street heading west). Continue west on 8th Street to Broadway. Turn left and continue south to Embarcadero.
Make left on Embarcadero to Concentra Clinic (384 Embarcadero).



CONCENTRA MEDICAL CENTER
384 EMBARCADERO W
(510) 465–9565

ALAMEDA HOSPITAL
2070 CLINTON AVENUE
ALAMEDA, CA 94501
(510) 522–3700

Figure A.12–1
ROUTE TO CLINIC AND HOSPITAL

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWN BY: MD | CHECKED BY: JA | APPROVED BY: AE | DCN: ECSD-RACIV-07-0232 | DRAWING NO: 070232A121.DWG
DATE: 01/31/07 | REV: REVISION 0 | CTO: #0015

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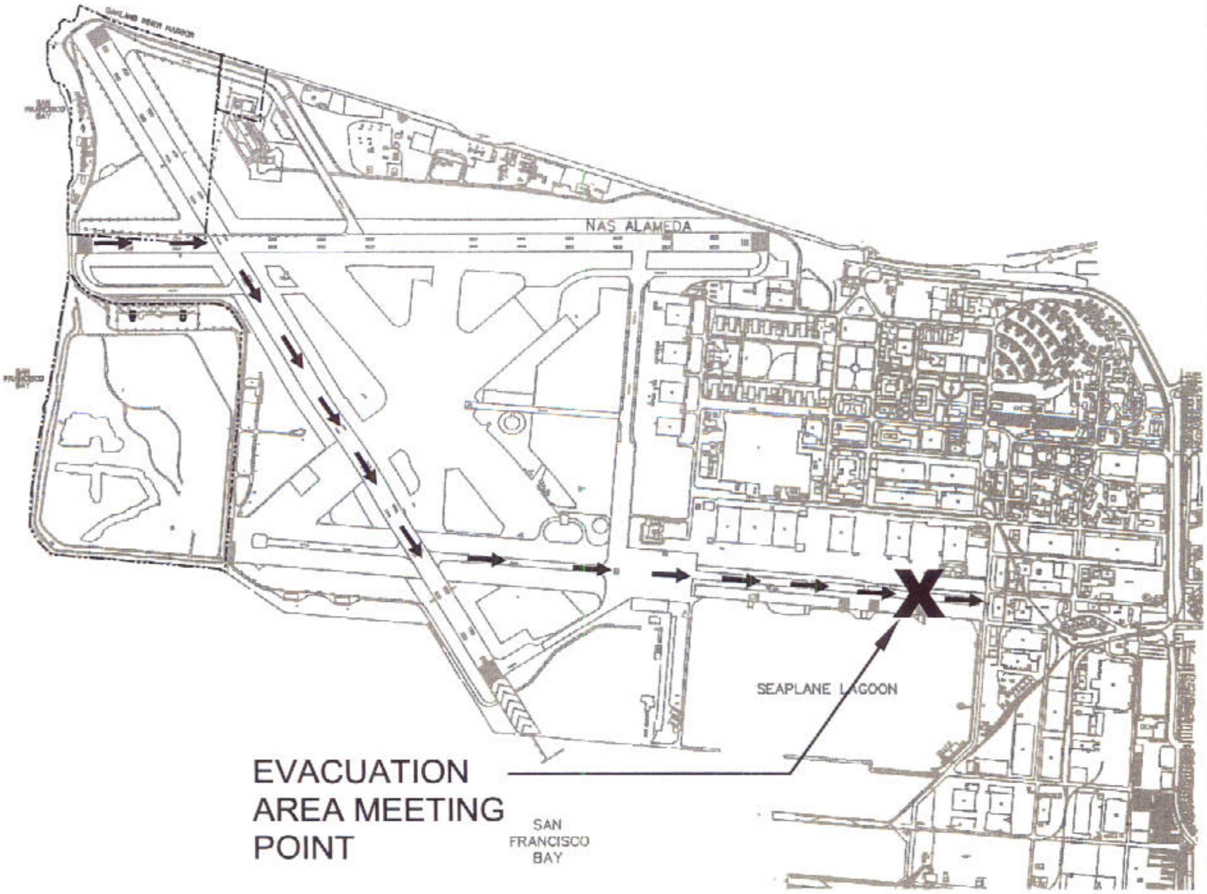

Figure A.12-2
EMERGENCY EVACUATION ROUTE

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

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ATTACHMENT 1

MATERIAL SAFETY DATA SHEETS

Genium Publishing Corporation
One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Material Safety Data Sheets Collection:
Sheet No. 316
Benzene

Issued: 11/78 Revision: E, 8/90

Section 1. Material Identification

32

Benzene (C_6H_6) Description: Derived by fractional distillation of coal tar, hydrodealkylation of toluene or pyrolysis of gasoline, catalytic reforming of petroleum, and transalkylation of toluene by disproportionation reaction. Used as a fuel; a chemical reagent; a solvent for a large number of materials such as paints, plastics, rubber, inks, oils, and fats; in manufacturing phenol, ethylbenzene (for styrene monomer), nitrobenzene (for aniline), dodecylbenzene (for detergents), cyclohexane (for nylon), chlorobenzene, diphenyl, benzene hexachloride, maleic anhydride, benzene-sulfonic acid, artificial leather, linoleum, oil cloth, varnishes, and lacquers; for printing and lithography; in dry cleaning; in adhesives and coatings; for extraction and rectification; as a degreasing agent; in the tire industry; and in shoe factories. Benzene has been banned as an ingredient in products intended for household use and is no longer used in pesticides.

Other Designations: CAS No. 0071-43-2, benzol, carbon oil, coal naphtha, cyclohexatriene, mineral naphtha, nitration benzene, phene, phenyl hydride, pyrobenzol.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*[73] for a suppliers list.

Cautions: Benzene is a confirmed *human carcinogen* by the IARC. *Chronic low-level exposure may cause cancer (leukemia) and bone marrow damage, with injury to blood-forming tissue.* It is also a dangerous fire hazard when exposed to heat or flame.

R 1
I 4
S 2*
K 4
*Skin absorption

NFPA
3
2 0
-

HMIS
H 3
F 3
R 0
PPG†
† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Benzene, ca 100%*

1989 OSHA PELs
(29 CFR 1910.1000, Table Z-1-A)
8-hr TWA: 1 ppm, 3 mg/m^3
15-min STEL: 5 ppm, 15 mg/m^3

(29 CFR 1910.1000, Table Z-2)
8-hr TWA: 10 ppm
Acceptable Ceiling Concentration: 25 ppm
Acceptable Maximum Peak: 50 ppm (10 min)†

1989-90 ACGIH
TLV-TWA: 10 ppm, 32 mg/m^3

1988 NIOSH RELs
TWA: 0.1 ppm, 0.3 mg/m^3
Ceiling: 1 ppm, 3 mg/m^3

1985-86 Toxicity Data‡
Man, oral, LD_{Lo}: 50 mg/kg; no toxic effect noted
Man, inhalation, TC_{Lo}: 150 ppm inhaled intermittently over 1 yr in a number of discrete, separate doses affects the blood (other changes) and nutritional and gross metabolism (body temperature increase)
Rabbit, eye: 2 mg administered over 24 hr produces severe irritation

* OSHA 29 CFR 1910.1000, Subpart Z, states that the final benzene standard in 29 CFR 1910.1028 applies to all occupational exposures to benzene except in some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.
† Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift.
‡ See NIOSH, *RTECS* (CY1400000), for additional irritative, mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 176 °F (80 °C)
Melting Point: 42 °F (5.5 °C)
Vapor Pressure: 100 mm Hg at 79 °F (26.1 °C)
Vapor Density (Air = 1): 2.7
Evaporation Rate (Ether = 1): 2.8

Molecular Weight: 78.11
Specific Gravity (15 °C/4 °C): 0.8787
Water Solubility: Slightly (0.180 g/100 g of H_2O at 25 °C)
%Volatile by Volume: 100
Viscosity: 0.6468 mPa at 20 °C

Appearance and Odor: A colorless liquid with a characteristic sweet, aromatic odor. The odor recognition threshold (100% of panel) is approximately 5 ppm (unfatigued) in air. Odor *is not* an adequate warning of hazard.

Section 4. Fire and Explosion Data

Flash Point: 12 °F (-11.1 °C), CC	Autoignition Temperature: 928 °F (498 °C)	LEL: 1.3% v/v	UEL: 7.1% v/v

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish benzene fires. Water may be ineffective as an extinguishing agent since it can scatter and spread the fire. Use water spray to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Unusual Fire or Explosion Hazards: Benzene is a Class 1B flammable liquid. A concentration exceeding 3250 ppm is considered a potential fire explosion hazard. Benzene vapor is heavier than air and can collect in low lying areas or travel to an ignition source and flash back. Explosive and flammable benzene vapor-air mixtures can easily form at room temperature. *Eliminate all ignition sources where benzene is used, handled, or stored.*

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Structural firefighter's protective clothing provides limited protection. Stay out of low areas. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Runoff to sewer can create pollution, fire, and explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Benzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Benzene explodes on contact with diborane, permanganic acid, bromine pentafluoride, peroxodisulfuric acid, and peroxomonosulfuric acid. *It ignites on contact with dioxygen difluoride, dioxygenyl tetrafluoroborate, iodine heptafluoride, and sodium peroxide + water.* Benzene forms sensitive, explosive mixture with iodine pentafluoride, ozone, liquid oxygen, silver perchlorate, nitryl perchlorate, nitric acid, and arsenic pentafluoride + potassium methoxide (explodes above 30 °C). A vigorous or incandescent reaction occurs with bromine trifluoride, uranium hexafluoride, and hydrogen + Raney nickel [above 410 °F (210 °C)]. Benzene is incompatible with oxidizing materials.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of benzene can produce toxic gases and vapors such as carbon monoxide.

Section 6. Health Hazard Data

Carcinogenicity: The ACGIH, OSHA, and IARC list benzene as, respectively, a supected human carcinogen, a cancer hazard, and, based on sufficient human and animal evidence, a human carcinogen (Group 1).
Summary of Risks: Prolonged skin contact or excessive inhalation of benzene vapor may cause headache, weakness, appetite loss, and fatigue. The most important health hazards are cancer (leukemia) and bone marrow damage with injury to blood-forming tissue from chronic low-level exposure. Higher level exposures may irritate the respiratory tract and cause central nervous system (CNS) depression.
Medical Conditions Aggravated by Long-Term Exposure: Exposure may worsen ailments of the heart, lungs, liver, kidneys, blood, and CNS.
Target Organs: Blood, central nervous system, bone marrow, eyes, upper respiratory tract, and skin.
Primary Entry Routes: Inhalation, skin contact.
Acute Effects: Symptoms of acute overexposure include irritation of the eyes, nose, and respiratory tract, breathlessness, euphoria, nausea, drowsiness, headache, dizziness, and intoxication. Severe exposure may lead to convulsions and unconsciousness. Skin contact may cause a drying rash (dermatitis).
Chronic Effects: Long-term chronic exposure may result in many blood disorders ranging from aplastic anemia (an inability to form blood cells) to leukemia.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Immediately rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air. Emergency personnel should protect against inhalation exposure. Provide CPR to support breathing or circulation as necessary. Keep awake and transport to a medical facility.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* since aspiration may be fatal. Call a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: Evaluate chronic exposure with a CBC, peripheral smear, and reticulocyte count for signs of myelotoxicity. Follow up any early indicators of leukemia with a bone marrow biopsy. Urinary phenol conjugates may be used for biological monitoring of recent exposure. Acute management is primarily supportive for CNS depression.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a benzene spill control and countermeasure plan (SCCP).* Notify safety personnel, evacuate all unnecessary personnel, eliminate all heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against vapor inhalation, eye contact, and skin absorption. Absorb as much benzene as possible with an inert, noncombustible material. For large spills, dike far ahead of spill and contain liquid. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of confined spaces such as sewers, watersheds, and waterways because of explosion danger. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Waste No. U019
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 307 (a), 311 (b)(4), 112; and per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Tables Z-1-A and Z-2)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations at least below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all heat and ignition sources and incompatible materials. *Caution! Benzene vapor may form explosive mixtures in air.* To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. When opening or closing benzene containers, use nonsparking tools. Keep fire extinguishers readily available.
Engineering Controls: Because OSHA specifically regulates benzene (29 CFR 1910.1028), educate workers about its potential hazards and dangers. Minimize all possible exposures to carcinogens. If possible, substitute less toxic solvents for benzene; use this material with extreme caution and only if absolutely essential. Avoid vapor inhalation and skin and eye contact. Use only with adequate ventilation and appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Designate regulated areas of benzene use (see legend in the box below) and label benzene containers with "DANGER, CONTAINS BENZENE, CANCER HAZARD."
Other Precautions: Provide preplacement and periodic medical examinations with emphasis on a history of blood disease or previous exposure.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Benzene (*benzol*)
DOT Hazard Class: Flammable liquid
ID No.: UN1114
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Benzene
IMO Hazard Class: 3.2
ID No.: UN1114
IMO Label: Flammable liquid
IMDG Packaging Group: II

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE–NO SMOKING
AUTHORIZED PERSONNEL ONLY
RESPIRATOR REQUIRED

MSDS Collection **References:** 1, 2, 12, 26, 73, 84-94, 100, 101, 103, 109, 124, 126, 127, 132, 134, 136, 138, 139, 143
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Upfal, MD, MPH; **Edited by:** JR Stuart, MS

Section 1. Material Identification

Coal Tar Creosote (molecular formula varies with purity) Description: Three main derivations: by distillation of coal tar produced by high-temperature carbonization of bituminous coal; by mixing strained naphthalene oil, wash oil, and strained or light anthracene oil; as a by-product of conventional coal coking. It typically contains up to 160 chemicals, mainly aromatic compounds such as phenol, pyrol and pyridine. Used mainly as a wood preservative for railroad ties, poles, fence posts, marine pilings, and other lumber for outdoor use; as a water-proofing agent, fuel oil constituent, frothing agent for mineral separation, hop defoliant, and lubricant for die molds; in manufacturing chemicals; and in medicine as an antiseptic, disinfectant, antipyretic, astringent, germicide, and styptic.
Other Designations: CAS No. 8001-58-9, Awpa,® brick oil, Caswell No. 225,® coal tar oil, creosote, creosote oil, creosotum, cresylic creosote, heavy oil, liquid pitch oil, naphthalene oil, Preserv-o-sote,® Sakresote,® tar oil, wash oil.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.
Cautions: Flammable, liquid coal tar creosote is toxic by inhalation, ingestion, and skin contact. The IARC and NTP classify it as *a human carcinogen.*

R 1
I 4
S 4*
K 2
* Skin absorption

NFPA
Health 2, Flammability 2, Reactivity 0, Special -

HMIS
H 2
F 2
R 0
PPG†
† Sec. 8

* Skin absorption can occur with phenol, a major component of coal tar creosote.

Section 2. Ingredients and Occupational Exposure Limits

Coal tar creosote, ca 100%

1990 OSHA PEL
8-hr TWA: 0.2 mg/m³*

1987 IDLH Level
700 mg/m³

1990-91 ACGIH TLV
TWA: 0.2 mg/m³*

1990 NIOSH REL
0.1 mg/m³ (cyclohexane extractable portion)

1985-86 Toxicity Data†
Rat, oral, LD_{50}: 725 mg/kg; toxic effects not yet reviewed
Dog, oral, LD_{Lo}: 600 mg/kg; toxic effects not yet reviewed
Rat, TD_{Lo}: 52,416 mg/kg administered during 91 days prior to mating produces reproductive effects on fallopian tubes and ovaries
Mouse, skin, TD_{Lo}: 99 g/kg produces tumors in skin and appendages

* As coal tar pitch volatiles.
† See NIOSH, *RTECS* (GF8615000), for additional mutation, reproductive, tumorigenic, and other toxicity data.

Section 3. Physical Data

Boiling Point: 381 to 752 °F (194 to 400 °C)
Distillation Range: 446 to 554 °F (230 to 290 °C)
Heat of Combustion: -12,500 Btu/lb
Heat of Vaporization: 107 Btu/lb
Molecular Weight: Varies with purity
Density/Specific Gravity: 1.07 to 1.08 at 68 °F (20 °C)
Water Solubility: Slightly soluble

Appearance and Odor: Pure coal tar creosote is colorless, but the industrial product is a yellow to black oily liquid with an aromatic smoky smell and a burning caustic taste.

Section 4. Fire and Explosion Data

Flash Point: 165.2 °F (74 °C), CC	**Autoignition Temperature:** 637 °F (336 °C)	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), or regular foam. For large fires, use fog or regular foam. Since water is least effective, use it as an extinguishing agent only when the preferred measures are unavailable. However, use water spray to cool fire-exposed containers.
Unusual Fire or Explosion Hazards: Vapors may travel to an ignition source and flash back. Containers may explode in heat of fire. Coal tar creosote presents a vapor explosion hazard indoors, outdoors, and in sewers.
Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear full protective clothing. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Immediately leave area if you hear a rising sound from venting safety device or notice any fire-caused tank discoloration. Isolate area for 1/2 mile in all directions if fire involves tank, rail car or tank truck. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Fully decontaminate or properly dispose of personal protective clothing.

Section 5. Reactivity Data

Stability/Polymerization: Coal tar creosote is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Creosote oil mixed with chlorosulfonic acid in a closed container causes an increase in temperature and pressure.
Conditions to Avoid: Avoid excessive heat and contact with chlorosulfonic acid.
Hazardous Products of Decomposition: Thermal oxidative decomposition of coal tar creosote can produce oxides of carbon and thick, black, acrid smoke.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA list coal tar creosote as a carcinogen.
Summary of Risks: Coal tar creosote is toxic by inhalation, ingestion, and skin contact. It contains a variety of hydrocarbons such as phenol and polycyclic aromatic hydrocarbons such as benzo[a]pyrene, benzanthracene, and phenol derivatives. The range of toxicity depends on the exposure concentration, amount, and duration. Effects may include irritation, burns, and several forms of cancer.
Medical Conditions Aggravated by Long-Term Exposure: Chronic respiratory or skin diseases.
Target Organs: Eyes, skin, bladder, kidneys, and respiratory system.
Primary Entry Routes: Inhalation, ingestion, and skin contact.
Acute Effects: Skin contact may cause irritation, burning, itching, redness, pigment changes, dermatitis (a rash of redness and small bumps), or burns. Photosensitization (worsening of rash with exposure to sunlight) may occur. Inhalation may be irritating to the respiratory tract. Eye contact may cause conjunctivitis (inflammation of the eye's lining), keratitis (corneal inflammation), or corneal burns with scarring. Ingestion may result in nausea, vomiting, abdominal pain, rapid pulse, respiratory distress, and shock. Systemic absorption by any route (including skin absorption) may cause trouble breathing, thready (continuous or drawn out) pulse, dizziness, headache, nausea, vomiting, salivation, and convulsions. Exposure to large doses (particularly by ingestion) may be fatal.
Chronic Effects: Dermatitis, skin cancer, and lung cancer.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. *Do not* let victim rub eyes or keep them tightly closed. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Wash affected area with soap and flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious* person drink 1 to 2 glasses of milk or water. *Do not induce vomiting!*
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Cresol may be detected in urine.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel. Isolate hazard area, deny entry, and stay upwind of spills. Shut off all ignition sources–no flares, smoking, or flames in hazard area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. If possible with no risk, stop leak. Water spray may be used to reduce vapor but it may not prevent ignition in closed spaces. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal. For large spills, dike far ahead of liquid spill for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Degradation: Coal tar creosote is fouling to shoreline. Ecotoxicity values are: TL_{50}, goldfish (*Carassius auratus*), 3.51 ppm/24 hr (60:40) mixture of creosote and coal tar; LD_{50}, bob white quail (*Colinus virginianus*), 1,260 ppm/8 days (60:40) mixture of creosote and coal tar.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Material No. U051
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [* per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Listed (as coal tar pitch volatiles) as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent all skin contact. Applying a layer of petroleum jelly or lanolin castor oil ointment to the face reduces vapor contact and penetration through skin. Frequent change of protective garments is an additional protective measure.
Ventilation: Provide general and local exhaust ventilation systems equipped with high-efficiency particulate filters to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Take particular care to avoid any contamination of drains or ventilation ducts. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in a cool, dry, well-ventilated area. Store coal tar creosote as close to area of use as possible to minimize transporting distance.
Engineering Controls: Use engineering controls to keep airborne concentrations below the OSHA PEL. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Always perform synthesis and purification procedures under a vertical ventilation hood and make regular operational safety checks. Label doors to rooms where coal tar creosote is produced, used, or stored as containing a carcinogen. Locate emergency equipment at well-marked and clearly identified stations in case emergency escape is necessary.
Other Precautions: Preplacement and periodic medical examinations of exposed workers emphasizing respiratory, skin, liver, and kidney disorders, including comprehensive work and medical history, physical examination, CXR, PFTs, urinalysis, LFT, and sputum cytology as the attending physician considers appropriate. Educate workers about coal tar creosote's carcinogenicity and proper handling procedures to avoid exposure.
Other Comments: Caution is in order when handling or sawing old creosote-treated lumber since it retains a considerable portion of creosote for up to 25 to 30 years.
Transportation Data (49 CFR 172.101)
DOT Shipping Name: Creosote
DOT Hazard Class: Flammable liquid
ID No.: UN1136
DOT Label: Flammable liquid

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 139, 140, 142, 143, 146, 148, 153, 159
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** Mark Upfal, MD, MPH; **Edited by:** JR Stuart, MS

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Material Safety Data Sheets Collection:

Sheet No. 470
Diesel Fuel Oil No. 2-D

Issued: 10/81 Revision: A, 11/90

Section 1. Material Identification

33

Diesel Fuel Oil No. 2-D Description: Diesel fuel is obtained from the middle distillate in petroleum separation; a distillate oil of low sulfur content. It is composed chiefly of unbranched paraffins. Diesel fuel is available in various grades, one of which is synonymous with fuel oil No. 2-D. This diesel fuel oil requires a minimum Cetane No. (efficiency rating for diesel fuel comparable to octane number ratings for gasoline) of 40 (ASTM D613). Used as a fuel for trucks, ships, and other automotive engines; as mosquito control (coating on breeding waters); and for drilling muds.
Other Designations: CAS No. 68334-30-5, diesel fuel.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(73) for a suppliers list.

Cautions: Diesel fuel oil No. 2-D is a skin irritant and central nervous depressant with high mist concentrations. It is an environmental hazard and moderate fire risk.

RISK	
R	1
I	-
S	2
K	2

NFPA: 2 (top), 0 (left), 0 (right), - (bottom)

HMIS	
H	0
F	2
R	0
PPG*	

* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Diesel fuel oil No. 2-D*

1989 OSHA PEL	1990-91 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data‡
None established	Mineral Oil Mist TWA: 5 mg/m^3† STEL: 10 mg/m^3	None established	Rat, oral, LD_{50}: 9 g/kg produces gastrointestinal (hypermotility, diarrhea) effects

* Diesel fuel No. 2-D tends to be low in aromatics and high in paraffinics. This fuel oil is complex mixture of: 1) >95% paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, 2) sulfur (<0.5%), and 3) benzene (<100 ppm). [A low benzene level reduces carcinogenic risk. Fuel oils can be exempted under the benzene standard (29 CFR 1910.1028)]. Although low in the fuel itself, benzene concentrations are likely to be much higher in processing areas.
† As sampled by nonvapor-collecting method.
‡ Monitor NIOSH, *RTECS* (HZ1800000), for future toxicity data.

Section 3. Physical Data

Boiling Point Range: 340 to 675 °F (171 to 358 °C)
Viscosity: 1.9 to 4.1 centistoke at 104 °F (40 °C)
Specific Gravity: <0.86
Water Solubility: Insoluble

Appearance and Odor: Brown, slightly viscous liquid.

Section 4. Fire and Explosion Data

Flash Point: 125 °F (52 °C) min.	Autoignition Temperature: >500 °F (932 °C)	LEL: 0.6% v/v	UEL: 7.5% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or foam to fight fire. Use a water spray to cool fire exposed containers. Do not use a forced water spray directly on burning oil since this will scatter the fire. Use a smothering technique for extinguishing fire.
Unusual Fire or Explosion Hazards: Diesel fuel oil No. 2-D is a OSHA Class II combustible liquid. Its volatility is similar to that of gas oil. Vapors may travel to a source of ignition and flash back.
Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective clothing. If feasible, remove containers from fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways due to pollution and fire or explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Diesel fuel oil No. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: It is incompatible with strong oxidizing agents; heating greatly increases the fire hazard.
Conditions to Avoid: Avoid heat and ignition sources.
Hazardous Products of Decomposition: Thermal oxidative decomposition of diesel fuel oil No. 2-D can produce various hydrocarbons and hydrocarbon derivatives, and other partial oxidation products such as carbon dioxide, carbon monoxide, and sulfur dioxide.

Section 6. Health Hazard Data

Carcinogenicity: Although the IARC has not assigned an overall evaluation to diesel fuels as a group, it has evaluated occupational exposures in petroleum refining as an IARC probable human carcinogen (Group 2A). It has evaluated distillate (light) diesel oils as not classifiable as human carcinogens (Group 3).
Summary of Risks: Although diesel fuel's toxicologic effects should resemble kerosine's, they are somewhat more pronounced due to additives such as sulfurized esters. Excessive inhalation of aerosol or mist can cause respiratory tract irritation, headache, dizziness, nausea, vomiting, and loss of coordination, depending on concentration and exposure time. When removed from exposure area, affected persons usually recover completely. If vomiting occurs after ingestion and if oil is aspirated into the lungs, hemorrhaging and pulmonary edema, progressing to renal involvement and chemical pneumonitis, may result. A comparative ratio of oral to aspirated lethal doses may be 1 pt vs. 5 ml. Aspiration may also result in transient CNS depression or excitement. Secondary effects may include hypoxia (insufficient oxygen in body cells), infection, pneumatocele formation, and chronic lung dysfunction. Inhalation may result in euphoria, cardiac dysrhythmias, respiratory arrest, and CNS toxicity. Prolonged or repeated skin contact may irritate hair follicles and block sebaceous glands, producing a rash of acne pimples and spots, usually on arms and legs.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Central nervous system, skin, and mucous membranes.
Primary Entry Routes: Inhalation, ingestion.
Acute Effects: Systemic effects from ingestion include gastrointestinal irritation, vomiting, diarrhea, and in severe cases central nervous system depression, progressing to coma or death. Inhalation of aerosols or mists may result in increased rate of respiration, tachycardia (excessively rapid heart beat), and cyanosis (dark purplish discoloration of the skin and mucous membranes caused by deficient blood oxygenation).
Chronic Effects: Repeated contact with the skin causes dermatitis.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. If large areas of the body have been exposed or if irritation persists, get medical help immediately. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Contact a physician immediately. Position to avoid aspiration.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Gastric lavage is contraindicated due to aspiration hazard. Preferred antidotes are charcoal and milk. In cases of severe aspiration pneumonitis, consider monitoring arterial blood gases to ensure adequate ventilation. Observe the patient for 6 hr. If vital signs become abnormal or symptoms develop, obtain a chest x-ray.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate area for large spills, remove all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Clean up spills promptly to reduce fire or vapor hazards. Use a noncombustible absorbent material to pick up small spills or residues. For large spills, dike far ahead to contain. Pick up liquid for reclamation or disposal. Do not release to sewers or waterways due to health and fire and/or explosion hazard. Follow applicable OSHA regulations (29 CFR 1910.120). Diesel fuel oil No. 2-D spills may be environmental hazards. Report large spills.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.21): Ignitable waste
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use a NIOSH-approved respirator with a mist filter and organic vapor cartridge. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and productivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Use and storage conditions should be suitable for a OSHA Class II combustible liquid. Store in closed containers in a well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Use nonsparking tools and explosion-proof electrical equipment. No smoking in storage or use areas.
Engineering Controls: Avoid vapor or mist inhalation and prolonged skin contact. Wear protective rubber gloves and chemical safety glasses where contact with liquid or high mist concentration may occur. Additional suitable protective clothing may be required depending on working conditions. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures. Do not wear oil contaminated clothing. At least weekly laundering of work clothes is recommended. Do not put oily rags in pockets. When working with this material, wear gloves or use barrier cream.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Fuel oil

DOT Hazard Class: Combustible liquid

ID No.: NA1993

DOT Label: None

DOT Packaging Exceptions: 173.118a

DOT Packaging Requirements: None

MSDS Collection **References:** 1, 6, 7, 12, 73, 84, 101, 103, 126, 127, 132, 133, 136, 143, 146
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MD; **Edited by:** JR Stuart, MS

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Material Safety Data Sheets Collection:
Sheet No. 385
Ethylbenzene
Issued: 8/78 Revision: B, 9/92

Section 1. Material Identification

Ethylbenzene ($C_6H_5C_2H_5$) Description: Derived by heating benzene and ethylene in presence of aluminum chloride with subsequent distillation, by fractionation directly from the mixed xylene stream in petroleum refining, or dehydrogenation of naphthenes. Used as a solvent, an antiknock agent in gasoline; and as an intermediate in production of synthetic rubber, styrene, cellulose acetate, diethylbenzene, acetophenone, ethyl anthraquinone, propyl oxide, and α-methylbenzol alcohol.
Other Designations: CAS No. 100-41-4, ethylbenzol, EB, phenylethane, NCI-C56393.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

R 1
I 3
S 2*
K 4
* Skin absorption

NFPA
3 (top), 2 (left), 0 (right), - (bottom)

HMIS
H 2†
F 3
R 0
PPE - Sec. 8
† Chronic effects

Cautions: Ethylbenzene is a skin and mucous membrane irritant considered the most irritating of the benzene series. Inhalation causes acute and chronic central nervous system (CNS) effects. It is highly flammable and forms explosive mixtures with air.

Section 2. Ingredients and Occupational Exposure Limits

Ethylbenzene, ca >99.0%. Impurities include ~ 0.1% *meta & para* xylene, ~ 0.1% cumene, and ~ 0.1% toluene.

1991 OSHA PELs
8-hr TWA: 100 ppm (435 mg/m^3)
15-min STEL: 125 ppm (545 mg/m^3)
Action Level: 50 ppm (217 mg/m^3)

1990 IDLH Level
2000 ppm

1990 NIOSH REL
TWA: 100 ppm (435 mg/m^3)
STEL: 125 ppm (545 mg/m^3)

1992-93 ACGIH TLVs
TWA: 100 ppm (434 mg/m^3)
STEL: 125 ppm (545 mg/m^3)

1990 DFG (Germany) MAK
TWA: 100 ppm (440 mg/m^3)
Category 1: local irritants
Peak Exposure Limit: 200 ppm, 5 min momentary value, max of 8/shift
Danger of cutaneous absorption

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 100 ppm/8 hr caused eye effects, sleep, and respiratory changes.
Human, lymphocyte: 1 mmol/L induced sister chromatid exchange.
Rat, oral, LD_{50}: 3500 mg/kg; toxic effects not yet reviewed
Rat (female), inhalation, TC_{Lo}: 1000 ppm/7 hr/day, 5 days/wk, for 3 wk prior to mating and daily for 19 days of gestation produced pups with high incidence of extra ribs.[179]

* See NIOSH, *RTECS* (DA0700000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 277 °F (136 °C)
Melting Point: -139 °F (-95 °C)
Surface Tension: 31.5 dyne/cm
Ionization Potential: 8.76 eV
Viscosity: 0.64 cP at 77 °F (25 °C)
Refraction Index: 1.4959 at 68 °F (20 °C)
Relative Evaporation Rate (ether = 1): 0.0106
Bulk Density: 7.21 lb/Gal at 77 °F (25 °C)
Critical Temperature: 651 °F (343.9 °C)
Critical Pressure: 35.6 atm
Molecular Weight: 106.16
Density: 0.863 at 77 °F (25 °C)
Water Solubility: Slightly, 14 mg/100 mL at 59 °F (15 °C)
Other Solubilities: Miscible in alcohol, ether; soluble in carbon tetrachloride, benzene, sulfur dioxide, and many organic solvents; insoluble in ammonia
Odor Threshold: 2.3 ppm
Vapor Pressure: 7.1 mm Hg at 68 °F (20 °C); 10 mmHg at 78.62 °F (25.9 °C); 100 mm Hg 165.38 °F (74.1 °C)
Saturated Vapor Density (Air = 0.075 lb/ft^3 or 1.2 kg/m^3): 0.0768 lb/ft^3 or 1.2298 kg/m^3
Appearance and Odor: Colorless, flammable liquid with a pungent odor.

Section 4. Fire and Explosion Data

Flash Point: 64 °F (18 °C) CC	**Autoignition Temperature:** 810 °F (432 °C)	**LEL:** 1.0% v/v	**UEL:** 6.7% v/v

Extinguishing Media: Class 1B Flammable liquid. For small fires, use dry chemical, carbon dioxide, or 'alcohol-resistant' foam. For large fires, use fog or 'alcohol-resistant' foam. Use water only if other agents are unavailable; EB floats on water and may travel to an ignition source and spread fire. **Unusual Fire or Explosion Hazards:** Burning rate = 5.8 mm/min. Vapors may travel to an ignition source and flash back. Container may explode in heat of fire. EB poses a vapor explosion hazard indoors, outdoors, and in sewers. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Cool container sides with water until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Withdraw immediately if you hear rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Ethylbenzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Reacts vigorously with oxidizers.
Conditions to Avoid: Exposure to heat and oxidizers.
Hazardous Products of Decomposition: Thermal oxidative decomposition of EB can produce acrid smoke and irritating fumes.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list EB as a carcinogen. **Summary of Risks:** Occupational exposure to EB alone is rare since it is usually present together with other solvents. EB is irritating to the eyes, skin, and respiratory tract. Vapor inhalation produces varying degrees of CNS effects depending on concentration. The liquid is absorbed through the skin but vapors are not. 56 to 64% of inhaled ethylbenzene is retained and metabolized. Urinary metabolites following exposure to 23 to 85 ppm for 8 hr are mandelic acid (64%), phenylglyoxylic acid (25%), and methylphenylcarbinol/1-phenyl ethanol (5%). Concurrent exposure to xylene and ethylbenzene causes slower excretion of EB metabolites. Based on the rat LD_{50}, one manufacturer gives 3 to 4 oz. as the lethal dose for a 100 lb person.

Continue on next page

Section 6. Health Hazard Data

Medical Conditions Aggravated by Long-Term Exposure: Skin and CNS diseases and impaired pulmonary function (especially obstructive airway disease). **Target Organs:** Eyes, respiratory system, skin, CNS, blood. **Primary Entry Routes:** Inhalation, skin and eye contact. **Acute Effects:** Vapor inhalation of 200 ppm caused transient eye irritation; 1000 ppm caused eye irritation with profuse watering (tolerance developed rapidly); 2000 ppm caused severe and immediate eye irritation and watering, nasal irritation, chest constriction, and vertigo; 5000 ppm was intolerable and caused eye and nose irritation. Inhalation of high concentrations may cause narcosis, cramps, and death due to respiratory paralysis. Skin exposed to pure ethylbenzene for 10 to 15 min absorbed 22 to 33 $mg/cm^2/hr$. Immersion of hand in solutions of 112 & 156 mg/L for 1 hr absorbed 118 & 215.7 $\mu g/cm^2/hr$, respectively. **Chronic Effects:** Repeated skin contact may cause dryness, scaling, and fissuring. Workers chronically exposed to > 100 ppm complained of fatigue, sleepiness, headache, and mild irritation of the eyes and respiratory tract. Repeated vapor inhalation may result in blood disorders, particularly leukopenia (abnormally low level of white blood cells) and lymphocytosis.

FIRST AID

Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting! Aspiration of even a small amount of EB in vomitus can cause severe damage since its low viscosity and surface tension will cause it to spread over a large area of the lung tissue.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: BEI = mandelic acid in urine (1.5 g/g of creatinine), sample at end of shift at workweeks end. Since this test is not specific, test for EB in expired air for confirmation.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel. Isolate and ventilate area, deny entry and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable container. Dike far ahead of large spill for later reclamation or disposal. Report any release >1000 lb. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** If released to soil, EB partially evaporates into the atmosphere, with a half-life of hrs to wks, and some leaches into groundwater, especially in soil with low organic carbon content. Biodegradation occurs with a half-life of 2 days. Some EB may absorb to sediment or bioconcentrate in fish. Evidence points to slow biodegradation in groundwater. In air, it reacts with photochemically produced hydroxyl radicals with a half-life of hrs to 2 days. Additional amounts may be removed by rain. **Ecotoxicity Values:** Shrimp (*Mysidopsis bahia*), LC_{50} = 87.6 mg/L/96 hr; sheepshead minnow (*Cyprinodon variegatus*) LC_{50} = 275 mg/L/96 hr; fathead minnow (*Pimephales promelas*) LC_{50} = 42.3 mg/L/96 hr in hard water & 48.5 mg/L/96 hr in softwater. **Disposal:** A candidate for rotary kiln incineration at 1508 to 2912°F (820 to 1600°C), liquid injection incineration at 1202 to 2912°F (650 to 1600°C), and fluidized bed incineration at 842 to 1796°F (450 to 980°C). Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.21): No. D001
Listed as a SARA Toxic Chemical (40 CFR 372.65)
SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per CWA, Sec. 311 (b)(4) & CWA, Sec. 307 (a)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use a powered air-purifying respirator with an appropriate organic vapor cartridge, a supplied-air respirator (SAR), SCBA, or chemical cartridge respirator with appropriate organic vapor cartridge. For < 2000 ppm, use a SAR or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets made of Viton or polyvinylchloride to prevent skin contact. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in a cool, dry, well-ventilated area away from ignition sources and oxidizers. Outside or detatched storage is preferred. If inside, store in a standard flammable liquids cabinet. Containers should have flame-arrester or pressure-vacuum venting. To prevent static sparks, electrically ground and bond all equipment used with ethylbenzene. Install Class 1, Group D electrical equipment. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain levels as low as possible. Purge and ventilate reaction vessels before workers are allowed to enter for maintenance or cleanup. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers that emphasize the CNS, skin, blood, and respiratory system.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Ethylbenzene
DOT Hazard Class: 3
ID No.: UN1175
DOT Packing Group: II
DOT Label: Flammable liquid
Special Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 173.150
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger Aircraft or Railcar: 5L
b) Cargo Aircraft Only: 60 L

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: —

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 153, 159, 162, 163, 164, 167, 168, 171, 176, 179
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** D Wilson, CIH; **Medical Review:** W Silverman, MD

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Material Safety Data Sheets Collection:

Sheet No. 467
Automotive Gasoline, Lead-free

Issued: 10/81 Revision: A, 9/91

Section 1. Material Identification

35

Automotive Gasoline, Lead-free, Description: A mixture of volatile hydrocarbons composed mainly of branched-chain paraffins, cycloparaffins, olefins, naphthenes, and aromatics. In general, gasoline is produced from petroleum, shale oil, Athabasca tar sands, and coal. Motor gasolines are made chiefly by cracking processes, which convert heavier petroleum fractions into more volatile fractions by thermal or catalytic decomposition. Widely used as fuel in internal combustion engines of the spark-ignited, reciprocating type. Automotive gasoline has an octane number of approximately 90. A high content of aromatic hydrocarbons and a consequent high toxicity are also associated with a high octane rating. Some gasolines sold in the US contain a minor proportion of tetraethyllead, which is added in concentrations not exceeding 3 ml per gallon to prevent engine "knock." However, methyl-tert-butyl ether (MTBE) has almost completely replaced tetraethyllead.

Other Designations: CAS No. 8006-61-9, benzin, gasoline, gasolene, motor spirits, natural gasoline, petrol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

R 1
I 2
S 2*
K 4
* Skin absorption

NFPA
3
1 0
-

HMIS
H 2
F 3
R 1
PPG†
† Sec. 8

Cautions: Inhalation of automotive gasoline vapors can cause intense burning in throat and lungs, central nervous system (CNS) depression, and possible fatal pulmonary edema. Gasoline is a dangerous fire and explosion hazard when exposed to heat and flames.

Section 2. Ingredients and Occupational Exposure Limits

Automotive gasoline, lead-free*

1990 OSHA PELs
8-hr TWA: 300 ppm, 900 mg/m^3
15-min STEL: 500 ppm, 1500 mg/m^3

1990-91 ACGIH TLVs
TWA: 300 ppm, 890 mg/m^3
STEL: 500 ppm, 1480 mg/m^3

1990 NIOSH REL
None established

1985-86 Toxicity Data*
Man, inhalation, TC_{Lo}: 900 ppm/1 hr; toxic effects include sense organs and special senses (conjunctiva irritation), behavioral (hallucinations, distorted perceptions), lungs, thorax, or respiration (cough)
Human, eye: 140 ppm/8 hr; toxic effects include mild irritation
Rat, inhalation, LC_{50}: 300 g/m^3/5 min

* A typical modern gasoline composition is 80% paraffins, 14% aromatics, and 6% olefins. The mean benzene content is approximately 1%. Other additives include sulfur, phosphorus, and MTBE.
† See NIOSH, *RTECS* (LX3300000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: Initially, 102 °F (39 °C); after 10% distilled, 140 °F (60 °C); after 50% distilled, 230 °F (110 °C); after 90% distilled, 338 °F (170 °C); final boiling point, 399 °F (204 °C)
Vapor Density (air = 1): 3.0 to 4.0
Density/Specific Gravity: 0.72 to 0.76 at 60 °F (15.6 °C)
Water Solubility: Insoluble

Appearance and Odor: A clear (gasoline may be colored with dye), mobile liquid with a characteristic odor recognizable at about 10 ppm in air.

Section 4. Fire and Explosion Data

Flash Point: -45 °F (-43 °C)	**Autoignition Temperature:** 536 to 853 °F (280 to 456 °C)	**LEL:** 1.3% v/v	**UEL:** 6.0% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or alcohol foam as extinguishing media. Use of water may be ineffective to extinguish fire, but use water spray to knock down vapors and to cool fire-exposed drums and tanks to prevent pressure rupture. Do not use a solid stream of water since it may spread the fuel.

Unusual Fire or Explosion Hazards: Automobile gasoline is an OSHA Class IB flammable liquid and a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow to an ignition source and flash back. Automobile gasoline can also react violently with oxidizing agents.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective clothing. When the fire is extinguished, use nonsparking tools for cleanup. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Automotive gasoline is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Automotive gasoline can react with oxidizing materials such as peroxides, nitric acid, and perchlorates.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of automotive gasoline can produce oxides of carbon and partially oxidized hydrocarbons.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC list gasoline as a possible human carcinogen (Group 2B). Although the IARC has assigned an overall evaluation to gasoline, it has not assigned an overall evaluation to specific substances within this group (inadequate human evidence).
Summary of Risks: Gasoline vapors are considered moderately poisonous. Vapor inhalation can cause central nervous system (CNS) depression and mucous membrane and respiratory tract irritation. Brief inhalations of high concentrations can cause a fatal pulmonary edema. Reported responses to gasoline vapor concentrations are: 160 to 270 ppm causes eye and throat irritation in several hours; 500 to 900 ppm causes eye, nose, and throat irritation, and dizziness in 1 hr; and 2000 ppm produces mild anesthesia in 30 min. Higher concentrations are intoxicating in 4 to 10 minutes. If large areas of skin are exposed to gasoline, toxic amounts may be absorbed. Repeated or prolonged skin exposure causes dermatitis. Certain individuals may develop hypersensitivity. Ingestion can cause CNS depression. Pulmonary aspiration after ingestion can cause severe pneumonitis. In adults, ingestion of 20 to 50 g gasoline may produce severe symptoms of poisoning.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eye, respiratory and central nervous systems.
Primary Entry Routes: Inhalation, ingestion, skin contact.
Acute Effects: Acute inhalation produces intense nose, throat, and lung irritation; headaches; blurred vision; conjunctivitis; flushing of the face; mental confusion; staggering gait; slurred speech; and unconsciousness, sometimes with convulsions. Ingestion causes inebriation (drunkenness), vomiting, dizziness, fever, drowsiness, confusion, and cyanosis (a blue to dark purplish coloration of skin and mucous membrane caused by lack of oxygen). Aspiration causes choking, cough, shortness of breath, increased rate of respiration, excessively rapid heartbeat, fever, bronchitis, and pneumonitis. Other symptoms following acute exposure include acute hemorrhage of the pancreas, fatty degeneration of the liver and kidneys, and passive congestion of spleen.
Chronic Effects: Chronic inhalation results in appetite loss, nausea, weight loss, insomnia, and unusual sensitivity (hyperesthesia) of the distal extremities followed by motor weakness, muscular degeneration, and diminished tendon reflexes and coordination. Repeated skin exposure can cause blistering, drying, and lesions.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Give conscious victim a mixture of 2 tablespoons of activated charcoal mixed in 8 oz of water to drink. Consult a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Use nonsparking tools. Take up small spills with sand or other noncombustible adsorbent. Dike storage areas to control leaks and spills. Follow applicable OSHA regulations (29 CFR 1910.120).
Aquatic Toxicity: Bluegill, freshwater, LC_{50}, 8 ppm/96 hr.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.21): Characteristic of ignitability
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. There are no specific NIOSH recommendations. However, for vapor concentrations not immediately dangerous to life or health, use chemical cartridge respirator equipped with organic vapor cartridge(s), or a supplied-air respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Materials such as neoprene or polyvinyl alcohol provide excellent/good resistance for protective clothing. **Note:** Resistance of specific materials can vary from product to product.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, dry, well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. Avoid direct sunlight. Storage must meet requirements of OSHA Class IB liquid. Outside or detached storage preferred.
Engineering Controls: Avoid vapor inhalation and skin or eye contact. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Indoor use of this material requires explosion-proof exhaust ventilation to remove vapors. Only use gasoline as a fuel source due to its volatility and flammable/explosive nature. Practice good personal hygiene and housekeeping procedures. Wear clean work clothing daily.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Gasoline (*including casing-head and natural*)
DOT Hazard Class: Flammable liquid
ID No.: UN1203
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Gasoline
IMO Hazard Class: 3.1
ID No.: UN1203
IMO Label: Flammable liquid
IMDG Packaging Group: II

MSDS Collection **References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 140, 143, 146, 153, 159
Prepared by: M Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

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Material Safety Data Sheets Collection:

Sheet No. 713
Lead (Inorganic)

Issued: 8/90

Section 1. Material Identification

32

Lead (Inorganic) (Pb) Description: Exists widely throughout the world in a number of ores. Its main commercial source is galena (lead sulphide). Lead mineral is separated from crude ores by blast-furnace smelting, drossing, or electrolytic refining. Lead is used mostly in manufacturing storage batteries. Other uses are in manufacturing tetraethyllead and both organic and inorganic lead compounds in ceramics, plastics, and electronic devices; in producing ammunition, solder, cable covering, sheet lead, and other metal products (brass, pipes, caulking); in metallurgy; in weights and as ballast; as a chemical intermediate for lead alkyls and pigments; as a constuction material for the tank linings, piping, and equipment used to handle the corrosive gases and liquids used in sulfuric acid manufacturing, petroleum refining, halogenation, sulfonation, extraction, and condensation; and for x-ray and atomic radiation protection.

Other Designations: CAS No. 7439-92-1, lead oxide; lead salts, inorganic; metallic lead; plumbum.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(73) for a suppliers list.

R	0
I	4
S	-
K	0

Genium

1 / 3 / 0 / -

HMIS
H 3
F 1
R 0
PPG*
* Sec. 8

Cautions: *Inorganic lead is a potent systemic poison.* Organic lead (for example, tetraethyl lead) has severe, but different, health effects. Occupational lead poisoning is due to inhalation of dust and fumes. Major affected organ systems are the nervous, blood, and reproductive systems, and kidneys. Health impairment or disease may result from a severe acute short- or long-term exposure.

Section 2. Ingredients and Occupational Exposure Limits

Lead (inorganic) fumes and dusts, as Pb, ca 100%

1989 OSHA PELs (Lead, inorganic compounds)
8-hr TWA: 50 µg/m³
Action Level TWA*: 30 µg/m³

29 CFR 1910.1025 Lead Standard
Blood Lead Level: 40 µg/100 g

1989-90 ACGIH TLV (Lead, inorganic, fumes and dusts)
TLV-TWA: 150 µg/m³

1988 NIOSH REL
10-hr TWA: <100 µg/m³

1985-86 Toxicity Data†
Human, inhalation, TC_{Lo}: 10 µg/m³ affects gastrointestinal tract and liver
Human, oral, TD_{Lo}: 450 mg/kg ingested over 6 yr affects peripheral and central nervous systems
Rat, oral, TD_{Lo}: 790 mg/kg affects multigeneration reproduction

* Action level applies to employee exposure without regard to respirator use.
† See NIOSH. *RTECS* (OF7525000), for additional mutative, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 3164 °F (1740 °C)
Melting Point: 621.3 °F (327.4 °C)
Vapor Pressure: 1.77 mm Hg at 1832 °F (1000 °C)
Viscosity: 3.2 cp at 621.3 °F (327.4 °C)
Molecular Weight: 207.20
Specific Gravity (20 °C/4 °C): 11.34
Water Solubility: Relatively insoluble in hot or cold water*

Appearance and Odor: Bluish-white, silvery, gray, very soft metal.

* Lead dissolves more easily at a low pH.

Section 4. Fire and Explosion Data

Flash Point: None reported	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported

Extinguishing Media: Use dry chemical, carbon dioxide, water spray, or foam to extinguish fire.
Unusual Fire or Explosion Hazards: Flammable and moderately explosive in the form of dust when exposed to heat or flame.
Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Lead is stable at room temperature in closed containers under normal storage and handling conditions. It tarnishes on exposure to air. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Mixtures of hydrogen peroxide + trioxane explode on contact with lead. Lead is incompatible with sodium azide, zirconium, disodium acetylide, and oxidants. A violent reaction on ignition may occur with concentrated hydrogen peroxide, chlorine trifluoride, sodium acetylide (with powdered lead), ammonium nitrate (below 200 °C with powdered lead). Lead is attacked by pure water and weak organic acids in the presence of oxygen. Lead is resistant to tap water, hydrofluoric acid, brine, and solvents.
Conditions to Avoid: Rubber gloves containing lead may ignite in nitric acid.
Hazardous Products of Decomposition: Thermal oxidative decomposition of lead can produce highly toxic fumes of lead.

Section 6. Health Hazard Data

Carcinogenicity: Although the NTP and OSHA do not list lead as a carcinogen, the IARC lists it as probably carcinogenic to humans, but having (usually) no human evidence. However, the literature reports instances of lead-induced neoplasms, both benign and malignant, of the kidney and other organs in laboratory rodents. Excessive exposure to lead has resulted in neurologic disorders in infants. Experimental studies show lead has reproductive and teratogenic effects in laboratory animals. Human male and female reproductive effects are also documented.
Summary of Risks: Lead is a potent, systemic poison that affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal (GI) system. The most important way lead enters the body is through inhalation, but it can also be ingested when lead dust or unwashed hands contaminate food, drink, or cigarettes. Much of ingested lead passes through feces without absorption into the body. Adults may absorb only 5 to 15% of ingested lead; children may absorb a much larger fraction. Once in the body, lead enters the bloodstream and circulates to various organs. Lead concentrates and remains in bone for many years. The amount of lead the body stores increases as exposure continues, with possibly cumulative effects. Depending on the dose entering the body, lead can be deadly within several days or affect health after many years. Very high doses can cause brain damage (encephalopathy).
Medical Conditions Aggravated by Exposure: Lead may aggravate nervous system disorders (e.g., epilepsy, neuropathies), kidney diseases, high blood pressure (hypertension), infertility, and anemia. Lead-induced anemia and its effect on blood presssure can aggravate cardiovascular disease.

Continue on next page

Section 6. Health Hazard Data, *continued*

Target Organs: Blood, central and peripheral nervous systems, kidneys, and gastrointestinal (GI) tract.
Primary Entry Routes: Inhalation, ingestion.
Acute Effects: An acute, short-term dose of lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are rare. Reversible kidney damage can occur from acute exposure, as well as anemia.
Chronic Effects: Symptoms of chronic long-term overexposure include appetite loss, nausea, metallic taste in the mouth, lead line on gingival (gum) tissue, constipation, anxiety, anemia, pallor of the face and the eye grounds, excessive tiredness, weakness, insomnia, headache, nervous irritability, fine tremors, numbness, muscle and joint pain, and colic accompanied by severe abdominal pain. Paralysis of wrist and, less often, ankle extensor muscles may occur after years of increased lead absorption. Kidney disease may also result from chronic overexposure, but few, if any, symptoms appear until severe kidney damage has occurred. Reproductive damage is characterized by decreased sex drive, impotence, and sterility in men; and decreased fertility, abnormal menstrual cycles, and miscarriages in women. Unborn children may suffer neurologic damage or developmental problems due to excessive lead exposure in pregnant women. Lead poisoning's severest result is encephalopathy manifested by severe headache, convulsions, coma, delirium, and possibly death.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Consult a physician if any health complaints develop.
Inhalation: Remove exposed person to fresh air and support breathing as needed. Consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If large amounts of lead were ingested, induce vomiting with Ipecac syrup. Consult a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: For diagnosis, obtain blood pressure, blood lead level (PbB), zinc protoporphyrin (ZPP), complete blood count for microcytic anemia and basophilic stippling, urinalysis, and blood urea nitrogen (BUN) of creatinine. Examine peripheral motor neuropathy, pallor, and gingival lead line. Use Ca-EDTA to treat poison, but *never* chelate prophylactically. Consult an occupational physician or toxicologist.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel and evacuate all unnecessary personnel immediately. Cleanup personnel should protect against inhalation of dusts or fume and contact with skin or eyes. Avoid creating dusty conditions. Water sprays may be used in large quantities to prevent the formation of dust. Cleanup methods such as vacuuming (with an appropriate filter) or wet mopping minimizes dust dispersion. Scoop the spilled material into closed containers for disposal or reclamation. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.33, Appendix II—EP Toxicity Test Procedures)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [* per Clean Water Act, Sec. 307(a)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact. Protective clothing made of man-made fibers and lacking turn-ups, pleats, or pockets retain less dust from lead.
Ventilation: Provide general and local ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially washing hands before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all incompatible materials, direct sunlight, and heat and ignition sources.
Engineering Controls: Educate worker about lead's hazards. Follow and inform employees of the lead standard (29 CFR 1910.1025). Avoid inhalation of lead dust and fumes and ingestion of lead. Use only with appropriate personal protective gear and adequate ventilation. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Avoid creating dusty conditions. Segregate and launder contaminated clothing. Take precautions to protect laundry personnel. Practice good personal hygiene and housekeeping procedures. For a variety of reasons, the lead concentration in workroom air may not correlate with the blood lead levels in individuals.
Other Precautions: Provide preplacement and periodic medical examinations which emphasize blood, nervous system, gastrointestinal tract, and kidneys, including a complete blood count and urinalysis. Receive a complete history including previous surgeries and hospitalization, allergies, smoking history, alcohol consumption, proprietary drug intake, and occupational and nonoccupational lead exposure. Maintain records for medical surveillance, airborne exposure monitoring, employee complaints, and physician's written opinions for at least 40 years or duration of employment plus 20 years. Measurement of blood lead level (PbB) and zinc protoporphyrin (ZPP) are useful indicators of your body's lead absorption level. Maintain worker PbBs at or below 40 μg/100 g of whole blood. To minimize adverse reproductive health effects to parents and developing fetus, maintain the PbBs of workers intending to have children below 30 μg/100 g. Elevated PbBs increase your risk of disease, and the longer you have elevated PbBs, the greater your chance of substantial permanent damage.

Transportation Data (49 CFR 172.102)

IMO Shipping Name: Lead compounds, soluble, n.o.s.
IMO Hazard Class: 6.1
ID No.: UN2291
IMO Label: St. Andrews Cross (X, Stow away from foodstuffs)
IMDG Packaging Group: III

MSDS Collection **References:** 26, 38, 73, 84, 85, 88, 89, 90, 100, 101, 103, 109, 124, 126, 132, 133, 134, 136, 138, 139, 142, 143
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Upfal, MD, MPH; **Edited by:** JR Stuart, MS

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Schenectady, NY 12304-4690 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 440
Methane

Issued: 7/80 Revision: A, 8/89

Section 1. Material Identification

29

Methane Description: Widely distributed in nature, methane comprises 0.00022% by volume of the earth's atmosphere. American natural gas is mostly methane (85%). At temperatures greater than 2012 °F (1100 °C), pure carbon combines with pure hydrogen to form methane. Above 2732 °F (1500 °C), the amount of methane produced increases with temperature. Obtained from sodium acetate and sodium hydroxide or from aluminum carbide and water. Commercially prepared from natural gas or by fermentation of cellulose and sewage sludge. Constituent of illuminating and cooking gas. Used in the manufacture of hydrogen, hydrogen cyanide, ammonia, acetylene, formaldehyde, and many other organics.
Other Designations: Fire damp; marsh gas; methyl hydride; CH_4; CAS No. 0074-82-8.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

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HMIS
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PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Methane, ca 100%*

OSHA PEL	ACGIH TLV, 1988-89	NIOSH REL	Toxicity Data†
None established	None established	None established	Not listed

* Check with your supplier to determine the exact composition of the purchased methane. Possible contaminants are ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), higher molecular weight alkanes, carbon dioxide (CO_2), nitrogen (N_2), and oxygen(O_2).
† Monitor NIOSH, *RTECS* (PA1490000), for future toxicity data.

Section 3. Physical Data

Boiling Point: -259 °F (161.6 °C)
Vapor Density (Air = 1): 0.544 at 32 °F (0 °C)
Molecular Weight: 16 g/mol
Water Solubility: Slight*
Melting Point: -296.5 °F (-182.5 °C)

Appearance and Odor: A colorless, odorless, tasteless, extremely flammable gas. Commercial methane's trace amounts of a suitable mercaptan compound give it natural gas's familiar rotten egg smell.

*Soluble in alcohol and ether.

Section 4. Fire and Explosion Data

Flash Point: -213 °F (-136.11 °C)	Autoignition Temperature: 999 °F (537 °C)	LEL: 5% v/v*	UEL: 15% v/v*

Extinguishing Media: Methane's extreme flammability, extensive explosibility range, and very low flash point represent dangerous fire and explosion risks. *Treat any fire situation involving rapidly escaping and burning methane gas as an emergency.* Extinguish methane fires by shutting off the source of the gas. Use water sprays to cool fire-exposed containers and to protect the personnel attempting to seal the source of the escaping gas.
Unusual Fire or Explosion Hazards: Methane gas is very flammable with an extensive explosibility range. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipelines. Never extinguish the burning gas without first locating and sealing its source. Otherwise, the still leaking gas could explosively re-ignite without warning and cause more damage than if it burned itself out.
Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

* The loudest methane-air explosions occur when 1 volume of methane is mixed with 10 volumes of air (or 2 volumes of oxygen). **Warning:** Air with more than 14% by volume methane burns *noiselessly.* Methane burns with a pale, faintly luminous, not always easily detected flame.

Section 5. Reactivity Data

Stability/Polymerization: Methane is stable at room temperature in closed, pressurized containers during routine operations. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Genium reference 84 reports that methane can react violently with bromine pentafluoride, chlorine, chlorine dioxide, nitrogen trifluoride, liquid oxygen, and oxygen difluoride.
Conditions to Avoid: Never expose methane to ignition sources such as open flame, lighted cigarettes or pipes, uninsulated heating elements, or electrical or mechanical sparks. Prevent any accidental or uncontrollably rapid release of methane gas from high-pressure cylinders, tank cars, or pipelines.
Hazardous Products of Decomposition: Thermal oxidative degradation of methane can produce carbon dioxide and toxic carbon monoxide (CO).

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists methane as a carcinogen. **Summary of Risks:** As a simple asphyxiant, methane does not cause significant physiological responses, but it can displace the minimum required atmospheric oxygen level. Significant displacement results in an oxygen-deficient atmosphere with no adequate warning properties. Asphyxiation can occur especially in confined, poorly ventilated, undisturbed spaces infrequently entered by workers. Frostbite (cryogenic damage) can result from contact with liquid methane's extremely low temperature. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** None reported. **Primary Entry:** Inhalation. **Acute Effects:** The initial symptoms of simple asphyxiant gases's effects are rapid respiration and air hunger, diminished mental alertness, and impaired muscular coordination. Continuing lack of oxygen causes faulty judgement, depression of all sensations, rapid fatique, emotional instability, nausea, vomiting, prostration, unconsciousness, and finally, convulsions, coma, and death. **Chronic Effects:** None reported.

FIRST AID

Skin: (Liquid methane): Promptly flush the affected area with lots of tepid/lukewarm water to reduce freezing of tissues. Never apply direct heat to frostbitten areas. Loosely apply dry, bulky dressings to protect the area from further injury. Get treatment from qualified medical personnel. **Inhalation:** Rescuers must consider their own safety when entering confined, poorly ventilated, oxygen-deficient areas. Self-contained breathing equipment must be readily available. Rescuers must use nonsparking tools and equipment; e.g., floodlights lowered into any incident area must be electrically grounded and bonded, shatter-resistant, and sparkproof. **After first aid, get appropriate in-plant, paramedic, or community medical attention and support for inhalation exposures in oxygen-deficient atmospheres.** Seek prompt medical assistance for further observation and treatment.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a methane spill control and countermeasure plan (SCCP).* When a leak occurs, notify safety personnel, eliminate heat and ignition sources, evacuate unnecessary personnel, provide maximum explosion-proof ventilation, and implement the SCCP. Use only nonsparking tools and equipment. Locate and seal the source of the leaking gas. Use water sprays to protect the personnel attempting this shutoff. Large methane releases can result in spectacular explosions. If attempts to shut off the leaking gas are unsuccessful, evacuate the likely explosion area. **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Remove leaking or defective cylinders to a safe, outside, posted, discharge location. Let the methane gas discharge at a moderate rate. When it is empty, return the cylinder to the supplier after it is properly tagged, labelled, or stenciled MT (empty) or defective.

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). **Gloves:** To prevent skin contact, workers handling liquid methane should wear appropriate insulating gloves, safety glasses, and splash aprons, as required by the particular work conditions. **Respirator:** Wear a NIOSH-approved respirator if necessary. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres; use self-contained breathing equipment there. **Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the 5% v/v LEL (Sec. 4). Local exhaust ventilation is preferred since it prevents methane dispersion into the work area by eliminating it at its source (Genium ref. 103). Give special attention to proper ventilation of enclosed areas. **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, washing facilities, fire extinguishers, and oxygen bottles for emergency first-aid. **Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment. **Other:** If appropriate, consider installing automatic sensing equipment that warns workers of oxygen-deficient atmospheres or of potentially explosive air-gas mixtures. All engineering systems in any methane gas storage, handling, or processing area must be explosion-proof so they have no spark potential or hot spots. Pressurized systems must use only approved valves, manifolds, flanges, and flame arrestors. **Comments:** Methane gas presents dangerous fire, explosion, and reactivity risks. Regularly inspect and service all the piping systems which transport methane gas in production and storage areas. Before use, thoroughly test methane lines with nitrogen gas for leaking, especially in enclosed areas.

Section 9. Special Precautions and Comments

Storage Requirements: Store methane in closed, pressurized cylinders, tank cars, pipelines, or other containers in a cool, dry, well-ventilated, fireproof area away from heat and ignition sources and incompatible chemicals (Sec. 5). Protect these containers from physical damage and heat. Shield them from direct sunlight. **Special Handling/Storage:** Electrically ground and bond all containers, tanks, cylinders, tank cars and pipelines used in methane shipping, receiving, or transferring operations. Never smoke in any work area where the possibility of exposure to methane gas (fire hazard) exits. Recommended storage containers include steel.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Methane
DOT Hazard Class: Flammable gas
DOT ID No. : UN1971
DOT Label: Flammable gas
DOT Packaging Requirements: 49 CFR 173.302
DOT Packaging Exceptions: 49 CFR 173.306

IMO Shipping Name: Methane, compressed
IMO Hazard Class: 2.1
IMO Label: Flammable gas

MSDS Collection **References:** 1, 6, 7, 84-94, 100, 116, 117, 119, 120, 122

Prepared by: PJ Igoe, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Hardies, MD

F8

MACE SECURITY INTERNATIONAL -- CS MACE

MATERIAL SAFETY DATA SHEET

Part No. Indicator: A

Part Number/Trade Name: CS MACE

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General Information

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Company's Name: MACE SECURITY INTERNATIONAL

Company's Street: 160 BENMONT AVE

Company's City: BENNINGTON

Company's State: VT

Company's Country: US

Company's Zip Code: 05201-5000

Company's Emerg Ph #: 802-447-1503

Company's Info Ph #: 802-447-1503

Record No. For Safety Entry: 001

Tot Safety Entries This Stk#: 001

Status: SE

Date MSDS Prepared: 25FEB94

Safety Data Review Date: 06OCT94

MSDS Preparer's Name: BERNIE GRANEY

Preparer's Company: MACE SECURITY INTERNATIONAL

Preparer's St Or P. O. Box: 160 BENMONT AVE

Preparer's City: BENNINGTON

Preparer's State: VT

Preparer's Zip Code: 05201-5000

MSDS Serial Number: BVSKV

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Ingredients/Identity Information

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Proprietary: NO

Ingredient: O-CHLOROBENZYLIDENE MALONONITRILE

Ingredient Sequence Number: 01

Percent: 2

NIOSH (RTECS) Number: OO3675000

CAS Number: 2698-41-1

OSHA PEL: 0.05 PPM

ACGIH TLV: C 0.39 MG/CUM

Other Recommended Limit: 0.05 PPM

Proprietary: NO

Ingredient: SEC-BUTANOL ALCOHOL

Ingredient Sequence Number: 02

Percent: 20

NIOSH (RTECS) Number: EO1750000

CAS Number: 78-92-2

OSHA PEL: 100 PPM

ACGIH TLV: 100 PPM

Other Recommended Limit: 100 PPM

Proprietary: NO

Ingredient: 1,2-PROPANEDIOL (PROPYLENE GLYCOL)

Ingredient Sequence Number: 03

Percent: 20

NIOSH (RTECS) Number: TY2000000

CAS Number: 57-55-6

Proprietary: NO

Ingredient: CARVENE; CYCLOHEXENE, 1-METHYL-4-(1-METHYLETHENYL), CITRUS TERPENE, D-LIMONENE, P-MENTHADIENE

Ingredient Sequence Number: 04

Percent: 20

NIOSH (RTECS) Number: GW6360000

CAS Number: 5989-27-5

Proprietary: NO

Ingredient: DIPROPYLENE GLYCOL METHYL ETHER, DOWANOL DPM, DIPROPYLENE GLYCOL MONOMETHYL ETHER

Ingredient Sequence Number: 05

Percent: 30

NIOSH (RTECS) Number: JM1575000

CAS Number: 34590-94-8

OSHA PEL: 100 PPM SKIN

ACGIH TLV: 100 PPM

Other Recommended Limit: 100 PPM

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Physical/Chemical Characteristics

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Appearance And Odor: CLEAR AMBER LIQUID W/AROMATIC ODOR.

Boiling Point: 211-370F

Specific Gravity: 1.07

Solubility In Water: SLIGHT

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Fire and Explosion Hazard Data

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Flash Point: 110F

Flash Point Method: CC

Extinguishing Media: DRY CHEMICAL, CO2/WATER SPRAY

Special Fire Fighting Proc: COOL CONTAINERS IF EXPOSED TO FIRE/HIGH HEAT.

Unusual Fire And Expl Hazrds: PRODUCT PACKAGED IN AEROSOL FORM MAY CAUSE CONTAINERS TO BURST WHEN EXPOSED TO EXTREME HEAT. VAPORS ARE >AIR & MAY TRAVEL ALONG GROUND & BE IGNITED BY IGNITION.

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Reactivity Data

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Stability: YES

Cond To Avoid (Stability): EXTREME HEAT, TEMPS >175F

Hazardous Decomp Products: CO2, CO, VARIOUS HYDROCARBONS, SMALL AMOUNTS OF PHOSGENE.

Hazardous Poly Occur: NO

Conditions To Avoid (Poly): EXTREME HEAT, TEMPS >175F.

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Health Hazard Data

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Route Of Entry - Inhalation: YES

Route Of Entry - Skin: YES

Route Of Entry - Ingestion: YES

Health Haz Acute And Chronic: INHALATION: IRRITATION/BURNING SENSATION TO LUNGS & RESPIRATORY SYSTEM. EYES: IRRITATION/BURNING SENSATION. MAY CAUSE SUPERFICIAL KERATITIS & CONJUNCTIVITIS. SKIN: LIQUID CAN CAUSE IRRITATION/ ABSORPTION. INGESTION: LIQUID MAY CAUSE IRRITATION/BURNING SENSATION TO DIGESTIVE SYSTEM.

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NONE

Signs/Symptoms Of Overexp: IRRITATION, BURNING SENSATION, DIZZINESS, NAUSEA

Emergency/First Aid Proc: INHALATION: REMOVE TO FRESH AIR. IF BREATHING IS DIFFICULT, ADMINISTER OXYGEN/CPR IF NECESSARY. EYES: FLUSH W/ COOL WATER FOR 15 MINS. SKIN: WASH W/COOL WATER & SOAP. INGESTION: DRINK A GLASS OF WATER & INDUCE VOMITING. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EXTINGUISH ALL FLAMES, THEN SOAK UP MATERIAL IN ABSORBANT MATERIAL & SHOVEL INTO WASTE CONTAINER.

Waste Disposal Method: DISPOSE OF IN ACCORDANCE W/LOCAL, STATE & FEDERAL REGULATIONS. UN1950.

Precautions-Handling/Storing: PACKAGED PRODUCT IS UNDER PRESSURE. DON'T PUNCTURE, INCINERATE/STORE AT TEMPERATURES >130F.

Other Precautions: STRONGLY IRRITATING TO EYES, NOSE & SKIN. AVOID INHALING VAPORS & CONTACT W/SKIN. AVOID ABSORPTION OF PRODUCT ON CLOTHING.

Control Measures

Respiratory Protection: CHEMICAL RESPIRATOR, NIOSH APPROVED.

Protective Gloves: SOLVENT RESISTANT RUBBER

Eye Protection: CHEMICAL RESISTANT GOGGLES

Other Protective Equipment: SOLVENT RESISTANT TYPE CLOTHING W/FULL JACKET.

Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.

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Transportation Data

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Disposal Data

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Label Data

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Label Required: YES

Label Status: G

Common Name: CS MACE

Special Hazard Precautions: INHALATION: IRRITATION/BURNING SENSATION TO LUNGS & RESPIRATORY SYSTEM. EYES: IRRITATION/BURNING SENSATION. MAY CAUSE SUPERFICIAL KERATITIS & CONJUNCTIVITIS. SKIN: LIQUID CAN CAUSE IRRITATION/ ABSORPTION. INGESTION: LIQUID MAY CAUSE IRRITATION/BURNING SENSATION TO DIGESTIVE SYSTEM. IRRITATION, BURNING SENSATION, DIZZINESS, NAUSEA

Label Name: MACE SECURITY INTERNATIONAL

Label Street: 160 BENMONT AVE

Label City: BENNINGTON

Label State: VT

Label Zip Code: 05201-5000

Label Country: US

Label Emergency Number: 802-447-1503

URL for this msds http://hazard.com If you wish to update, add to, or delete information on your products please email data to dan@hazard.com.

RADIONUCLIDES

FACT SHEET

See related Fact Sheets: Acronyms & Abbreviations; Glossary of Terms; Cost Assumptions; Raw Water Composition; Total Plant Costs; and WaTER Program.

1. CONTAMINANT DATA

A. Chemical Data: Radioactive elements are often called radioactive isotopes or radionuclides. Radionuclides emit radiant atomic energy caused by the spontaneous disintegration of the nuclei of their atoms, resulting in radioactive particles or decay products that are members of the radioactive elements. As radionuclides decay, they emit ionizing radiation in the form of alpha (α) or beta (β) particles and gamma (γ) photons. Alpha particles are relatively massive and easy to stop. They typically travel 100 µm into tissue while beta particles may travel several centimeters. Gamma rays, having no charge or mass, are simply a form of electromagnetic radiation, that travel at the speed of light. Gamma rays have short wavelengths and therefore are capable of causing ionizations; as such they are biologically damaging. Generally, the soluble radionuclides of concern in water include: Radon (Rn), atomic number 86, atomic weight 222, a gas; Uranium (U), atomic number 92, atomic weight 238.03, a metal; and combined Radium-226/228 (Radium (Ra), atomic number 88, atomic weight 226.03, a metal). The three forms of radioactivity, α, β, and γ are also a concern.

B. Source in Nature: Radionuclides are both natural and man-made and are found in air, water, soil, plants, and the human body. Rn gas is especially widespread in soils, rocks, and granite, and is created by the decay of the U and Ra series. Several small sources of radiation exist in the home and persons in many occupations encounter radiation. Medical uses for radiation include therapy and diagnosis. This Fact Sheet is concerned with the soluble natural radionuclides found in water. Radionuclides in water are ingested by either drinking contaminated water or eating food that has been washed in the water. In the case of Rn, exposure occurs from inhalation of the gas or decay products released from water during household use. Higher levels of Rn are generally found in groundwater rather than surface water.

C. SDWA Limits (currently under review): Current or proposed limits include: Rn=300 pCi/L; U=0.02 pCi/L; Alpha Emitters (including Radium-226 but excluding Rn and U)=15 pCi/L; Beta/Photon Emitters=4 mrem/yr; and combined Radium-226/228=5 pCi/L. When finalized, the Radionuclide Rule will exclude Rn and U, which will have their own individual standards.

USEPA is scheduled to propose revised standard for Rn by 8/1/1999 and promulgate final rule by 8/1/2001; and promulgate final rules for U and the complete Radionuclides Rule by 8/1/2000.

D. Health Effects of Contamination: Radionuclides are known human carcinogens. All three forms of radiation are dangerous to living things. Rn is associated with lung cancer; Radium-226 is associated with bone sarcomas and head carcinomas; and Radium-228 is associated with bone sarcomas. Other health effects include kidney damage and birth defects. Low level exposures can cause somatic and/or genetic defects. Somatic defects may include a higher risk of cancer, sterility, cataracts, or reduced life span. Genetic defects may include chromosome damage.

Protection against the three forms of radiation differ significantly. Our skin is sufficient protection for α emitters external to the body, however taken internally, such as inhalation, α particles can be extremely dangerous. Beta particles can be stopped with shielding (i.e. 1 cm of aluminum). Gamma rays may require several centimeters of lead to provide adequate shielding.

2. REMOVAL TECHNIQUES

A. USEPA BAT (currently under review):

BAT Radionuclide	AS	GAC	IX	RO	Lime softening	Coagulation & filtration
Rn	X	X				
U			anion	X	X	X
α				X		
β			mixed bed	X		
Ra			cation	X	X	

! AS use towers filled with material, whereby water enters the top of the tower, is sprayed over the material exposing a thin layer of water to countercurrent air being blown in at the bottom. The process allows for mass transfer of the Rn from water into air. AS off-gas is either discharged to the atmosphere or treated by vapor phase GAC. Benefits: removal efficiencies greater than 99.9%; best suited large installations. Limitations: risks associated with off-gassed Rn; requires ample space; requires careful monitoring.

! GAC uses extremely porous carbon media in a process known as adsorption. As water passes through the media, the dissolved contaminants are attracted and held (adsorbed) on the solid surface. Benefits: well established; suitable for home use. Limitations: too expensive for large systems; less effective than aeration; requires careful monitoring. GAC cost curves will be included in a future revision.

! IX uses selectively charged resins to exchange acceptable ions from the resin for radionuclides in the water. Benefits: effective; well developed. Limitations: restocking of salt supply; regular regeneration; concentrate disposal.

! RO uses a semipermeable membrane, and the application of pressure to a concentrated solution which causes water, but not suspended or dissolved solids (radionuclides), to pass through the membrane. Benefits: produces high quality water. Limitations: cost; pretreatment/feed pump requirements; concentrate disposal.

! Lime softening uses $Ca(OH)_2$ in sufficient quantity to raise the pH to about 10 to precipitate carbonate hardness and heavy metals, like Ra. Benefits: lower capital costs; proven and reliable. Limitations: operator care required with chemical usage; sludge disposal.

! Coagulation and filtration uses the conventional treatment processes of chemical addition, coagulation, and dual media filtration. Benefits: low capital costs for proven, reliable process. Limitations: operator care required with chemical usage; sludge disposal.

B. Alternative Methods of Treatment: Distillation heats water until it turns to steam. The steam travels through a condenser coil where it is cooled and returned to liquid. The dissolved solids (radionuclides) remain in the boiler section. Distillation is not effective for Rn gas.

C. Safety and Health Requirements for Treatment Processes: Personnel involved with demineralization treatment processes should be aware of the chemicals being used (MSDS information), the electrical shock hazards, and the hydraulic pressures required to operate the equipment. General industry safety, health, and self protection practices should be followed, including proper use of tools.

3. BAT PROCESS DESCRIPTION AND COST DATA

General Assumptions: Refer to: Raw Water Composition Fact Sheet for ionic concentrations; and Cost Assumptions Fact Sheet for cost index data and process assumptions. All costs are based on *ENR*, PPI, and BLS cost indices for March 2001. General sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal are not included.

3A. Air Stripping for Rn Removal:

Process - AS is a physical separation process. Packed tower AS may use a tall, cylindrical tower filled with packing material. Water enters the top of the tower and is sprayed over the packing material exposing a thin layer of water to the countercurrent air being blown in at the bottom of the tower. The process maximizes the surface area of the water and allows for mass transfer of the Rn from water into air. Maximum volatilization occurs when the water is evenly distributed and the countercurrent air is evenly applied, even when a load change occurs. Treated water exits the bottom of the tower, while air containing the volatilized contaminants is vented to atmosphere or treated by vapor phase GAC. Air emissions above Clean Air Act standards must be treated prior to release. A variety of packing materials are available, or plastic elements may be used in place of packing material. Auxiliary equipment can include: automated controls and level switches or safety features such as differential pressure monitors. Alternate types of ASs include: aeration tanks, spray aeration, shallow trays, columns filled with chemical resistant ellipsoids, or cascade-type internal components.

Vapor phase GAC is similar to liquid phase GAC. It uses extremely porous carbon media in a process known as adsorption. As air passes through the highly porous media which has an extremely high surface area for adsorption, the volatilized contaminants adsorb on the solid surface. The treated air is discharged directly to the atmosphere. Careful selection of type of carbon to be used is based on the contaminants in the air, and manufacturer's recommendations.

Pretreatment - Chlorination and dechlorination for routine cleaning of scale, slime, and clogging may be required. With high TSS waters, prefiltration may be required.

Posttreatment - Postdisinfection of AS effluent may be required. Polishing of AS off-gas may be required.

Maintenance - Careful monitoring and testing to ensure contaminant removal. Packed tower ASs are subject to chemical/physical scaling of the equipment as a result of hardness or sliming of the packing material due biological growth. Regular replacement of vapor phase carbon media is required and is based on contaminant type, concentration, rate of water usage, and type of carbon used.

Waste Disposal - When large amounts of raw water with high levels of radioactive materials are treated for sufficiently long periods of time, the waste products can become radioactive enough to cause concern about safe and legal disposal. Waste products (i.e. GAC and cleaning solutions) require disposal in accordance with local or state regulations. The USEPA guidance entitled *Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Radioactivity*, dated June 1994, provides disposal information. Costs associated with waste disposal should be considered significant.

Advantages -
! Well established.
! Rn readily escapes from water into air.
! Low air/water ratios are sufficient which leads to lower O&M requirements and costs.
! Packed towers are more effective, but tray configurations are less susceptible to fouling and are easier to clean.

Disadvantages -
! Requires design by knowledgeable, experienced individual with specifics on water flow rate, air-to-water ratio, influent concentrations, water temperature, and atmospheric pressure. Design is based on Henry's Law Constant, which describes the relation between the distribution of a substance in the liquid and the gas phases where ideal conditions exist. Computer programs are available to assist with modeling, and most manufacturer's have programs for modeling their specific equipment.
! Risks associated with the off-gassed Rn.
! Fouling potential from the precipitation of Mn and Fe oxides.
! Risks of increases of Pb and Cu in some tap water due to increases in corrosivity of treated water.

Costs - The application of AS is extremely site specific. The costs of the equipment and operation and maintenance are based on the site specific organics and Rn concentrations. Because the organics and Rn concentrations vary greatly from location to location, a typical raw water analysis on which to base generic costs is impractical. For these reasons generic costs are not provided.

3B. Granular Activated Carbon for Rn Removal:

Process - GAC uses extremely porous carbon media in a process known as adsorption. As water passes through the highly porous media which has an extremely high surface area for adsorption, the dissolved contaminants adsorb on the solid surface. GAC is made of tiny clusters of carbon atoms stacked upon one another. The carbon media is produced by heating the carbon source (generally activated charcoal) in the absence of air to produce a high carbon material. The carbon media is activated by passing oxidizing gases through the material at extremely high temperatures. The activation process produces the pores that result in such high adsorption properties. The adsorption process depends on the following factors: 1) physical properties of the GAC, such as type of raw carbon, method of activation, pore size distribution, and surface area; 2) the chemical/electrical nature of the carbon source or method of activation, and the amount of oxygen and hydrogen associated with them, such that as the carbon surfaces become filled the more actively adsorbed contaminants will displace the less actively adsorbed ones; 3) chemical composition and concentration of contaminants, such as size, similarity, and concentration; 4) the temperature and pH of the water, adsorption usually increases as temperature and pH decrease; and 5) the flowrate and exposure time to the GAC, in that low contaminant concentration and flowrate with extended contact times increase the carbon's life. GAC devices include: pour-through for treating small volumes; faucet-mounted (with or without by-pass) for single point use; in-line (with or without by-pass) for treating large volumes at several faucets; and high-volume commercial units for treating community water supply systems. Careful selection of type of carbon to be used is based on the contaminants in the water, and manufacturer's recommendations.

Pretreatment - With bacterially unstable waters, filtration and disinfection prior to carbon treatment may be required. With high TSS waters, prefiltration may be required.

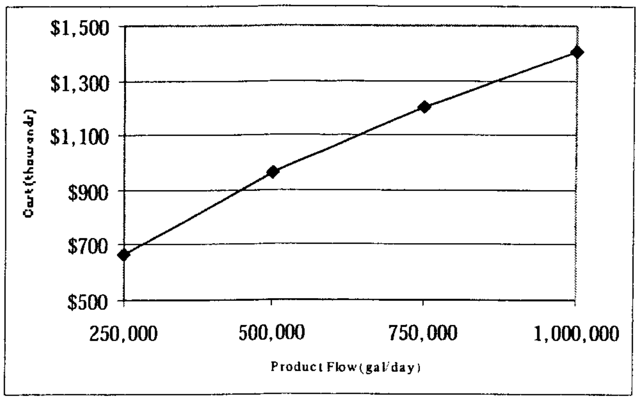
Maintenance - Careful monitoring and testing to ensure contaminant removal is required. Regular replacement of carbon media is required and is based on contaminant type, concentration, rate of water usage, and type of carbon used. The manufacturer's recommendations for media replacement should be consulted. Recharging by backwashing or flushing with hot water (145°F) may release the adsorbed Rn gas and any organic chemicals. With bacterially unstable waters, monitoring for bacterial growth is required because the adsorbed organic chemicals are a food source for some bacteria. Flushing is required if the carbon filter is not used for several days, and regular backwashing may be required to prevent bacterial growth. Perform system pressure and flowrate checks to verify backwashing capabilities. Perform routine maintenance checks of valves, pipes, and pumps.

Waste Disposal - When large amounts of raw water with high levels of radioactive materials are treated for sufficiently long periods of time, the waste products can become radioactive enough to cause concern about safe and legal disposal. Waste products (i.e. GAC, backwash water, and cleaning solutions) require disposal in accordance with local or state regulations. The USEPA guidance entitled *Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Radioactivity*, dated June 1994, provides disposal information. As a result of the wide variances in local and state laws, the costs presented below do not address waste disposal. However, costs associated with waste disposal should be considered significant. Disposal of spent GAC may be offered by the contractor providing the media replacement services.

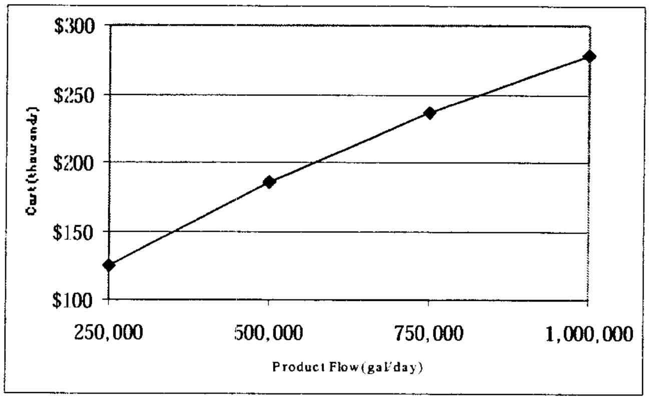
Advantages -
- ! Well established.
- ! Suitable for small systems, or even home use, providing disposal of spent carbon can be addressed.
- ! Typically inexpensive, with simple filter replacement requirements.
- ! Improves taste and smell; removes chlorine.

Disadvantages -
- ! Too expensive for large systems.
- ! Susceptible to sudden removal-efficiency drop-offs.
- ! Bacteria may grow on carbon surface.
- ! Adequate water flow and pressure required for backwashing/flushing.
- ! Requires careful monitoring and disposal of spent carbon.
- ! Less effective than aeration.

BAT Equipment Cost*



BAT Annual O&M Cost*



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal.

3C-a. Anion Ion Exchange for U Removal:

Process - Anion IX is a reversible chemical process in which ions from an insoluble, permanent, solid resin bed are exchanged for ions in water. The process relies on the fact that water solutions must be electrically neutral, therefore ions in the resin bed are exchanged with ions of similar charge in the water. As a result of the exchange process, no reduction in ions is obtained. IX operation for U removal begins with a fully recharged resin bed, having enough Cl^- or OH^- ions to carry out the anion exchange. Usually a polymer resin bed is composed of millions of medium sand grain size, spherical beads. As water passes through the resin bed, the negatively charged Cl^- or OH^- ions are released into the water, being substituted or replaced with the soluble, negatively charged U compounds in the water (ion exchange). When the resin becomes exhausted of Cl^- ions, the bed must be regenerated by passing a strong, usually NaCl (or KCl), solution over the resin bed, displacing the negatively charged U compounds with Cl^- ions. Current resins are not compound selective and may remove other anions before removing negatively charged U compounds. Therefore IX requires careful consideration of the raw water characteristics. Typically, IX for negatively charged U compounds utilizes a Cl^- or OH^- strongly basic anion resin bed.

Pretreatment - Guidelines are available on accepted limits for pH, organics, turbidity, and other raw water characteristics. Pretreatment may be required to reduce excessive amounts of TSS which could plug the resin bed, and typically includes media or carbon filtration.

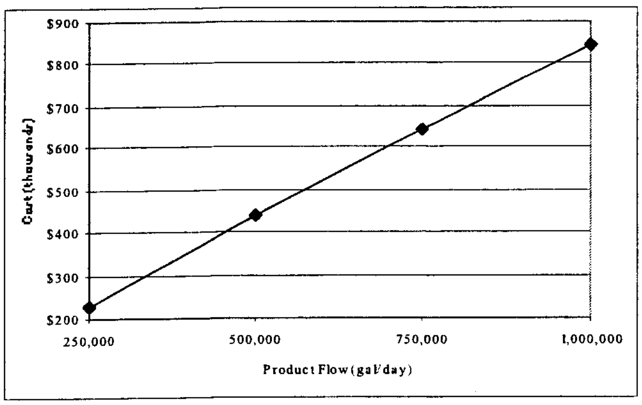
Maintenance - The IX resin requires regular regeneration, the frequency of which depends on raw water characteristics and the U concentration. Preparation of the NaCl solution is required. If utilized, filter replacement and backwashing will be required.

Waste Disposal - When large amounts of raw water with high levels of radioactive materials are treated for sufficiently long periods of time, the waste products can become radioactive enough to cause concern about safe and legal disposal. Waste products (i.e. resin, backwash water, and cleaning solutions) require disposal in accordance with local or state regulations. The USEPA guidance entitled *Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Radioactivity*, dated June 1994, provides disposal information. As a result of the wide variances in local and state laws, the costs presented below do not address waste disposal. However, costs associated with waste disposal should be considered significant.

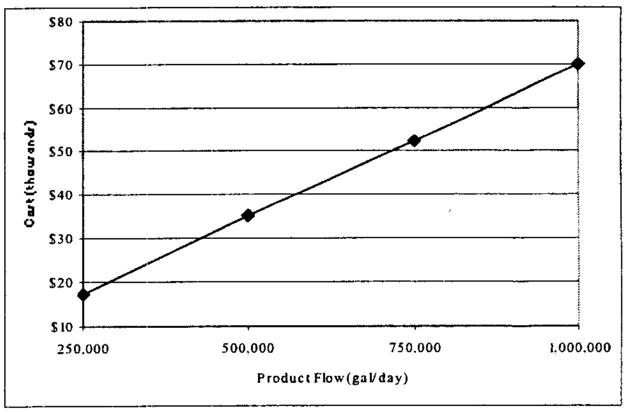
Advantages -
! Ease of operation; highly reliable.
! Lower initial cost; resins will not wear out with regular regeneration.
! Effective; widely used.
! Suitable for small and large installations.
! Variety of specific resins are available for removing specific contaminants.

Disadvantages -
! Requires salt storage.
! Strongly basic anion resins are susceptible to organic fouling; reduced life; thermodynamically unstable.
! Usually not feasible with high levels of TDS.
! Resins are sensitive to the presence of competing ions.

BAT Equipment Cost*



BAT Annual O&M Cost*



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal.

3C-b. Cation Ion Exchange for Ra Removal:
Process - Cation IX is a reversible chemical process in which ions from an insoluble, permanent, solid resin bed are exchanged for ions in water. The process relies on the fact that water solutions must be electrically neutral, therefore ions in the resin bed are exchanged with ions of similar charge in the water. As a result of the exchange process, no reduction in ions is obtained. IX operation for Ra removal begins with a fully recharged resin bed, having enough Na^+ or K^+ ions to carry out the cation exchange. Usually a polymer resin bed is composed of millions of medium sand grain size, spherical beads. As water passes through the resin bed, the negatively charged Na^+ ions are released into the water, being substituted or replaced with the soluble, positively charged Ra compounds in the water (ion exchange). When the resin becomes exhausted of Na^+ ions, the bed must be regenerated by passing a strong, usually NaCl (or KCl), solution over the resin bed, displacing the positively charged Ra compounds with Na^+ ions. Current resins are not compound selective and may remove other cations before removing positively charged Ra compounds. Therefore IX requires careful consideration of the raw water characteristics. Typically, IX for positively charged Ra compounds utilizes a Cl^- or OH^- strongly acid cation resin bed.

Pretreatment - Guidelines are available on accepted limits for pH, organics, turbidity, and other raw water characteristics. Pretreatment may be required to reduce excessive amounts of TSS which could plug the resin bed, and typically includes media or carbon filtration.

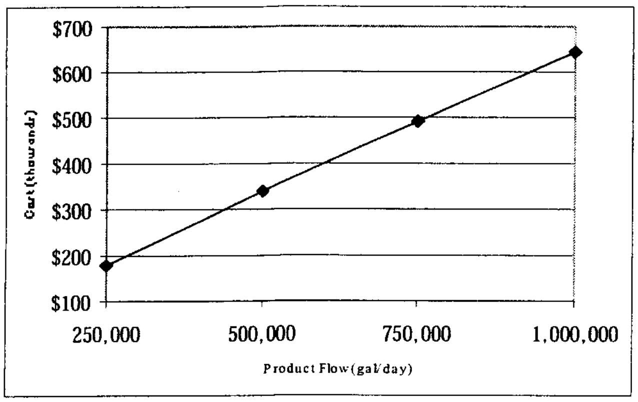
Maintenance - Depending on raw water characteristics and Ra concentration, the resin will require regular regeneration with a NaCl solution. Preparation of the NaCl solution is required. If utilized, filter replacement and backwashing will be required.

Waste Disposal - When large amounts of raw water with high levels of radioactive materials are treated for sufficiently long periods of time, the waste products can become radioactive enough to cause concern about safe and legal disposal. Waste products (i.e. resin, backwash water, and cleaning solutions) require disposal in accordance with local or state regulations. The USEPA guidance entitled *Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Radioactivity*, dated June 1994, provides disposal information. As a result of the wide variances in local and state laws, the costs presented below do not address waste disposal. However, costs associated with waste disposal should be considered significant.

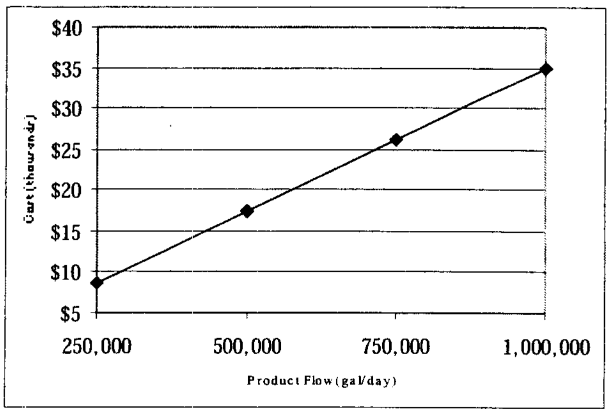
Advantages -
! Ease of operation; highly reliable.
! Lower initial cost; resins will not wear out with regular regeneration.
! Effective; widely used.
! Suitable for small and large installations.
! Variety of specific resins are available for removing specific contaminants.

Disadvantages -
! Requires salt storage.
! Usually not feasible with high levels of TDS.
! Resins are sensitive to the presence of competing ions.

BAT Equipment Cost*



BAT Annual O&M Cost*



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal.

3C-c. Mixed Bed Ion Exchange for β Removal:

Process - Mixed bed IX is a reversible chemical process in which ions from an insoluble, permanent, solid resin bed are exchanged for ions in water. The process relies on the fact that water solutions must be electrically neutral, therefore ions in the resin bed are exchanged with ions of similar charge in the water. As a result of the exchange process, no reduction in ions is obtained. IX operation for Gross Beta (β) Particle Activity and Photon Emitter removal begins with a fully recharged resin bed, having enough positive and negative ions to carry out the cation and anion exchange. Usually a polymer resin bed is composed of millions of medium sand grain size, spherical beads. As water passes through the resin bed, the negatively charged Na^+ or Cl^- ions are released into the water, being substituted or replaced with the soluble, positively or negatively charged β compounds in the water (ion exchange). When the resin becomes exhausted of Na^+ or Cl^- ions, the bed must be regenerated by passing a strong, usually NaCl (or KCl), solution over the resin bed, displacing the positively or negatively charged β compounds with Na^+ or Cl^- ions. Current resins are not compound selective and may remove other cations/anions before removing positively/negatively charged β compounds. Therefore IX requires careful consideration of the raw water characteristics. Typically, IX for β compounds utilizes a mixed Na^+ and Cl^- strongly acid/basic cation/anion resin bed.

Pretreatment - Guidelines are available on accepted limits for pH, organics, turbidity, and other raw water characteristics. Pretreatment may be required to reduce excessive amounts of TSS which could plug the resin bed, and typically includes media or carbon filtration.

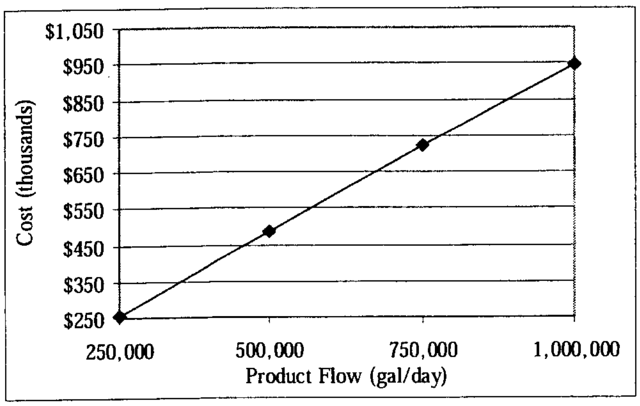
Maintenance - Depending on raw water characteristics and β concentration, the resin will require regular regeneration with a NaCl solution. Preparation of the NaCl solution is required. If utilized, filter replacement and backwashing will be required.

Waste Disposal - When large amounts of raw water with high levels of radioactive materials are treated for sufficiently long periods of time, the waste products can become radioactive enough to cause concern about safe and legal disposal. Waste products (i.e. resin, backwash water, and cleaning solutions) require disposal in accordance with local or state regulations. The USEPA guidance entitled *Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Radioactivity*, dated June 1994, provides disposal information. As a result of the wide variances in local and state laws, the costs presented below do not address waste disposal. However, costs associated with waste disposal should be considered significant.

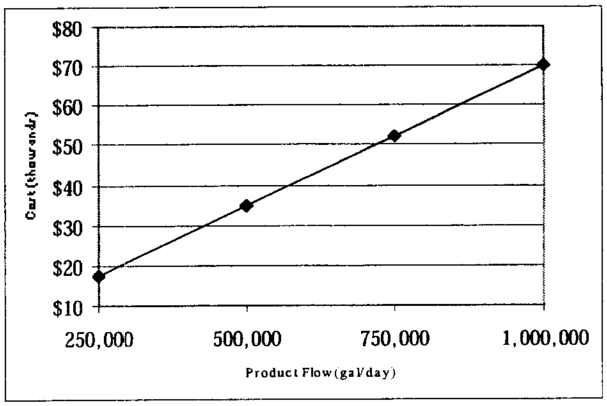
Advantages -
! Ease of operation; highly reliable.
! Lower initial cost; resins will not wear out with regular regeneration.
! Effective; widely used.
! Suitable for small and large installations.
! Variety of specific resins are available for removing specific contaminants.

Disadvantages -
! Requires salt storage.
! Usually not feasible with high levels of TDS.
! Resins are sensitive to the presence of competing ions.

BAT Equipment Cost*



BAT Annual O&M Cost*



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal.

3D. Reverse Osmosis for U, α, β, and Ra Removal:

Process - RO is a physical process in which contaminants are removed by applying pressure on the feed water to direct it through a semipermeable membrane. The process is the "reverse" of natural osmosis (water diffusion from dilute to concentrated through a semipermeable membrane to equalize ion concentration) as a result of the applied pressure to the concentrated side of the membrane, which overcomes the natural osmotic pressure. RO membranes reject ions based on size and electrical charge. The raw water is typically called feed; the product water is called permeate; and the concentrated reject is called concentrate. Common RO membrane materials include asymmetric cellulose acetate or polyamide thin film composite. Common membrane construction includes spiral wound or hollow fine fiber. Each material and construction method has specific benefits and limitations depending upon the raw water characteristics and pretreatment. A typical large RO installation includes a high pressure feed pump, parallel 1st and 2nd stage membrane elements (in pressure vessels); valving; and feed, permeate, and concentrate piping. All materials and construction methods require regular maintenance. Factors influencing membrane selection are cost, recovery, rejection, raw water characteristics, and pretreatment. Factors influencing performance are raw water characteristics, pressure, temperature, and regular monitoring and maintenance.

Pretreatment - RO requires a careful review of raw water characteristics and pretreatment needs to prevent membranes from fouling, scaling, or other membrane degradation. Removal of suspended solids is necessary to prevent colloidal and bio-fouling, and removal of dissolved solids is necessary to prevent scaling and chemical attack. Large installation pretreatment can include media filters to remove suspended particles; ion exchange softening or antiscalant to remove hardness; temperature and pH adjustment to maintain efficiency; acid to prevent scaling and membrane damage; activated carbon or bisulfite to remove chlorine (postdisinfection may be required); and cartridge (micro) filters to remove some dissolved particles and any remaining suspended particles.

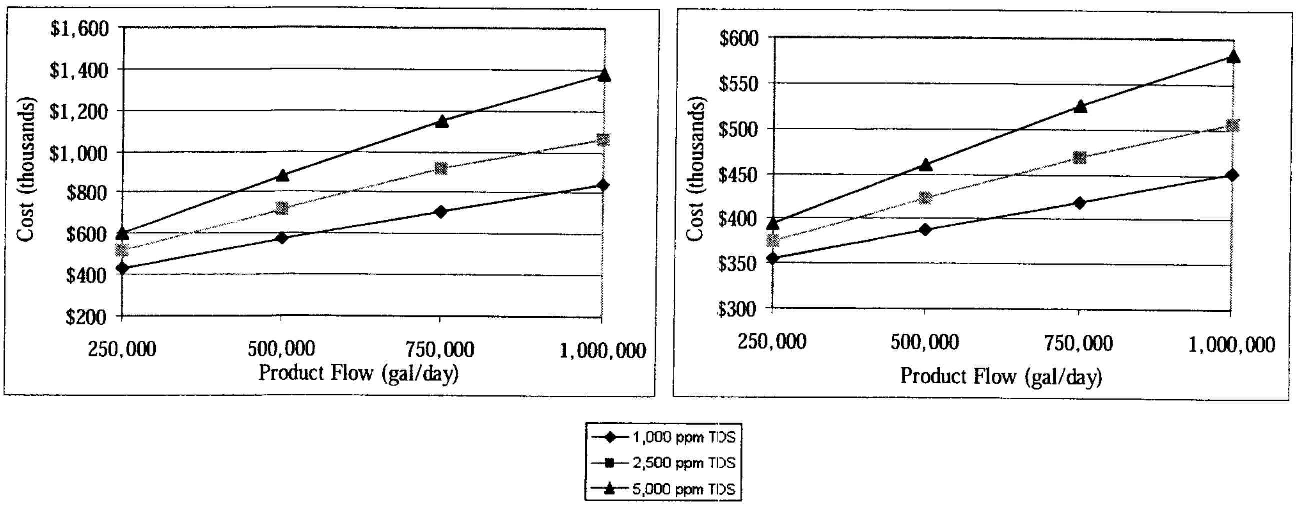
Maintenance - Monitor rejection percentage to ensure U and Ra removal below MCL. Regular monitoring of membrane performance is necessary to determine fouling, scaling, or other membrane degradation. Use of monitoring equations to track membrane performance is recommended. Acidic or caustic solutions are regularly flushed through the system at high volume/low pressure with a cleaning agent to remove fouling and scaling. The system is flushed and returned to service. $NaHSO_3$ is a typical caustic cleaner. RO stages are cleaned sequentially. Frequency of membrane replacement dependent on raw water characteristics, pretreatment, and maintenance.

Waste Disposal - When large amounts of raw water with high levels of radioactive materials are treated for sufficiently long periods of time, the waste products can become radioactive enough to cause concern about safe and legal disposal. Waste products (i.e. filters, elements, backwash water, and cleaning solutions) require disposal in accordance with local or state regulations. The USEPA guidance entitled *Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Radioactivity*, dated June 1994, provides disposal information. As a result of the wide variances in local and state laws, the costs presented below do not address waste disposal. However, costs associated with waste disposal should be considered significant.

Advantages -
! Produces highest water quality.
! Can effectively treat wide range of dissolved salts and minerals, turbidity, health and aesthetic contaminants, and certain organics; some highly-maintained units are capable of treating biological contaminants.
! Low pressure (<100 psi), compact, self-contained, single membrane units are available for small installations.

Disadvantages -
! Relatively expensive to install and operate.
! Frequent membrane monitoring and maintenance; monitoring of rejection percentage for U and Ra removal.
! Pressure, temperature, and pH requirements to meet membrane tolerances. May be chemically sensitive.

BAT Equipment Cost* | **BAT Annual O&M Cost***



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal.

3E. Lime Softening for U and Ra Removal:

Process - Lime softening uses chemical additions followed by an upflow SCC to accomplish coagulation, flocculation, and clarification. Chemical additions include $Ca(OH)_2$ to precipitate carbonate and Na_2CO_3 to precipitate noncarbonate hardness. In the upflow SCC, coagulation, flocculation (agglomeration of the suspended material, including U and Ra, into larger particles), and final clarification occur. In the upflow SCC, the clarified water flows up and over the weirs, while the settled particles are removed by pumping or other collection mechanisms (i.e. filtration).

Pretreatment - Jar tests to determine optimum pH for coagulation, and resulting pH adjustment, may be required. Optimum pH is about 10.5 or higher.

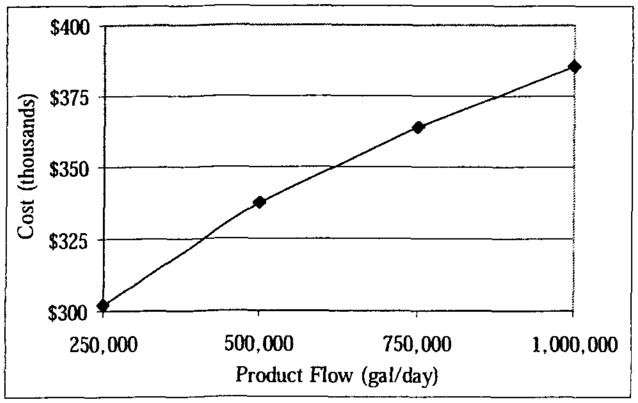
Maintenance - A routine check of chemical feed equipment is necessary several times during each work period to prevent clogging and equipment wear, and to ensure adequate chemical supply. All pumps, valves, and piping must be regularly checked and cleaned to prevent buildup of carbonate scale, which can cause plugging and malfunction. Similar procedures also apply to the sludge disposal return system, which takes the settled sludge from the bottom of the clarifier and conveys it to the dewatering and disposal processes.

Waste Disposal - When large amounts of raw water with high levels of radioactive materials are treated for sufficiently long periods of time, the waste products can become radioactive enough to cause concern about safe and legal disposal. Waste products (i.e. sludge and cleaning solutions) require disposal in accordance with local or state regulations. The USEPA guidance entitled *Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Radioactivity*, dated June 1994, provides disposal information. As a result of the wide variances in local and state laws, the costs presented below do not address waste disposal. However, costs associated with waste disposal should be considered significant.

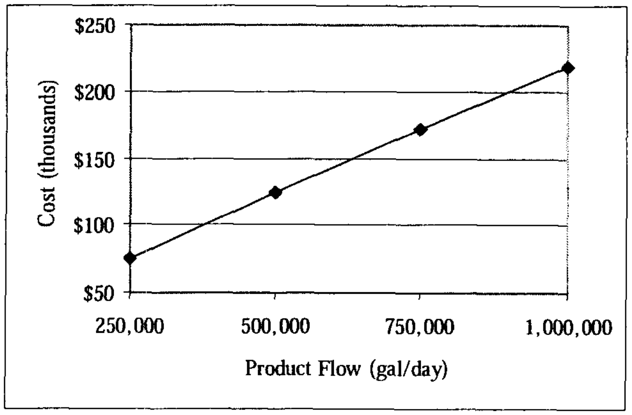
Advantages -
! Other heavy metals are also precipitated; reduces corrosion of pipes.
! Proven and reliable.
! Low pretreatment requirements.

Disadvantages -
! Operator care required with chemical handling.
! Produces high U and Ra-contaminated sludge volume.
! Sulfate may cause significant interference with removal efficiencies.

BAT Equipment Cost*



BAT Annual O&M Cost*



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal.

3F. Coagulation and Filtration for U Removal:

Process - Coagulation and filtration for uses the conventional chemical and physical treatment processes of chemical addition, rapid mix, coagulation with dry alum, flocculation, and dual media filtration. Chemical coagulation and flocculation consists of adding a chemical coagulant combined with mechanical flocculation to allow fine suspended and some dissolved solids to clump together (floc). $Al_2(SO_4)_3$ has been proven to be the most effective coagulant for U removal. Filtration provides final removal by dual media filtering of all floc and suspended solids.

Pretreatment - Jar tests to determine optimum pH for coagulation, and resulting pH adjustment, may be required.

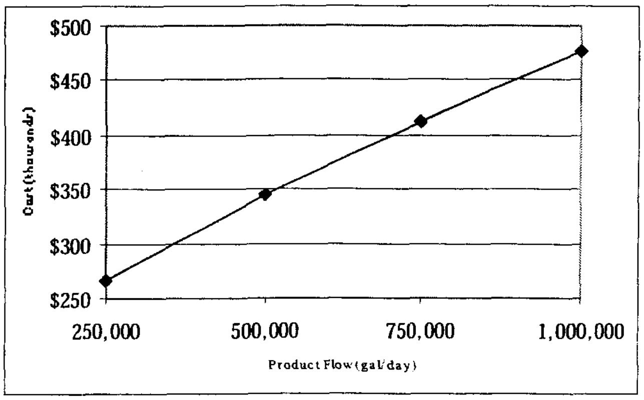
Maintenance - A routine check of chemical feed equipment is necessary several times during each work period to prevent clogging and equipment wear, and to ensure adequate chemical supply. All pumps, valves, and piping must be regularly checked and cleaned to prevent buildup of carbonate scale, which can cause plugging and malfunction. Routine checks of contaminant buildup in the filter is required, as well as filter backwash. Recharging or clean installation of media is periodically required.

Waste Disposal - When large amounts of raw water with high levels of radioactive materials are treated for sufficiently long periods of time, the waste products can become radioactive enough to cause concern about safe and legal disposal. Waste products (i.e. media, backwash water, and cleaning solutions) require disposal in accordance with local or state regulations. The USEPA guidance entitled *Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Radioactivity*, dated June 1994, provides disposal information. As a result of the wide variances in local and state laws, the costs presented below do not address waste disposal. However, costs associated with waste disposal should be considered significant.

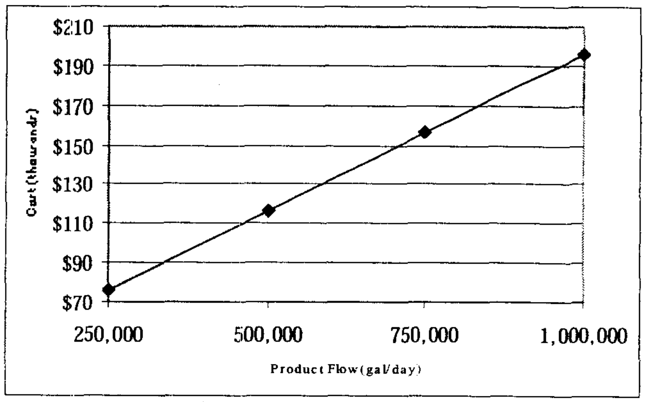
Advantages -
! Lowest capital costs.
! Lowest overall operating costs.
! Proven and reliable.
! Low pretreatment requirements.

Disadvantages -
! Operator care required with chemical handling.
! Produces high sludge volume.
! Sulfate may cause significant interference with removal efficiencies.

BAT Equipment Cost*



BAT Annual O&M Cost*



*Refer to Cost Assumptions Fact Sheet. Does not include general sitework, building, external pumps/piping, pretreatment, or off-site sludge disposal. Costs are presented for direct filtration (coagulation and flocculation plus filtration). Costs for coagulation and filtration would be less since flocculation is omitted.

Section 1. Material Identification

Toluene ($C_6H_5CH_3$) Description: Derived from petroleum i.e., dehydrogenation of cycloparaffin fractions followed by the aromatization of saturated aromatic hydrocarbons or by fractional distillation of coal-tar light oil and purified by rectification. Used widely as a solvent (replacing benzene in many cases) for oils, resins, adhesives, natural rubber, coal tar, asphalt, pitch, acetyl celluloses, cellulose paints and varnishes; a diluent for photogravure inks, raw material for organic synthesis (benzoyl & benzilidene chlorides, saccharine, TNT, toluene diisocyanate, and many dyestuffs), in aviation and high octane automobile gasoline, as a nonclinical thermometer liquid and suspension solution for navigational instruments.
Other Designations: CAS No. 108-88-3, Methacide, methylbenzene, methylbenzol, phenylmethane, toluol, Tolu-sol.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Toluene is an eye, skin, and respiratory tract irritant becoming narcotic at high centrations. Liver and kidney damage has occurred. Pregnant women chronically exposed to toluene have shown teratogenic effects. Toluene is highly flammable.

R 1
I 3
S 2*
K 3
* Skin absorption

NFPA
3
2 0
-

HMIS
H 2- Chronic effects
F 3
R 0
PPE-Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Toluene, < 100%; may contain a small amount of benzene (~ 1%), xylene, and nonaromatic hydrocarbons.

1991 OSHA PELs
8-hr TWA: 100 ppm (375 mg/m³)
15-min STEL: 150 ppm (560 mg/m³)

1990 IDLH Level
2000 ppm

1990 NIOSH RELs
TWA: 100 ppm (375 mg/m³)
STEL: 150 ppm (560 mg/m³)

1992-93 ACGIH TLV (Skin)
TWA: 50 ppm (188 mg/m³)

1990 DFG (Germany) MAK*
TWA: 100 ppm (380 mg/m³)
Half-life: 2 hr to end of shift
Category II: Substances with systemic effects
Peak Exposure Limit: 500 ppm, 30 min average value, 2/shift

1985-86 Toxicity Data†
Man, inhalation, TC_{Lo}: 100 ppm caused hallucinations, and changes in motor activity and changes in psychophysiological tests.
Human, oral, LD_{Lo}: 50 mg/kg; toxic effects not yet reviewed
Human, eye: 300 ppm caused irritation.
Rat, oral, LD_{50}: 5000 mg/kg
Rat, liver: 30 µmol/L caused DNA damage.

* Available information suggests damage to the developing fetus is probable.
†See NIOSH, *RTECS* (XS5250000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 232 °F (110.6 °C)
Melting Point: -139 °F (-95 °C)
Molecular Weight: 92.15
Density: 0.866 at 68 °F (20/4 °C)
Surface Tension: 29 dyne/cm at 68 °F (20 °C)
Viscosity: 0.59 cP at 68 °F (20 °C)
Refraction Index: 1.4967 at 20 °C/D
Water Solubility: Very slightly soluble, 0.6 mg/L at 68 °F (20 °C)
Other Solubilities: Soluble in acetone, alcohol, ether, benzene, chloroform, glacial acetic acid, petroleum ether, and carbon disulfide.
Vapor Pressure: 22 mm Hg at 68 °F (20 °C); 36.7 mm Hg at 86 °F (30 °C)
Saturated Vapor Density (Air = 0.075 lb/ft³ or 1.2 kg/m³): 0.0797 lb/ft³ or 1.2755 kg/m³
Odor Threshold (range of all referenced values): 0.021 to 69 ppm

Appearance and Odor: Colorless liquid with a sickly sweet odor.

Section 4. Fire and Explosion Data

Flash Point: 40 °F (4.4 °C) CC	Autoignition Temperature: 896 °F (480 °C)	LEL: 1.27% v/v	UEL: 7.0% v/v

Extinguishing Media: Toluene is a Class 1B flammable liquid. To fight fire, use dry chemical carbon dioxide, or 'alcohol-resistant' foam. Water spray may be ineffective as toluene floats on water and may actually spread fire. **Unusual Fire or Explosion Hazards:** Concentrated vapors are heavier than air and may travel to an ignition source and flash back. Container may explode in heat of fire. Toluenes' burning rate = 5.7 mm/min and its flame speed = 37 cm/sec. Vapor poses an explosion hazard indoors, outdoors, and in sewers. May accumulate static electricity. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing provides only limited protection. Apply cooling water to sides of tanks until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from fire and let burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire because a BLEVE (boiling liquid expanding vapor explosion) may be imminent. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Toluene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization can't occur. **Chemical Incompatibilities:** Strong oxidizers, concentrated nitric acid, nitric acid + sulfuric acid, dinitrogen tetroxide, silver perchlorate, bromine trifluoride, tetranitromethane, and 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione. **Conditions to Avoid:** Contact with heat, ignition sources, or incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of toluene can produce carbon dioxide, and acrid, irritating smoke.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list toluene as a carcinogen. **Summary of Risks:** Toluene is irritating to the eyes, nose, and respiratory tract. Inhalation of high concentrations produces a narcotic effect sometimes leading to coma as well as liver and kidney damage. 93% of inhaled toluene is retained in the body of which 80% is metabolized to benzoic acid, then to hippuric acid and excreted in urine. The remainder is metabolized to *o*-cresol and excreted or exhaled unchanged. Toluene metabolism is inhibited by alcohol ingestion and is synergistic with benzene, asphalt fumes, or chlorinated hydrocarbons (i.e. perchloroethylene). Toluene is readily absorbed through the skin at 14 to 23 mg/cm²/hr. Toluene is absorbed quicker during exercise than at rest and appears to be retained longer in obese versus thin victims; presumably due to its lipid solubility. There is inconsistent data on toluene's ability to damage bone marrow; chronic poisoning has resulted in anemia and leucopenia with biopsy showing bone marrow hypo-plasia. These reports are few and some authorities argue that the effects may have been due to benzene contaminants. Chronic inhalation during pregnancy has been associated with teratogenic effects on the fetus including microcephaly, CNS dysfunction, attentional deficits, developmental delay + language impairment, growth retardation, and physical defects including a small midface, short palpebral fissures, with deep-set eyes, low-set ears, flat nasal bridge with a small nose, micrognathia, and blunt fingertips. There is some evidence that toluene causes an autoimmune illness in which the body produces antibodies that cause inflammation of its own kidney.

Continue on next page

Section 6. Health Hazard Data

Medical Conditions Aggravated by Long-Term Exposure: Alcoholism and CNS, kidney, skin, or liver disease. **Target Organs:** CNS, liver, kidney, skin. **Primary Entry Routes:** Inhalation, skin contact/absorption. **Acute Effects:** Vapor inhalation causes respiratory tract irritation, fatigue, weakness, confusion, dizziness, headache, dilated pupils, watering eyes, nervousness, insomnia, parasthesis, and vertigo progressing to narcotic coma. Death may result from cardiac arrest due to ventricular fibrillation with catecholamines loss. Liquid splashed in the eye causes conjunctival irritation, transient corneal damage and possible burns. Prolonged skin contact leads to drying and fissured dermatitis. Ingestion causes GI tract irritation and symptoms associated with inhalation. **Chronic Effects:** Symptoms include mucous membrane irritation, headache, vertigo, nausea, appetite loss and alcohol intolerance. Repeated heavy exposure may result in encephalopathies (cerebellar ataxia and cognitive dysfunction), liver enlargement, and kidney dystrophy (wasting away). Symptoms usually appear at workdays end, worsen at weeks end and decrease or disappear over the weekend.
FIRST AID **Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult an ophthalmologist immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting because of danger of aspiration into the lungs. Gastric lavage may be indicated if large amounts are swallowed; potential toxicity needs to be weighed against aspiration risk when deciding for or against gastric lavage. **Note to Physicians:** Monitor cardiac function. If indicated, use epinephrine and other catecholamines carefully, because of the possibility of a lowered myocardial threshold to the arrhythmogenic effects of such substances. Obtain CBC, electrolytes, and urinalysis. Monitor arterial blood gases. If toluene has > 0.02% (200 ppm) benzene, evaluate for potential benzene toxicity. BEI: hippuric acid in urine, sample at shift end (2.5 g/g creatinine); Toluene in venous blood, sample at shift end (1.0 mg/L).

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Cleanup personnel protect against inhalation and skin/eye contact. Use water spray to cool and disperse vapors but it may not prevent ignition in closed spaces. Cellosolve, hycar absorbent materials, and fluorocarbon water can also be used for vapor suppression/containment. Take up small spill with earth, sand, vermiculite, or other absorbent, noncombustible material. Dike far ahead of large spills for later reclamation or disposal. For water spills, (10 ppm or greater) apply activated carbon at 10X the spilled amount and remove trapped material with suction hoses or use mechanical dredges/lifts to remove immobilized masses of pollutants and precipitates. Toluene can undergo fluidized bed incineration at 842 to 1796 °F (450 to 980 °C), rotary kiln incineration at 1508 to 2912 °F (820 to 1600 °C), or liquid injection incineration at 1202 to 2912 °F (650 to 1600 °C). Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** Blue gill, LC_{50} = 17 mg/L/24 hr; shrimp (*Crangonfracis coron*), LC_{50} = 4.3 ppm/96 hr; fathead minnow (*Pimephales promelas*), LC_{50} = 36.2 mg/L/96 hr. **Environmental Degradation:** If released to land, toluene evaporates and undergoes microbial degradation. In water, toluene volatilizes and biodegrades with a half-life of days to several weeks. In air, toluene degrades by reaction with photochemically produced hydroxyl radicals. **Disposal:** Treat contaminated water by gravity separation of solids, followed by skimming of surface. Pass through dual media filtration and carbon absorption units (carbon ratio 1 kg to 10 kg soluble material). Return waste water from backwash to gravity separator. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U220
SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg)
[* per RCRA, Sec. 3001; CWA, Sec. 311 (b)(4); CWA, Sec. 307 (a)]
Listed as a SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses with shatter-resistant glass and side-shields or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any chemical cartridge respirator with appropriate organic vapor cartridges, any supplied-air respirator (SAR), or SCBA. For < 2000 ppm, use any SAR operated in continuous-flow mode, any SAR or SCBA with a full facepiece, or any air-purifying respirator with a full facepiece having a chin-style, front or back mounted organic vapor canister. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Polyvinyl alcohol with a breakthrough time of > 8 hr, Teflon and Viton are recommended as suitable materials for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove toluene from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from ignition sources and incompatibles. Outside or detached storage is preferred. If stored inside, use a standard flammable liquids warehouse, room, or cabinet. To prevent static sparks, electrically ground and bond all equipment used with toluene. Do not use open lights in toluene areas. Install Class 1, Group D electrical equipment. Check that toluene is free of or contains < 1% benzene before use. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. **Administrative Controls:** Adopt controls for confined spaces (29 CFR 1910.146) if entering areas of unknown toluene levels (holes, wells, storage tanks). Consider preplacement and periodic medical exams of exposed workers that emphasize the CNS, liver, kidney, and skin. Include hemocytometric and thrombocyte count in cases where benzene is a contaminant of toluene. Monitor air at regular intervals to ensure effective ventilation.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Toluene
DOT Hazard Class: 3
ID No.: UN1294
DOT Packing Group: II
DOT Label: Flammable Liquid
Special Provisions (172.102): T1

Packaging Authorizations
a) Exceptions: 150
b) Non-bulk Packaging: 202
c) Bulk Packaging: 242

Quantity Limitations
a) Passenger Aircraft or Railcar: 5L
b) Cargo Aircraft Only: 60L

Vessel Stowage Requirements
Vessel Stowage: B
Other: --

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 140, 148, 153, 159, 163, 164, 167, 169, 171, 174, 175, 176, 180.
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, CIH, MPH; **Medical Review:** AC Darlington, MD, MPH

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Material Safety Data Sheets Collection:

Sheet No. 318
Xylene *(Mixed Isomers)*

Issued: 11/80 Revision: E, 9/92 Errata: 12/94

Section 1. Material Identification

45

Xylene (Mixed Isomers) (C_8H_{10}) Description: The commercial product is a blend of the three isomers [*ortho*-(*o*-), *meta*-(*m*-), *para*-(*p*-)] with the largest proportion being *m*- xylene. Xylene is obtained from coal tar, toluene by transalkylation, and pseudocumene. Used in the manufacture of dyes, resins, paints, varnishes, and other organics; as a general solvent for adhesives, a cleaning agent in microscope technique; as a solvent for Canada balsam microscopy; as a fuel component; in aviation gasoline, protective coatings, sterilizing catgut, hydrogen peroxide, perfumes, insect repellants, pharmaceuticals, and the leather industry; in the production of phthalic anhydride, isophthalic, and terephthalic acids and their dimethyl esters which are used in the manufacture of polyester fibers; and as an indirect food additive as a component of adhesives. Around the home, xylene is found as vehicles in paints, paint removers, degreasing cleaners, lacquers, glues and cements and as solvent/vehicles for pesticides.

Other Designations: CAS No. 1330-20-7 [95-47-6; 108-38-3; 106-42-3 (*o*-, *m*-, *p*-isomers)], dimethylbenzene, methyltoluene, NCI-C55232, Violet 3, xylol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Xylene is an eye, skin, and mucous membrane irritant and may be narcotic in high concentrations. It is a dangerous fire hazard.

R 1
I 2
S 2
K 3

NFPA
3
2 0
–

HMIS
H 2†
F 3
R 0
PPE ‡
† Chronic Effects
‡ Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Xylene (mixed isomers): the commercial product generally contains ~ 40% *m*-xylene; 20% each of *o*-xylene, *p*-xylene, and ethylbenzene; and small quantities of toluene. Unpurified xylene may contain pseudocumene.

1991 OSHA PELs
8-hr TWA: 100 ppm (435 mg/m^3)
15-min STEL: 150 ppm (655 mg/m^3)

1990 IDLH Level
1000 ppm

1990 NIOSH RELs
TWA: 100 ppm (435 mg/m^3)
STEL: 150 ppm (655 mg/m^3)

1992-93 ACGIH TLVs
TWA: 100 ppm (434 mg/m^3)
STEL: 150 ppm (651 mg/m^3)
BEI (Biological Exposure Index): Methylhippuric acids in urine at end of shift: 1.5 g/g creatinine

1990 DFG (Germany) MAK
TWA: 100 ppm (440 mg/m^3)
Category II: Substances with systemic effects
Half-life: < 2 hr
Peak Exposure: 200 ppm, 30 min, average value, 4 peaks per shift

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 200 ppm produced olfaction effects, conjunctiva irritation, and other changes involving the lungs, thorax, or respiration.
Man, inhalation, LC_{Lo}: 10000 ppm/6 hr; toxic effects not yet reviewed.
Human, oral, LD_{Lo}: 50 mg/kg; no toxic effect noted.
Rat, oral, LD_{50}: 4300 mg/kg; toxic effect not yet reviewed.
Rat, inhalation, LC_{50}: 5000 ppm/4 hr; toxic effects not yet reviewed.

* See NIOSH, *RTECS* (XE2100000), for additional toxicity data.

Section 3. Physical Data

Boiling Point Range: 279 to 284 °F (137 to 140 °C)*
Boiling Point: *ortho:* 291 °F (144 °C); *meta:* 281.8 °F (138.8 °C); *para:* 281.3 °F (138.5 °C)
Freezing Point/Melting Point: *ortho:* -13 °F (-25 °C); *meta:* -53.3 °F (- 47.4 °C); *para:* 55 to 57 °F (13 to 14 °C)
Vapor Pressure: 6.72 mm Hg at 70 °F (21 °C)
Saturated Vapor Density (Air = 1.2 kg/m^3): 1.23 kg/m^3, 0.077 lbs/ft^3
Molecular Weight: 106.16
Specific Gravity: 0.864 at 20 °C/4 °C
Water Solubility: Practically insoluble
Other Solubilities: Miscible with absolute alcohol, ether, and many other organic liquids.
Octanol/Water Partition Coefficient: logKow = 3.12-3.20
Odor Threshold: 1 ppm
Viscosity: <32.6 SUS

Appearance and Odor: Clear, sweet-smelling liquid.

* Materials with wider and narrower boiling ranges are commercially available.

Section 4. Fire and Explosion Data

Flash Point	Autoignition Temperature	LEL	UEL
Flash Point: 63 to 77 °F (17 to 25 °C) CC	**Autoignition Temperature:** 982 °F (527 °C) (*m*-)	**LEL:** 1.1 (*m*-, *p*-); 0.9 (*o*-)	**UEL:** 7.0 (*m*-, *p*-); 6.7 (*o*-)

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), water spray or regular foam. For large fires, use water spray, fog or regular foam. Water may be ineffective. Use water spray to cool fire-exposed containers. **Unusual Fire or Explosion Hazards:** Xylene vapors or liquid (which floats on water) may travel to an ignition source and flash back. The heat of fire may cause containers to explode and/or produce irritating or poisonous decomposition products. Xylene may present a vapor explosion hazard indoors, outdoors, or in sewers. Accumulated static electricity may occur from vapor or liquid flow sufficient to cause ignition. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing will provide limited protection. If feasible and without risk, move containers from fire area. Otherwise, cool fire-exposed containers until well after fire is extinguished. Stay clear of tank ends. Use unmanned hose holder or monitor nozzles for massive cargo fires. If impossible, withdraw from area and let fire burn. Withdraw immediately in case of any tank discoloration or rising sound from venting safety device. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Xylene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Xylene is easily chlorinated, sulfonated, or nitrated. **Chemical Incompatibilities:** Incompatibilities include strong acids and oxidizers and 1,3-dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin). Xylene attacks some forms of plastics, rubber, and coatings. **Conditions to Avoid:** Avoid heat and ignition sources and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of xylene can produce carbon dioxide, carbon monoxide, and various hydrocarbon products.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list xylene as a carcinogen. **Summary of Risks**: Xylene is an eye, mucous membrane, and respiratory tract irritant. Irritation starts at 200 ppm; severe breathing difficulties which may be delayed in onset can occur at high concentrations. It is a central nervous system (CNS) depressant and at high concentrations can cause coma. Kidney and liver damage can occur with xylene exposure. With prolonged or repeated cutaneous exposure, xylene produces a defatting dermatitis. Chronic toxicity is not well defined, but it is less toxic than benzene. Prior to the 1950s, benzene was often found as a contaminant of xylene and the effects attributed to xylene such as blood dyscrasias are questionable. Since the late 1950s, xylenes have been virtually benzene-free and blood dyscrasias have not been associated with xylenes. Chronic exposure to high concentrations of xylene in animal studies have demonstrated mild reversible decrease in red and white cell counts as well as increases in platelet counts.

Continue on next page

Section 6. Health Hazard Data, *continued*

Menstrual irregularity was reported in association with workplace exposure to xylene perhaps due to effects on liver metabolism. Xylene crosses the human placenta, but does not appear to be teratogenic under conditions tested to date. **Medical Conditions Aggravated by Long-Term Exposure:** CNS, respiratory, eye, skin, gastrointestinal (GI), liver and kidney disorders. **Target Organs:** CNS, eyes, GI tract, liver, kidneys, and skin. **Primary Entry Routes:** Inhalation, skin absorption (slight), eye contact, ingestion. **Acute Effects:** Inhalation of high xylene concentrations may cause dizziness; nausea, vomiting, and abdominal pain; eye, nose, and throat irritation; respiratory tract irritation leading to pulmonary edema (fluid in lung); drowsiness; and unconsciousness. Direct eye contact can result in conjunctivitis and corneal burns. Ingestion may cause a burning sensation in the oropharynx and stomach and transient CNS depression. **Chronic Effects:** Repeated or prolonged skin contact may cause drying and defatting of the skin leading to dermatitis. Repeated eye exposure to high vapor concentrations may cause reversible eye damage, peripheral and central neuropathy, and liver damage. Other symptoms of chronic exposure include headache, fatigue, irritability, chronic bronchitis, and GI disturbances such as nausea, loss of appetite, and gas.

FIRST AID *Emergency personnel should protect against exposure.* **Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Carefully dispose of contaminated clothing as it may pose a fire hazard. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. Monitor exposed person for respiratory distress. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, *do not induce vomiting!* If spontaneous vomiting should occur, keep exposed person's head below the hips to prevent aspiration (breathing liquid xylene into the lungs). *Aspiration of a few millimeters of xylene can cause chemical pneumonitis, pulmonary edema, and hemorrhage.* **Note to Physicians:** Hippuric acid or the ether glucuronide of *ortho*-toluic acid may be useful in diagnosis of *meta-*, *para-* and *ortho*-xylene exposure, respectively. Consider gastric lavage if a large quantity of xylene was ingested. Proceed gastric lavage with protection of the airway from aspiration; consider endotracheal intubation with inflated cuff.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove all heat and ignition sources, and ventilate spill area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. If feasible and without undue risk, stop leak. Use appropriate foam to blanket release and suppress vapors. Water spray may reduce vapor, but does not prevent ignition in closed spaces. For small spills, absorb on paper and evaporate in appropriate exhaust hood or absorb with sand or some non-combustible absorbent and place in containers for later disposal. For large spills dike far ahead of liquid to contain. Do not allow xylene to enter a confined space such as sewers or drains. On land, dike to contain or divert to impermeable holding area. Apply water spray to control flammable vapor and remove material with pumps or vacuum equipment. On water, contain material with natural barriers, booms, or weirs; apply universal gelling agent; and use suction hoses to remove spilled material. Report any release in excess of 1000 lb. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** Little bioconcentration is expected. Biological oxygen demand 5 (after 5 days at 20 °C): 0.64 (no stated isomer). **Ecotoxicity values:** LD_{50}, Goldfish, 13 mg/L/24 hr, conditions of bioassay not specified, no specific isomer. **Environmental Degradation:** In the atmosphere, xylenes degrade by reacting with photochemically produced hydroxyl radicals with a half-life ranging from 1-1.7 hr. in the summer to 10-18 hr in winter or a typical loss of 67-86% per day. Xylenes are resistant to hydrolysis. **Soil Absorption/Mobility:** Xylenes have low to moderate adsorption to soil and when spilled on land, will volatilize and leach into groundwater. **Disposal:** As a hydrocarbon, xylene is a good candidate for controlled incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U239, F003 (spent solvent)
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per Clean Water Act, Sec. 311(b)(4); per RCRA, Sec. 3001]

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For concentrations >1000 ppm, use any chemical cartridge respirator with organic vapor cartridges; any powered, air-purifying respirator with organic vapor cartridges; any supplied-air respirator; or any self-contained breathing apparatus. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent all skin contact. With breakthrough times > 8 hr, consider polyvinyl alcohol and fluorocarbon rubber (Viton) as materials for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in clearly labelled, tightly closed, containers in a cool, well-ventilated place, away from strong oxidizing materials and heat and ignition sources. During transferring operations, electrically ground and bond metal containers. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Use hermetically sealed equipment, transfer xylene in enclosed systems, avoid processes associated with open evaporating surfaces, and provide sources of gas release with enclosures and local exhaust ventilation. Use Class I, Group D electrical equipment. **Administrative Controls:** Establish air and biological monitoring programs and evaluate regularly. Consider preplacement and periodic medical examinations including a complete blood count, a routine urinalysis, and liver function tests. Consider hematologic studies if there is any significant contamination of the solvent with benzene. If feasible, consider the replacement of xylene by less toxic solvents such as petrol (motor fuel) or white spirit. Before carrying out maintenance and repair work, steam and flush all equipment to remove any xylene residues.

Transportation Data (49 CFR 172.101)

	Packaging Authorizations	**Quantity Limitations**	**Vessel Stowage Requirements**
DOT Shipping Name: Xylenes	a) Exceptions: 173.150	a) Passenger, Aircraft, or Railcar: 5L	a) Vessel Stowage: B
DOT Hazard Class: 3	b) Nonbulk Packaging : 173.202	b) Cargo Aircraft Only: 60L	b) Other: –
ID No.: UN1307	c) Bulk Packaging: 173.242		
DOT Packing Group: II			
DOT Label: Flammable Liquid			
Special Provisions (172.102): T1			

MSDS Collection **References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 149, 153, 159, 163, 164, 167, 171, 174, 176, 180.
Prepared by: MJ Wurth, BS; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** W Silverman, MD

ATTACHMENT 2

FORMS

TETRA TECH EC, INC.

DAILY BRIEFING SIGN-IN SHEET

Date: ______________________ Project Name/Location: ______________________

Shift/Department: ______________________ Person Conducting Briefing: ______________________

1. AWARENESS (e.g., special EHS concerns, pollution prevention, recent incidents, etc.):

____

____

____

2. OTHER ISSUES (EHS Plan changes, attendee comments, etc.):

____

____

3. ATTENDEES (Print Name):

1.	21.
2.	22.
3.	23.
4.	24.
5.	25.
6.	26.
7.	27.
8.	28.
9.	29.
10.	30.
11.	31.
12.	32.
13.	33.
14.	34.
15.	35.
16.	36.
17.	37.
18.	38.
19.	39.
20.	40.

Give completed documentation to SHSS.

SITE SAFETY BRIEFING FORM

Site: ______________________ **Job No:** ______________________

Date: ______________________ **Time:** ______________________

Task: ______________________ **Health/Safety Officer:** ______________________

Person Providing Briefing: ______________________

TOPICS:

- ☐ Site SHSP
- ☐ Chemical Hazards
- ☐ Equipment Hazards
- ☐ Electrical Hazards
- ☐ Heat Stress
- ☐ Pollution Prevention
- ☐ MSDS Review
- ☐ Personal Decontamination
- ☐ Personal Hygiene
- ☐ Employee Rights/Responsibilities
- ☐ Hazard Evaluations
- ☐ Emergency Response Procedures
- ☐ AHAs

CHEMICAL HAZARDS:

Material/Chemical	Planned Use	MSDS Reviewed

ACTIVITY HAZARD ANALYSIS (list activities reviewed):

PERSONS IN ATTENDANCE:
(Name/Organization)

____
____
____
____

PERSONS IN ATTENDANCE:
(Name/Organization)

____
____
____
____

NOTES/COMMENTS:

____
____
____

FIELD TEAM REVIEW SHEET

Each field team shall sign this section after site-specific training is completed and before being permitted to work on site.

I have read and understand this Site-Specific Health and Safety Plan for **Alameda IR Sites 1, 2 and 32 Time-Critical Removal Action, Alameda, California.**

I will comply with the provisions contained herein.

Print Name	Signature	Date

MEDICAL DATA SHEET

Name: ______________________________

Project: ______________________________

Company: ______________________________

Home Telephone Number: ______________________________

Home Address: ______________________________

Age: __________ **Height:** __________ **Weight:** __________ **Blood Type:** __________

Name of Emergency Contact: ______________________________

Telephone Number of Emergency Contact: ______________________________

Drug or Other Allergies: ______________________________

Particular Sensitivities: ______________________________

Do you wear contact lenses? ______________________________

Provide a checklist of previous illness or exposures to hazardous chemicals: __________

____

What medications are you presently using? ______________________________

____

Do you have any medical restrictions? If yes, explain: ______________________________

____

Name, address, and phone number of personal physician:

____

____

CORPORATE ESQ REPORT # ____________

INCIDENT/NEAR MISS REPORT AND INVESTIGATION

TYPE OF INCIDENT - CHECK ALL THAT APPLY

❐ INJURY/ILLNESS ❐ VEHICLE DAMAGE ❐ PROPERTY DAMAGE ❐ FIRE
❐ SPILL/RELEASE ❐ PERMIT EXCEEDENCE ❐ HIGH LOSS POTENTIAL (NEAR MISS) ❐ OTHER

1.GENERAL INFORMATION

PROJECT/OFFICE: REPORT #: DATE OF REPORT:

DATE OF INCIDENT: MILITARY TIME: ____ DAY OF WEEK: ____

TtEC SUPERVISOR ON DUTY: AT SCENE OF INCIDENT: ❐ YES ❐ NO

LOCATION OF INCIDENT:

WEATHER CONDITIONS: ADEQUATE LIGHTING AT SCENE: ❐ YES ❐ NO ❐ N/A

DESCRIBE WHAT HAPPENED (STEP BY STEP - use additional pages if necessary)

AFFECTED EMPLOYEE INFORMATION

(Include injured person, driver/operator, or employee whose activities resulted in the incident. Use another page to provide information for additional employees)

NAME: TtEC EMPLOYEE: ❐ YES ❐ NO

HOME ADDRESS:

SOCIAL SECURITY #: HOME PHONE #:

JOB CLASSIFICATION: YEARS IN JOB CLASSIFICATION:

HOURS WORKED ON SHIFT PRIOR TO INCIDENT: YEARS WITH TtEC: AGE:

DID INCIDENT RELATE TO ROUTINE TASK FOR JOB CLASSIFICATION: ❐ YES ❐ NO

INJURY/ILLNESS INFORMATION

NATURE OF INJURY OR ILLNESS:

OBJECT/EQUIPMENT/SUBSTANCE CAUSING HARM:

FIRST AID PROVIDED: ❐ YES ❐ NO

IF YES, WHERE WAS IT GIVEN: ❐ ON SITE ❐ OFF SITE

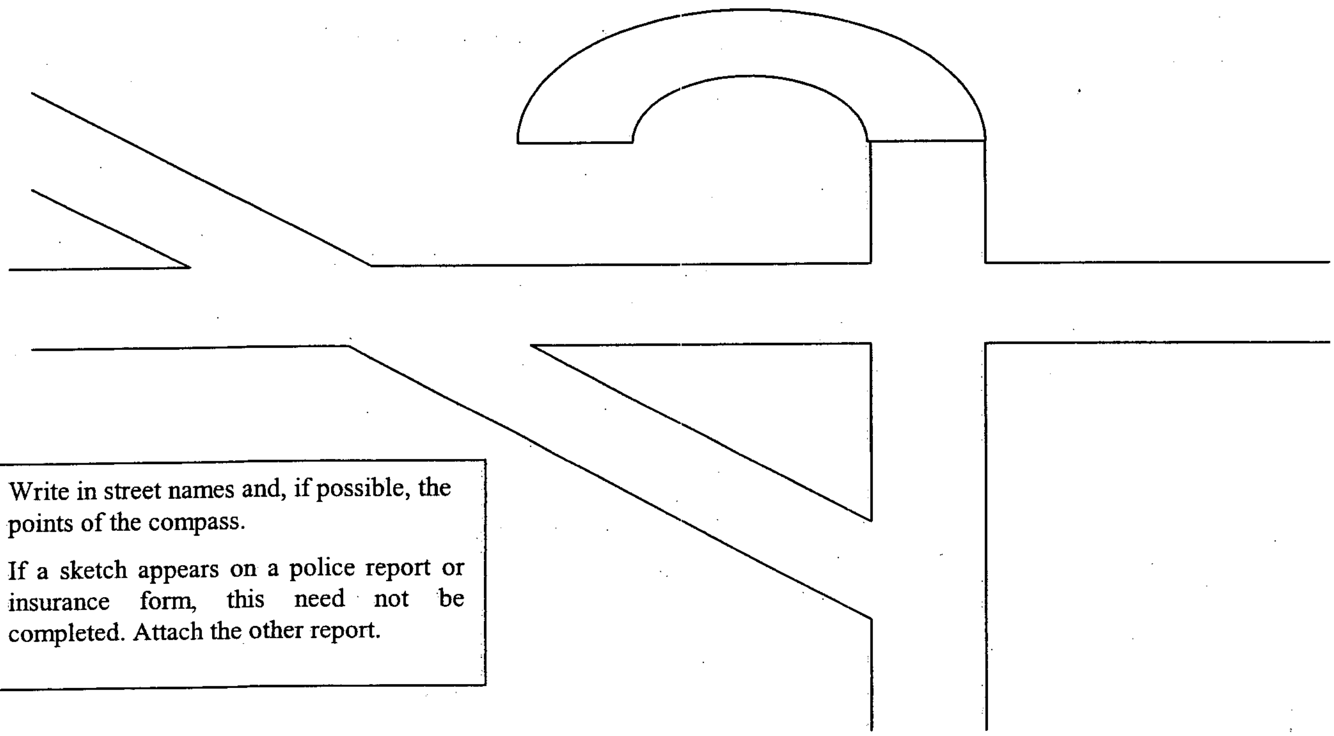
IF YES, WHO PROVIDED FIRST AID:

WILL THE INJURY/ILLNESS RESULT IN: ❐ RESTRICTED DUTY ❐ LOST TIME ❐ UNKNOWN

MEDICAL TREATMENT INFORMATION		
WAS MEDICAL TREATMENT PROVIDED?:	❒ YES ❒ NO	
IF YES, WAS MEDICAL TREATMENT PROVIDED:	❒ ON SITE ❒ DR.'S OFFICE ❒ HOSPITAL	
NAME OF PERSON(S) PROVIDING TREATMENT:		
ADDRESS WHERE TREATMENT WAS PROVIDED:		
TYPE OF TREATMENT:		
VEHICLE AND PROPERTY DAMAGE INFORMATION		
VEHICLE/PROPERTY DAMAGED:		
DESCRIPTION OF DAMAGE:		
SPILL AND AIR EMISSIONS INFORMATION		
SUBSTANCE SPILLED OR RELEASED:	FROM WHERE:	TO WHERE:
ESTIMATED QUANTITY/DURATION:		
CERCLA HAZARDOUS SUBSTANCE? YES ❒ NO ❒	RQ EXCEEDED? YES ❒ NO ❒ SPECIFY: ________	
REPORTABLE TO AGENCY? YES ❒ NO ❒	SPECIFY: ________________	
WRITTEN REPORT? YES ❒ NO ❒	TIME FRAME: ________________	
RESPONSE ACTION TAKEN		
PERMIT EXCEEDENCE		
TYPE OF PERMIT:	PERMIT #:	
DATE OF EXCEEDENCE:	DATE FIRST KNOWLEDGE OF EXCEEDENCE:	
PERMITTED LEVEL OR CRITERIA (e.g., Water quality):		
EXCEEDENCE LEVEL OR CRITERIA:	EXCEEDENCE DURATION:	
REPORTABLE TO AGENCY? YES ❒ NO ❒	SPECIFY: ________________	
WRITTEN REPORT? YES ❒ NO ❒	TIME FRAME: ________________	
RESPONSE ACTION TAKEN:		
NOTIFICATIONS		
NAME(S) OF TtEC PERSONNEL NOTIFIED:		DATE/TIME:
CLIENT NOTIFIED:	DATE/TIME:	
AGENCY NOTIFIED:	DATE/TIME:	❒ NOT REQUIRED
CONTACT NAME:		
PERSONS PREPARING REPORT		
EMPLOYEE'S NAME: (PRINT)	SIGN:	
EMPLOYEE'S NAME (PRINT)	SIGN:	
SUPERVISOR'S NAME: (PRINT)	SIGN:	
NOTE: ***Supervisor to forward a copy of Incident Report to immediate supervisor, PESM, ESS or ESC, and other personnel as identified in Table 1 of this procedure ASAP, but no later then 24 hours.***		

INCIDENT SKETCH

VEHICLE INCIDENTS



Write in street names and, if possible, the points of the compass.

If a sketch appears on a police report or insurance form, this need not be completed. Attach the other report.

INVESTIGATIVE REPORT

DATE OF INCIDENT:________ DATE OF INVESTIGATION REPORT:________

INCIDENT COST:	ESTIMATED: $__________	ACTUAL: $__________
OSHA RECORDABLE(S):	❐ YES ❐ NO # RESTRICTED DAYS_____	# DAYS AWAY FROM WORK______
CAUSE ANALYSIS		
Was the activity addressed in an AHA?	❐ YES (Attach a copy)	❐ NO
IMMEDIATE CAUSES – WHAT ACTIONS AND CONDITIONS CONTRIBUTED TO THIS EVENT? (USE NEXT PAGE)		
BASIC CAUSES - WHAT SPECIFIC PERSONAL OR JOB FACTORS CONTRIBUTED TO THIS EVENT? (USE NEXT PAGE)		
ACTION PLAN		
REMEDIAL ACTIONS - WHAT HAS AND OR SHOULD BE DONE TO CONTROL EACH OF THE CAUSES LISTED? INCLUDE MANAGEMENT PROGRAMS (SEE ATTACHED LIST) FOR CONTROL OF INCIDENTS IF APPLICABLE.		

ACTION	PERSON RESPONSIBLE	TARGET DATE	COMPLETION DATE

PERSONS PERFORMING INVESTIGATION		
INVESTIGATOR'S NAME: (PRINT)	SIGN:	DATE:
INVESTIGATOR'S NAME: (PRINT)	SIGN:	DATE:
INVESTIGATOR'S NAME: (PRINT)	SIGN:	DATE:
MANAGEMENT REVIEW		
PROJECT/OFFICE MANAGER (PRINT)	SIGN:	
COMMENTS:		
PESM or ESC (PRINT)	SIGN:	
COMMENTS:		

***NOTE:** Attach additional information as necessary. Supervisor to forward copy of Investigative Report to the PM or OM, PESM or ESC ASAP, but no later then 72 hours after the incident. A copy shall be sent to the Director, Health and Safety Programs within 24 hours of completion of the report.*

EXAMPLES OF IMMEDIATE CAUSES	
SUBSTANDARD ACTIONS	SUBSTANDARD CONDITIONS
1. OPERATING EQUIPMENT WITHOUT AUTHORITY	1. GUARDS OR BARRIERS
2. FAILURE TO WARN	2. PROTECTIVE EQUIPMENT
3. FAILURE TO SECURE	3. TOOLS, EQUIPMENT, OR MATERIALS
4. OPERATING AT IMPROPER SPEED	4. CONGESTION
5. MAKING SAFETY DEVICES INOPERABLE	5. WARNING SYSTEM
6. REMOVING SAFETY DEVICES	6. FIRE AND EXPLOSION HAZARDS
7. USING DEFECTIVE EQUIPMENT	7. POOR HOUSEKEEPING
8. FAILURE TO USE PPE PROPERLY	8. NOISE EXPOSURE
9. IMPROPER LOADING	9. EXPOSURE TO HAZARDOUS MATERIALS
10. IMPROPER PLACEMENT	10. EXTREME TEMPERATURE EXPOSURE
11. IMPROPER LIFTING	11. ILLUMINATION
12. IMPROPER POSITION FOR TASK	12. VENTILATION
13. SERVICING EQUIPMENT IN OPERATION	13. VISIBILITY
14. UNDER INFLUENCE OF ALCOHOL/DRUGS	
15. HORSEPLAY	

EXAMPLES OF BASIC CAUSES	
PERSONAL FACTORS	JOB FACTORS
1. CAPABILITY	1. SUPERVISION
2. KNOWLEDGE	2. ENGINEERING
3. SKILL	3. PURCHASING
4. STRESS	4. MAINTENANCE
5. MOTIVATION	5. TOOLS/EQUIPMENT
	6. WORK STANDARDS
	7. WEAR AND TEAR
	8. ABUSE OR MISUSE

MANAGEMENT PROGRAMS FOR CONTROL OF INCIDENTS	
1. LEADERSHIP AND ADMINISTRATION	10. HEALTH CONTROL
2. MANAGEMENT TRAINING	11. PROGRAM AUDITS
3. PLANNED INSPECTIONS	12. ENGINEERING CONTROLS
4. TASK ANALYSIS AND PROCEDURES	13. PERSONAL COMMUNICATIONS
5. TASK OBSERVATION	14. GROUP MEETINGS
6. EMERGENCY PREPAREDNESS	15. GENERAL PROMOTION
7. ORGANIZATIONAL RULES	16. HIRING AND PLACEMENT
8. ACCIDENT/INCIDENT ANALYSIS	17. PURCHASING CONTROLS
9. PERSONAL PROTECTIVE EQUIPMENT	

NOTIFICATION REMINDER
Fatalities or hospitalization (admittance) of three or more individuals requires notification to OSHA within 8 hours. Contact the Director, Health and Safety Programs or Director, ESQ Programs to make the notification. If unavailable, the senior operations person on site should make the notification.

Incident/Near Miss Report and Investigation Instructions

General: The incident report (pages 1 and 2) must be completed within 24 hours. Do not delay the report if any information is unknown. It can be provided later by revising the Report.

Type of Incident: Check all that apply. A High Loss Potential (Near Miss) incident is one that does not result in loss, but under slightly different circumstances, could have resulted in an OSHA Recordable injury, spill, release, permit exceedence, fire, or vehicle/property damage in excess of $500. All High Loss Potential (Near Miss) incidents are to be investigated.

General Information

Project/Office: If the incident occurs on a delivery order contract, give the contract/program name, DO# and location. If the incident occurs on a C&E field project, give the Office location managing the project as well as the project/location.

Report No.: Optional numbering field for offices/projects.

Supervisor: The Supervisor responsible for the work effort involving the incident. Do not give a subcontractor supervisor or craft foreman name. If the Supervisor was the Affected Employee, this field should contain the name of his or her supervisor. The Supervisor is the project supervisor if the incident happens on a project, or the administrative supervisor if the incident happens in the office. E.g., a geologist, acting as an FOL gets injured on a job site, or in a motor vehicle in the course of project work. The Supervisor is most likely the Project Manager. If the same geologist gets injured lifting a box in his office, the Supervisor is likely the Office Science Lead.

Location of Incident: The specific location on the project, in the office, or off-site location.

Weather Conditions: Temperature, precipitation, approximate wind speed and direction, cloud cover, relative humidity. This information may be included in the description section, and must be given in detail whenever it is a factor in the cause or impact., e.g., spill, release, heat stress, wind blown material.

Describe What Happened: This section must be completed in sufficient detail to adequately describe the events and conditions leading up to and resulting from the incident. Try to answer the questions who, what, where, when, and how. This information is then used to determine why (cause). Provide details such as work objective, procedure being used, body position, and PPE. Include diagrams or sketches for all incidents involving vehicles/equipment and other incidents where they aid in providing detail or perspective. Consider attaching photographs. Follow the guidelines in Practical Loss Control Leadership, and consider the impact of each of the following:

P - People
E - Equipment
M – Material
E – Environment

To do an effective job, a visual inspection of the scene is usually necessary along with private interviews of affected employees and witnesses.

Where appropriate, use terms indicating the type of contact, e.g., struck by; struck against; fall from elevation; fall on same level; caught in; caught between or under; caught on; contact with; overstress; equipment failure; environmental release; fire.

Affected Employee Information

Employee: Direct hire, whether professional, administrative, or craft; full-time or part-time; permanent or temporary. If the affected employee is not an employee, give the name of the employer and business relationship (e.g., client, subcontractor) in the description section above.

Hours Worked on Shift Prior to the Incident: Only include the amount of time the employee worked that shift or day prior to the incident.

Years with SES-TECH: For SES-TECH employees, give the number of years employed with SES-TECH. If the employee has worked for SES-TECH for less than a year, do not write <1. Give the answer in fraction of year, or specify the number of months, e.g., 0.1 or 1 month.

Injury/Illness Information

Nature of Injury or Illness: If the incident resulted in an injury or illness, give a brief description of the body part affected and type of injury or illness, e.g., fractured thumb, left hand; carpal tunnel syndrome, right hand.

First Aid Provided: First Aid is any treatment that does not have to be provided by a health care professional, even if it is. E.g., a laceration that is cleaned and bandaged in a clinic may constitute first aid, if sutures are not given.

Will the Injury Result In: Do not delay the report if this information is unknown.

Medical Treatment Information

Was Medical Treatment Provided? Medical treatment is that treatment that must be provided by a licensed medical practitioner, e.g., sutures, prescription medication, etc.

Type of Treatment: This information is important in determining OSHA recordability, since some forms of treatment would not constitute a Recordable case (e.g., one-time administration of prescriptions, negative diagnostic exams). Attach a copy of the treating professional's statement/work release.

Vehicle and Property Damage Information

Vehicle/Property Damaged: For vehicles, indicate VIN and whether it is company owned or leased, business trip rental (Avis) or owned by others.

Description of Damage: Be specific as to the identity of damaged part, location and extent.

Spill and Air Emissions Information

Substance Spilled or Released: For pure substances, list materials by common name/chemical. For wastes, indicate waste code. For mixtures or contaminated media, provide contaminant name, CAS No., concentration.

RQ Exceeded? Reportable quantity. Contact your ESQ representative for guidance. Specify the RQ for the material, whether you answer yes or no.

Reportable to Agency? If yes, specify the federal, state or local agency that must be provided with verbal and/or written notification.

Written Report? Answer yes if the release requires a written report to be filed and note the time frame.

Response Action Taken: Describe the mitigation efforts, as well as any reports made, beyond initial notification.

Permit Exceedence

Type of Permit: List name of permit including the agency name where applicable (e.g., NPDES, PSAPCA NOC)

Date of Exceedence: Specify date exceedence occurred (e.g., date discharge in excess of permit limits occurred)

Date First Knowledge of Exceedence: Specify date when first knew there was an exceedence (i.e., date analytical received). This date may be different from the date of the exceedence listed above.

Permitted Level or Criteria: List numerical discharge or emission limit or narrative criteria specified in the permit (e.g., 20% opacity limit, Best Management Practices (BMP) implementation per SWPPP).

Exceedence Level or Criteria: Specify actual numeric discharge/emission limit or narrative criteria which was exceeded (e.g., 22% opacity, failure of BMPs (silt fencing collapse) per SWPPP)

Exceedence Duration: Specify time frame by date and hours (using military time) during which exceedence occurred.

See "**Spill/Release Information**" (above) for description of remaining questions.

Persons Preparing Report

Employee's Name: The affected employee described on page 1 should review the report and sign here, as well as other employees witnessing or involved in the incident.

Supervisor's Name: The Supervisor must review and sign the report indicating agreement. The Supervisor and the Investigator (next page) should be the same person.

Investigative Report

Report No.: This is the same as the project/office optional report number from page 1 of the Incident/Near Miss Report.

Date of Investigative Report: This date should be within 7 hours of the incident. In cases where the investigation is not completed until a later date, submit the incomplete report within the 72 hours, and a revised report should be submitted when the missing information is obtained.

Incident Cost: For all vehicle/equipment or property damage cases, an estimated or actual loss value must be entered. If an estimated value is entered, the report must be revised when the actual costs are known.

OSHA Recordables: This section should be completed in consultation with the PESM. If it cannot be determined at the time of the report, the PESM should consult with the Director, Health and Safety Programs and revise the report when a determination is made.

No. of Restricted Days: This relates to days of restricted work activity, not restrictions on motion or physical capability. If the employee is capable of doing his normal job the day after the injury and thereafter, there are no restricted days, even if the physician indicates a physical restriction. It does not include the day of the injury.

No. of Days Away from Work: The number of days after the day of the injury that the employee was scheduled to work but could not due to an occupational injury. If the treating physician releases an employee to return to work, but the employee chooses not to come to work, do not count those days. In this case the PESM should contact the Director, Health and Safety Programs.

Cause Analysis

Immediate Causes: Determine the immediate causes, using the example on page 4. If one or more of the examples fits the circumstance, use those words in the cause description. This facilitates statistical analysis of the incident database for program evaluation/modification. However, do not confine your cause determination to the guide words. Explain, e.g., Improper Lifting – employee attempted to lift box by bending at the waist and twisting while lifting. Be sure that the incident description on page 1 is sufficiently detailed to support the causal analysis in this section. An assumption of cause (e.g., improper lifting) from the injury (low back pain) is not acceptable.

Basic Causes: Like the Immediate Causes, use the guide words in the attachment whenever appropriate and explain. For example, improper motivation may be because the correct way takes more time or effort; short cutting standard procedure is tolerated or positively reinforced; or the person thinks there is no personal benefit to always doing the job correctly.

Note: The investigator is encouraged to review the Practical Loss Control Leadership chapters on *Causes and Effects of Loss* and *Accident/Incident Investigation* before doing the causal analysis. As a check, the investigator may refer to the S.C.A.T. Chart available from the PESM.

Remedial Actions: Include all actions taken or those that should be taken to prevent recurrence. Be sure that actions address the causes. For example, training (safety meetings) may be a necessary response for lack of knowledge, but may be inadequate for improper motivation. If completion dates exceed the 72 hours reporting period, a revised report must be submitted when all remedial actions are complete.

Persons Performing Investigation: The primary investigator is the Supervisor in charge of the work where the incident occurred. Others participating in the investigation, such as the Project Manager, ESS, QC, site engineer, foreman, etc. should also sign the report.

Management Review: The Project or Office Manager and the PESM or office ESC must sign the report indicating their satisfaction with thoroughness of the investigation and the report, and their concurrence that the action items address the identified causes. This constitutes the peer review, and the report, particularly the description, should be clear to readers not familiar with the project or incident.

TETRA TECH EC, INC.

SITE SAFETY PLAN CHANGE APPROVAL FORM

N62473-06-D-2201 **CTO: 015**

Date ______________________ **Amendment Number** __________

Project Name: ______________________ **Project Number:** __________

Section of SHSP: ______________________ **Page Number:** __________

Change to read: ______________________

Reason for change: ______________________

Approvals: ______________________

Project Superintendent or Manager

____

SHSS

____

PESM (CIH)

ATTACHMENT 3

ACTIVITY HAZARD ANALYSES

ACTIVITY HAZARD ANALYSIS (AHA) #1

Mobilization and Site Setup

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
1. Set up work areas.	Workers could be exposed to chemical hazards.	Delineate exclusion zones and use PPE as required by the type of material being used. Refer to MSDSs. Ambient air monitoring and visual observation will be used to verify selection of PPE. Identify all chemical hazards and receive training (MSDSs) regarding safe handling of chemicals. The SHSS will file copies of all MSDSs at site.
	Noise from site setup could cause hearing loss.	Hearing protection is required when sound levels exceed 85 dBA continuously. Usually this will only be for workers working in unenclosed cabs of heavy equipment or ground workers working near heavy equipment.
	Slip, trip, and fall hazards could be present.	Work areas will be visually inspected and slip, trip, and fall hazards will be marked, barricaded, or eliminated, if feasible. Work area will be kept neat and in an orderly state of housekeeping. Supplies will always be placed in areas away from normal foot traffic. Equipment and tools will always be placed in a safe location and will not present a trip hazard to nearby workers. Maintain proper illumination in all work areas. Work is authorized normally during daylight hours only. Refer to EHS Procedure 3-8, Fall Protection.
	Sharp objects could cause punctures.	Wear cut-resistant work gloves when sharp edges or other objects may cause the possibility of lacerations or other injury. When possible, sharp edges will be blunted. Workers should not stand or walk on equipment or supplies.
	Strains from manually moving materials and equipment could occur.	Personnel will be directed to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand truck will be encouraged. Employees will not lift more than 50 pounds. Obtain assistance from another worker or use a mechanical device. Refer to EHS Procedure 3-1, Ergonomics.
	Workers could be exposed to extreme temperatures.	Monitor for heat stress in accordance with EHS Procedure 4-6, Temperature Extremes. Provide fluids and rest breaks during warm weather and while wearing impermeable protective clothing.
	Eye hazards could be present.	Safety glasses are the minimum required eye protection for all work areas.

ACTIVITY HAZARD ANALYSIS (AHA) #1

Mobilization and Site Setup

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
Set up work areas (continued).	Electrocution could occur from generator used to power site trailer or power tools.	Only qualified electricians are allowed to hook up or disconnect electrical circuits. Follow lock-out/tag-out protocols. Inspect all extension cords daily for structural integrity, ground continuity, and damaged areas. Extension cord must be rated for hard usage or extra hard usage (Table 400-4, National Electrical Code). Inspect extension cord connection. Use GFCIs on all outdoor 115- to 120-volt, 20-ampere or less circuits. Elevate or cover electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching (cover only in accordance with National Electrical Code requirements). Keep plugs and receptacles out of water, unless they are approved, submersible types. Ground all electrical circuits in accordance with the National Electrical Code or other applicable standards and regulations. If a generator is used, be sure it is a type that does not require grounding. If it requires grounding, follow manufacturer's directions. National Electrical Code 250-6 lists the exceptions for grounding portable and vehicle-mounted generators.
	Lack of communication in widely dispersed areas could lead to delayed response in an emergency.	Ensure that each work team has a telephone or access to a telephone for communication. In addition, workers must have a 2-way radio that can contact someone who has access to a phone if they are not in line of sight of other workers. If more than one team at a time is working, ensure that there is communication between the work teams and project management. Use the buddy system.
	Workers could be struck by or against heavy equipment.	Wear high-visibility reflective vests when exposed to vehicle traffic. Make eye contact with operators before approaching equipment. Understand and review posted hand signals. Traffic barricades, signs, flags, and backup spotters will be used during field activities.
2. Install barricades and other support structures.	Improper use of power and hand tools could cause injury or damage tools.	Inspect all tools before each use. Personnel will be trained in the proper use of hand tools. All power tools will be grounded, protected by GFCI, or double-insulated.
	Material handling could cause injury.	Identify and avoid pinch points. Maintain communication with others involved in material handling. Use appropriate PPE.
	Strains from handling materials could occur.	Personnel will be directed to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand trucks will be encouraged. Personnel will work at a steady pace. Refer to EHS Procedure 3-1, Ergonomics.

ACTIVITY HAZARD ANALYSIS (AHA) #1

Mobilization and Site Setup

Analyzed By: R. Margotto

Equipment to be Used	Inspection Requirements	Training Requirements
Heavy equipment, hand tools	Daily and before use. Use form provided in plan.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles-licensed personnel will operate trucks. Specific training for power tools, hand tools, and electrical safety is required.

Notes:

AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
dBA – decibels, A-scale
EHS – Environmental Health and Safety
GFCI – ground fault circuit interrupter
MSDS – Material Safety Data Sheet
PPE – personal protective equipment
SHSS – Site Health and Safety Supervisor

ACTIVITY HAZARD ANALYSIS (AHA) #2

Trailer Installation at Alameda Point

Created by: Jennifer Amdursky **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
The intent of this AHA is to implement safe procedures for trailer installation.		
1. Identify driver requirements prior to trailer delivery.	Lack of tractor/trailer inspection could lead to citations or tickets.	Ensure that driver has a current commercial driver's license.
2. Locate utility lines.	Contact with above and below ground utilities could cause property damage or injury.	Make sure all above and below ground utilities have been identified. Review as-built drawings and conduct a ground survey.
3. Oversee truck arriving at selected site.	Location could be unstable or unable to appropriately support the trailer.	Locate trailer on a surface that is stable.
4. Oversee truck positioning trailer into selected area.	Truck or trailer could hit someone or something.	Use spotters when positioning trailer. Ensure that spotters know how to communicate with driver of truck.
5. Make sure truck is secured.	Truck and trailer could roll.	Set parking brake and chock wheels to prevent truck and trailer from rolling.
6. Unhook trailer.	Improper placement could cause trailer jack to fail.	Ensure that trailer jack is working properly and is placed on stable ground or cribbing.
	Trailer could fall off hitch.	Ensure that nonessential personnel stay clear of operation.
7. Level trailer.	Back injuries, trip hazards, and falls could result from leveling trailer.	Use correct lifting techniques and be aware of potential hazards.
8. Secure trailer.	Contact with above and below ground utilities could cause property damage and injury.	Make sure that all above and below ground utilities have been identified.
9. Install anchors.	High winds could tip over trailer.	Ensure that trailer is anchored according to recommended procedures.
	Noise and sharp edges could result from installing anchors.	Ensure that hearing and hand protection are worn when installing anchor straps.
10. Install stairs.	Door clearances may not line up properly keeping door from opening/ closing or may present trip hazards.	Ensure that swing radius of door and stair platform; maintain a 21-inch clearance.
	Doors could blow open during high winds and strike on-site personnel.	Ensure that doors are equipped by a restraint system.
	Failure to comply with OSHA could result in injury or property damage.	Ensure that stairs, hand rails, mid rails and platform meet OSHA standards.
11. Secure stairs.	Unstable stairs could cause trip or fall hazards.	Ensure that stairs are anchored to the trailer or ground.
12. Run cables for electrical hookup of trailer.	Cables could cause trip hazards.	Carefully unroll cables. Place cables in holders and mark any trip hazards.
	Cables could be energized.	Ensure that cables are not connected to live sources.
13. Connect electrical hookup to trailer.	Contact with energized source could cause electrocution.	If possible, de-energize the source connection so that wiring can be performed safely.
	Cables could be energized.	Ensure that cables are not connected to live sources.
14. Install generator – inspect generator upon delivery.	Defective generator could cause injuries or electrocution.	Ensure that there is an operator's manual. Follow the manual regarding inspection procedure.

ACTIVITY HAZARD ANALYSIS (AHA) #2

Trailer Installation at Alameda Point

Created by: Jennifer Amdursky **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
15. Set up generator.	Generator could move if it is not on stable ground or wheels are not chocked.	Position unit using spotters. Place wheel chocks under wheels so that generator cannot move when it is position.
	Workers could be hit by unit as it is placed into position.	When jack is dropped to raise the generator off the trailer hitch, ensure that hands are away from pinch points and that feet are positioned away.
	Workers could be injured by jack, especially if jack is placed in soft soil.	Use cribbing to provide a solid stable surface if necessary.
	Failure to ground generator could cause workers to be electrocuted.	Ensure that unit is internally grounded per National Electrical Code or that unit is grounded using the approved grounding rod and that the rod is installed per the National Electrical Code.
16. Connect lines to generator.	Connection while the lines are energized or the generator is on could cause electrocution of workers.	Turn off generator before installing lines. No live electrical work is permitted at any time during installation of power to the trailer.
17. Power up generator.	Failure to follow manufacturer's directions could damage the generator or cause electrocution.	Follow manufacturer's directions.
	Excessive noise could result from the operation of the generator motor.	Wear hearing protection in vicinity of generator.
18. Refuel generator.	Improper refueling could cause fires.	Refuel only when the unit is off and the engine is slightly cool.
	Fuel could spill and cause environmental damage or worker exposure.	Refuel only in a designated area and have spill control materials available. Workers should wear PPE.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles	Daily and before use. Use equipment safety checklist.	Only licensed personnel will operate vehicles.
Generator, if used	Daily and before use. Use inspection checklist provided by manufacturer.	Only trained personnel may operate generator. Only qualified electricians may work on electrical components of system.
Equipment, hand tools	Inspect all equipment and tools before each use.	Specific training for power tools and hand tools will be provided.

Notes:

AHA – activity hazard analysis
CIH – Certified Industrial Hygienist
OSHA – Occupational Safety and Health Administration
PPE – personal protective equipment

ACTIVITY HAZARD ANALYSIS (AHA) #3

Clearing and Grubbing for Alameda Point

Created by: Cliff Stephan, CHP **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
The intent of this AHA is to remove and or clear any trees, shrubs, bushes etc., at Alameda Point. Clearing and grubbing may involve the following pieces of equipment: chipper/shredders, brush hog, mowers, chain saw, weed cutters, axes, and backhoes.		
1. Inspect work area.	Failure to inspect work area may result in trips and falls from the same level.	Ensure that work area is free from potential trip hazards and that only a minimum of authorized personnel are permitted in the work zone.
	Local vehicle traffic could strike and injure surveyors and field crew.	Ensure that all individuals participating in the field activities wear reflective vests. Workers will not work in street areas unless flaggers, signs, barricades and/or cones are used.
2. Inspect first aid kit, eye wash station, and fire extinguisher.	Failure to have proper medical supplies during emergency could result in inadequate treatment of personnel or potentially increase injuries.	Ensure that first aid kit contains all necessary supplies and that eye wash station is capable of supplying a 15-minute steady supply of solution.
3. Inspect equipment daily.	Failure to conduct daily inspection of equipment may cause injury to personnel and or property damage.	Ensure that all operating components, parts, systems, and mechanisms will operate as intended and inspected by a qualified person. Ensure that a copy of the inspection form is available and on file.
4. Locate utilities.	Failure to identify underground, as well as overhead hazards, may result in personal injury and or property damage.	Ensure that USA has identified all underground utilities prior to any clearing or grubbing. The contact number for northern California is 1-800-642-2444.
	See AHA #7 on Geophysical Survey	
5. Use heavy equipment.	Workers could be struck by or against heavy equipment.	Wear high-visibility outerwear. Make eye contact with operator (with acknowledgement) prior to approaching any heavy equipment. Review and understand posted hand signals. Use signs, flags, and spotters.
	Contact with radioactive-contaminated equipment could contaminate personnel.	Wear appropriate PPE identified in the Health and Safety Plan. Ensure that good hygiene practices are followed such as washing thoroughly prior to eating meals.
	Workers could be exposed to dust, potentially biologically contaminated dust, radioactive dust, chemically contaminated dust, and asbestos-contaminated dust.	Minimize the area that is to be disturbed for sampling. Wear Level D PPE.
6. Use chain saw during clearance operations.	Workers could be struck by flying debris or be struck by or against equipment.	Follow manufacturers' recommended guidelines for safe operation of equipment. Wear chaps if operating a chain saw. Ensure that saw has not been "rigged" to stay in the "on" position --- saw must automatically shut off when the trigger is released.

ACTIVITY HAZARD ANALYSIS (AHA) #3

Clearing and Grubbing for Alameda Point

Created by: Cliff Stephan, CHP **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
7. Fuel equipment.	Workers may come into contact with fuel when refueling.	Review MSDS prior to handling fuels. Follow instructions on bonding and grounding. Wear appropriate PPE. Take precautions to prevent spills from occurring. Fuel only in designated areas that have spill protection and control. Have spill kits available and clean up all spills immediately.
8. Use mowers and brush hogs.	Refueling may cause spills and fire. Operation of equipment may cause debris to fly out from the decking area. Mower and or towing unit for brush hog may tip over while being operated.	Refuel equipment on a level surface after engine has cooled. Do not smoke while refueling. Wear proper PPE including hearing protection. Ensure that other individuals maintain safe distances while equipment is in operation. Ensure that equipment checks are completed daily and follow manufacturer guidelines. Never ride or pull equipment along the horizontal plane of a steep slope. Ride perpendicular to the grade. Operate at safe speeds. Be observant for pits, depressions, large rocks and any other object that can destabilize equipment.
9. Load and haul materials.	Workers could be struck by limbs, branches, etc.	Do not walk under suspended loads. Ensure that all waste material is compatible and acceptable for proper disposal.
10. Demobilize.	Slip, trips, falls, pinch points, back and muscle strain could occur.	Use proper lifting techniques when demobilizing. Be aware of pinch points and use leather gloves. Get help with loads of 50 or more pounds.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles	Daily and before use. Use equipment safety checklist.	Only licensed personnel will operate vehicles.
Chain saws	Inspect saw according to manufacturer's directions. Especially inspect the cutting chain.	Operator must have documented training and proficiency.
Equipment and hand tools	Inspect equipment and tools before each use.	Training on use of specific equipment such as weed wackers and mowers (if used) will be provided. Worker must have general knowledge on the use of hand tools.

Notes:

AHA – Activity Hazard Analysis
CHP – Certified Health Physicist
CIH – Certified Industrial Hygienist
MSDS – Material Safety Data Sheet
PPE – personal protective equipment
USA – Underground Services Alert

ACTIVITY HAZARD ANALYSIS (AHA) #4

Transportation and Disposal

Created by: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
Once soil is removed and characterized, it is placed into separate stockpiles. Each stockpile is ultimately managed for proper disposal		
1. Load and haul soil.	Workers could be struck by or against heavy equipment or trucks.	Establish and follow traffic control procedures outlined in the TCRA Work Plan. Wear reflective warning vests. Avoid equipment swing areas, and designated traffic routes. Make eye contact with operators before approaching equipment or trucks. Understand and review posted hand signals. Use spotters and flaggers as necessary to direct trucks as well as any nearby traffic.
	Drivers of trucks could be injured by loads as they are being placed in trucks.	Prohibit truck drivers from standing near trucks as they are being loaded. Prohibit truck drivers from sitting in the cab of trucks as they are being loaded, unless the truck is equipped with a cab protector (FOPS). Load trucks so that dust generation is minimal, by dropping the load as close as possible to the top of the truck.
	Dirt and dust can accumulate on roads used for transport of material.	Brush off trucks before they enter a paved road. Tarp truck or load truck in such a manner to prevent dirt and dust from getting onto paved roads.
2. Manage stockpile.	Stockpiles could create dust while soil is being stored.	Cover all stockpiles at the end of each day. Use dust suppression during operational hours.
	Improper stockpile management could cause workers to be injured by material falling from stockpile.	Spoil banks, stockpiles, and equipment must be at least 3 feet away from the excavation. Avoid climbing on stockpiles. Cover all stockpiles to minimize generation of dust. Avoid walking on plastic covers of stockpiles as they will be slippery, especially if wet. Do not lift more than 35 pounds when handling sandbags to secure cover. Use safe lifting techniques when handling sandbags. Do not toss sandbags. Use mechanical assistance whenever possible.
3. Load truck from stockpile.	Loaders operate quickly with loaders operating in reverse a large amount of the time and may hit other equipment or workers on ground.	If workers on the ground must be in the vicinity of the stockpiles, they must maintain visual contact with the operator at all times. Operator must use good judgment in operating loader by weighing safety factors over productivity. Operators must look in the direction they are traveling. Loaders must load trucks from sides and not the rear of the truck.
	Workers must climb stockpile to remove sandbags and walk on plastic sheeting. Workers could slip and workers could injure themselves by lifting sandbags improperly.	Watch step when walking on stockpile. Use boots with slip-resistant soles. Do not bend over to pick up sandbags. Bend at the knees to lift sandbags. No sandbag should exceed 35 pounds. Do not toss sandbags to the side. Always keep sandbags in front of body. Avoid twisting at waist.
	While loading or picking up the plastic sheeting, dust could be released.	Provide dust control. Avoid handling plastic sheeting during periods of wind in excess of 15 miles per hour. Be sure a tarp is placed over truck before truck leaves stockpile area.

ACTIVITY HAZARD ANALYSIS (AHA) #4

Transportation and Disposal

Created by: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
4. Haul materials.	Workers could be struck by or against heavy equipment or trucks.	Establish and follow traffic procedures outlined in the TCRA Work Plan. Wear reflective warning vests. Avoid equipment swing areas and designated traffic routes. Make eye contact with operators before approaching equipment or trucks. Understand and review posted hand signals. Use spotters and flaggers, as necessary, to direct trucks, as well as any nearby traffic.
	Drivers of trucks could be injured by loads as they are being placed in trucks.	Prohibit truck drivers from standing near trucks as they are being loaded. Prohibit truck drivers from sitting in the cab of trucks as they are being loaded, unless the truck is equipped with a cab protector (FOPS).
	Dirt and dust can accumulate on roads used for transport of material.	Brush off trucks before they enter a paved road. Tarp or load truck in such a manner to prevent dirt and dust from getting onto paved roads.
5. Management of water, sludge, contaminated soils, debris and PPE, etc.	Handling of drums can expose workers to injury.	If handling drums, use a drum dolly, a pallet on a forklift, or a drum grabber attached to a backhoe or excavator to move the drums into storage. If handling drums, inspect the path that the drum must be moved over. Ensure that there are no ruts or other obstacles that can cause the drum to tip over or be difficult to handle over the surface being traversed. Place drums in an approved storage area. When manually handling drums, avoid placing hands between drums, since you may pinch your fingers. Wear leather work gloves. If drums have to be manually positioned, be sure you know how to "break and roll" a drum. Avoid manually positioning drums if at all possible. Only one person should break and roll a drum if it must be manually moved without mechanical assistance.
	Loading drums on trucks could injure workers.	Use a truck that has a Tommy Lift and move the drum onto the lift using a drum dolly. Be sure the drum is secured and will not roll when the lift is raised. Wheel the drum to the best location on the truck for transport. Be sure to evenly distribute the weight of the load on the bed of the truck. Secure drums in place on the truck. If drums are loaded with a drum handling device attached to a backhoe or excavator, stand away from the truck when the drum is placed on the truck. Once the drum is placed and the loader moves away from the truck, use a drum dolly on the truck to position the drum. Avoid placing pallets of drums on a truck unless the pallets can be positioned where they are going to remain for transport. It is very difficult to move loaded pallets manually.
	Containers may leak.	Inspect all containers on a regular basis (weekly for non-hazardous material; daily for hazardous material). Have spill cleanup supplies and equipment readily available. Surface may become slippery. Wear work boots with good traction soles. Avoid exposure to the material. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.

ACTIVITY HAZARD ANALYSIS (AHA) #4

Transportation and Disposal

Created by: Roger Margotto, CIH

Equipment to be Used	Inspection Requirements	Training Requirements
Heavy equipment, dump trucks	Daily or before use. All equipment must be inspected and certified by a competent mechanic.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicle-licensed personnel will operate trucks.
Tarping rack	Inspect all parts before installation. Inspect unit each day of use.	Competent person must supervise erection of the rack. All personnel using rack must be trained in its use.
Pumps and hoses	Inspect all pumps and hoses before use. Inspect daily and before each use. Especially check the connections of hoses for leaks.	Personnel must be trained in the operation of the pumps. Personnel will be trained in the methods for proper and safe connection of hoses.

Notes:

AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
FOPS – falling object protective system
PPE – personal protective equipment
TCRA – time-critical removal action

ACTIVITY HAZARD ANALYSIS (AHA) #5

Stockpile Management

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
1. Load and haul.	Workers could be struck by or against heavy equipment or trucks.	Establish and follow the traffic procedures outlined in the TCRA Work Plan. Wear reflective warning vests. Avoid equipment swing areas, and designated traffic routes. Make eye contact with operators before approaching equipment or trucks. Understand and review posted hand signals. Use spotters and flaggers as necessary to direct trucks, as well as any nearby traffic.
	Truckers and ground workers could be struck by load as it is loaded.	Prohibit truck drivers from standing near trucks as they are being loaded. Prohibit truck drivers from sitting in the cab of trucks as they are being loaded, unless the truck is equipped with a cab protector (FOPS). Load trucks so that dust generation is minimal, by dropping the load as close as possible to the top of the truck.
	Dirt and dust can accumulate on roads used for transport of material.	Brush off trucks before they enter a paved road. Tarp truck or load truck in such a manner to prevent dirt and dust from getting onto paved roads.
2. Manage stockpile.	Stockpiles could create dust while soil is being stored.	Cover all stockpiles at the end of each day. Use dust suppression during operational hours.
	Improper stockpile management could cause workers to be injured by material falling from stockpile.	Spoil banks, stockpiles, and equipment must be at least 3 feet away from the excavation. Avoid climbing on stockpiles. Cover all stockpiles to minimize generation of dust. Avoid walking on plastic covers of stockpiles, as they will be slippery, especially if wet. Do not lift more than 50 pounds when handling sandbags to secure cover. Use safe lifting techniques when handling sandbags. Do not toss sandbags. Use mechanical assistance whenever possible.
3. Load truck from stockpile.	Loaders operate quickly, with loaders operating in reverse a large amount of the time. Ground workers might not be seen. Debris may hit other equipment or workers on ground.	If workers on ground must be in the vicinity, they must maintain visual contact with the operator at all times. Operator must use good judgment in operating loader by weighing safety factors over productivity. Operators must look in the direction they are traveling. Loaders must load trucks from sides and not the rear of the truck.
	Workers must climb stockpile to remove sandbags and walk on plastic sheeting. Workers could slip and workers could injure themselves by lifting sandbags improperly.	Watch step when walking on stockpile. Use boots with slip-resistant soles. Do not bend over to pick up sandbags. Bend at the knees to lift sandbags. No sandbag should exceed 35 pounds. Do not toss sandbags to the side. Always keep sandbags in front of body. Avoid twisting at waist.
	While loading or picking up the plastic sheeting, dust could be released.	Provide dust control. Avoid handling plastic sheeting during periods of wind in excess of 15 miles per hour. Be sure a tarp is placed over truck before truck leaves stockpile area.

ACTIVITY HAZARD ANALYSIS (AHA) #5

Stockpile Management

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
4. Haul soil.	Workers could be struck by or against heavy equipment or trucks.	Establish and follow a Traffic Control Plan. Wear reflective warning vests. Avoid equipment swing areas and designated traffic routes. Make eye contact with operators before approaching equipment or trucks. Understand and review posted hand signals. Use spotters and flaggers, as necessary, to direct trucks, as well as any nearby traffic.
	Drivers of trucks could be injured by loads as they are being placed in trucks.	Prohibit truck drivers from standing near trucks as they are being loaded. Prohibit truck drivers from sitting in the cab of trucks as they are being loaded, unless the truck is equipped with a cab protector (FOPS).
	Dirt and dust can accumulate on roads used for transport of material.	Brush off trucks before they enter a paved road. Tarp or load truck in such a manner to prevent dirt and dust from getting onto paved roads.

Equipment to be Used	Inspection Requirements	Training Requirements
Hand tools	Daily and before use.	Specific training for hand tools.
Heavy equipment, dump trucks. Tarping rack, loader	Daily or before use. All equipment must be inspected and certified by a competent mechanic.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicle-licensed personnel will operate trucks.

Notes:

AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
FOPS – falling object protective system

ACTIVITY HAZARD ANALYSIS (AHA) #6

Screening Soil with Trommel Screen Plant

Analyzed B: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
1. Start up screen plant.	Workers could be struck by screening plant.	Utilize Level D PPE as a minimum: safety shoes, safety glasses, hard hat, and traffic vest in area around Trommel. Level C PPE will be required in the EZ during site operations. The Trommel shall be free of obstructions prior to startup. Employees shall be trained as to the manufacturer-recommended startup/operating procedures prior to commencing work. All conveyors and Trommels will have emergency stops. If used, conveyors will have emergency stops along the length of the conveyor. Personnel shall be clear of the Trommel discharge points and conveyor prior to starting. Ensure that all guards are secure and in place prior to starting. No guards shall be removed unless proper lockout procedures are implemented. Personnel will not climb onto the Trommel when it is in operation. Personnel shall know the location of the "kill switch" (emergency stop button). Position the conveyors and Trommel in a downwind location to minimize dust exposure. Ensure that legs for stabilization are positioned correctly and safety pins are in place. Sound an alarm prior to the start up of the Trommel or conveyors.
	Workers could suffer heat exhaustion or stroke.	Heat stress prevention will be implemented under guidelines established in EHS Procedure 4-6, Temperature Extremes.
2. Conduct Trommel operation.	Workers could be struck by throwback of materials.	Material shall be added using excavator/loader/heavy equipment only. All conveyors will have guards protecting workers from all moving parts. Operator loading material shall have the remote control device, if available. Employees shall never place hands, arms, feet, legs or any other body part within the limits of the feed hopper when the Trommel is in operation. All employees working around the conveyors and Trommel will eliminate loose clothing and jewelry. ANSI-approved safety glasses and face shields shall be worn to protect workers from projectiles ejected from Trommel discharge points. If conveyors are used, all workers shall stay clear of the conveyor chutes. The work area shall be secured to prevent unauthorized personnel from entering during operation. Material to be screened shall be moist to reduce dust produced. Have water trucks mist materials on a regular basis.
	Contact with exposed gears or pulleys could cause injury.	Install guards around all exposed gears and pulleys. Ensure that all operators are trained in accordance with manufacturer's operation and maintenance manual. Comply with all safety directives contained therein. Utilize lockout/tag-out equipment procedures per TtEC's EHS Procedure 6-4 and manufacturer's recommendation during maintenance work. Clear area and sound alarm before startup. Note: before initial plant startup, the plant will be inspected by the SHSS, SUXOS and the Site Superintendent or designee. All ground personnel will wear reflective safety vests.

ACTIVITY HAZARD ANALYSIS (AHA) #6

Screening Soil with Trommel Screen Plant

Analyzed B: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
Conduct Trommel operation (continued).	Workers could be exposed to noise.	Use hearing protection.
	Falling from equipment taller than 6 feet could cause injury.	Wear personal fall protection and ensure that workers are trained in using this equipment.
	Workers could be exposed to flying debris.	Avoid working too close to unit. Wear hard hat and safety shield.
	Workers could be exposed to dust	Use dust control measures. Assess dust levels. Wear respiratory protection if dust levels exceed 0.5 mg/m^3 as measured by a miniRAM®.
	Workers could be exposed to fire/explosion.	Stop the Trommel if MPPEH is discovered by UXO Technicians observing Trommel operations. Inspect and remove MPPEH if safe to move.
	Workers could be struck by or against heavy equipment.	Wear high-visibility reflective vests when exposed to vehicle traffic. Make eye contact with operators before approaching equipment. Understand and review posted hand signals. Traffic barricades, signs, flags, and backup spotters will be used during field activities.
	Biological hazards could be present.	Proper PPE will be worn (long-sleeved and light-colored coveralls/Tyvek) to avoid skin contact with contaminated soil, plants or other irritants. Personnel will be instructed on how to recognize hazardous species (i.e., ticks, spiders and snakes).
	Material handling could cause injury.	Identify and avoid pinch points. Maintain communication with others involved in material handling. Use appropriate PPE.
3. Shut down screen plant.	Accidental startup of screen could occur.	Trommel shall be equipped with a locking device on the ignition system or lockout/tag-out procedures will be followed to prevent unauthorized startup of equipment.
4. Maintain screen plant.	Workers could be struck by debris.	Lockout/tag-out procedures outlined in EHS Procedure 6-4 will be followed to prevent accidental startup of machines. All personnel will be given proper instruction on lock-out/tag-out procedures. All machinery will be shut down prior to maintenance. Additionally, Trommel must come to a complete stop and the Trommel drum locked in position after shut down prior to commencing maintenance operations.
5. Relocate screen plant.	On uneven terrain, the screen could roll after detachment.	Trommel will be located on even terrain free of obstruction. Trommel will be checked and otherwise secured prior to beginning activities.

ACTIVITY HAZARD ANALYSIS (AHA) #6

Screening Soil with Trommel Screen Plant

Analyzed By/Date: Roger Margotto, CIH

Equipment to be Used	Inspection Requirements	Training Requirements
Trommel and conveyor	Daily, before use.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles-licensed personnel will operate trucks. Operators of the Trommel will have reviewed and understand the operation of the Trommel. A pre-startup inspection with a safety professional is required.
Loader, backhoe, water truck, bulldozer	Daily, before use.	Specific training on rigging is required, if chains, wire ropes or slings are used to lift material into feed hopper. Operators will have specific training on the use of the equipment they are operating and the Site Supervisor will document the authority of the operator to operate each specific piece of equipment. Operator's manuals for each piece of equipment will be on site.

Notes:

ANSI – American National Standards Institute
CIH – Certified Industrial Hygienist
EHS – Environmental Health and Safety
EZ – exclusion zone
mg/m^3 – milligrams per cubic meter
MPPEH – munitions possibly presenting an explosive hazard
PPE – personal protective equipment
SHSS – Site Health and Safety Specialist
SUXOS – Senior Unexploded Ordnance Supervisor
UXO – unexploded ordnance

ACTIVITY HAZARD ANALYSIS (AHA) #7

Geophysical Survey

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
1. Conduct geophysical survey.	Slips, trips, and falls could occur during survey.	Work areas shall be visually inspected and slip, trip, and fall hazards shall be marked, barricaded, or eliminated, if feasible. Use care in work area; look for depressions and obstructions. Employees shall only be allowed to work on walking/working surfaces that have the strength and integrity to support employees safely. Look out for ground squirrel holes. Openings 18 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded.
	Workers could suffer heat exhaustion or stroke.	Heat stress prevention will be implemented under guidelines established in EHS Procedure 4-6, Temperature Extremes.
	Workers could be struck by vehicles in traffic area.	Wear high-visibility reflective vest. Post an observer, as needed, when surveyor is using instruments. (A surveyor is often focused on the task and may not be aware of nearby traffic.) Use traffic control or barricades, if necessary, to keep traffic away from workers.
	Handling of instruments can cause strain to worker.	Carry instruments as required by the manufacturer of the instrument. Use straps when provided and adjust for comfort. Use care when walking so that there are no sudden jerks or mis-steps that can cause the worker to strain to maintain control of the instrument. Get assistance from other workers if several instruments must be carried.
	Use of spray paint to mark underground utilities and anomalies could expose employees to paint fumes or the paint itself.	Follow manufacturers' instructions on use of paint. Review MSDS. Never point paint toward another person.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles, equipment, hand tools.	Daily and before use.	Only Department of Motor Vehicles-licensed personnel will operate vehicles. Specific training for power tools, hand tools, and survey instruments will be provided.

Notes:

CIH – Certified Industrial Hygienist
MSDS – Material Safety Data Sheet
PPE – personal protective equipment

ACTIVITY HAZARD ANALYSIS (AHA) #8

Intrusive Investigation

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/ Health Hazards	Recommended Controls
1. Perform intrusive investigation using equipment, tools and detection instruments.	There is potential exposure to workers from chemical hazards.	Delineate exclusion zones and use PPE specified in SHSP. (Level D) Visual observation shall be used to verify selection of PPE. Identify all chemical hazards and receive training (MSDS) regarding safe handling of chemicals. The SHSS will file copies of all MSDSs at the site. Look out for chemical hazards located in debris and rubble.
	Workers could be exposed to noise.	Hearing protection is required when sound levels exceed 84 dBA continuously.
	Biological hazards such as snakes, insects, or spiders could cause injury or bites.	Wear PPE. Look carefully for snakes before stepping into any area or before placing hands near the ground. Watch out for snakes when disturbing rubble or debris. Use insect repellant as necessary.
	Slip, trip, and fall hazards could be present.	Work areas shall be visually inspected and slip, trip, and fall hazards shall be marked, barricaded, or eliminated, if feasible. Use care in work area; look for depressions and obstructions. Refer to EHS Procedure 3-8, Fall Protection. Use care if it is necessary to walk on debris and rubble Open holes should be barricaded or marked.
	Sharp objects could cause punctures.	Wear cut-resistant work gloves when sharp edges or other objects may cause the possibility of lacerations or other injury. When possible, sharp edges will be blunted. Workers should avoid walking on rubble, especially where there is rebar. Worker should wear steel toe boots with steel shanks.
	Strains from manually moving materials and equipment could occur.	Personnel shall be directed to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand truck shall be encouraged. Employees will not lift more than 50 pounds. Refer to EHS Procedure 3-1, Ergonomics.
	Improper use or poorly maintained power and hand tools could cause injury.	Inspect all tools before each use. Discard or tag out any tool that is not safe, has broken handles, patched handles, missing guards, and so forth. Personnel will be trained in the proper use of hand and power tools. If power tools are connected to power sources other than batteries, the tools will be grounded or double-insulated and connected to a GFCI outlet.
2. Conduct MPPEH operations.	Workers could come into contact with MPPEH materials.	Evacuate all non-essential personnel from the area before beginning operations. Conduct operations only under the direct supervision of qualified UXO personnel. Use remote sensing equipment when available to detect MPPEH. Performed by UXO-qualified personnel only. Conducted via visual detection and/or use of probes.

ACTIVITY HAZARD ANALYSIS (AHA) #8

Intrusive Investigation

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/ Health Hazards	Recommended Controls
Conduct MPPEH operations. (Continued)	Handling of MPPEH could cause explosion.	Ensure the SUXOS is present and handling of MPPEH is performed by only UXO-qualified personnel. Should an explosion occur, notify SUXOS. Allow only UXO-qualified personnel on site. Under no circumstances will personnel work alone. Keep all spark and flame producing materials away from energetic materials. Do not handle ammunition and explosives roughly or carelessly. Extra care should be taken, because in most cases the hazards of the ammunition and/or explosives increase with age, deterioration, or damage. Take appropriate precautions to minimize the potential of electrostatic energy. Conduct operations only under favorable weather conditions.
	Slips, trips and falls could occur.	Identify, remove, and avoid slip/trip/fall hazards at the start of work. Wear high-traction boots. Practice good housekeeping.
	Workers could be struck by heavy equipment.	Use back-up alarms and spotters to avoid injury. Always make eye contact with the operator before approaching. Never approach from the operator's blind side.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles, equipment, hand tools, metals detecting instruments	Daily and before use. Use equipment safety checklist.	Only Department of Motor Vehicles-licensed personnel will operate vehicles. Specific training for power tools and hand tools will be provided.

Notes:

CIH – Certified Industrial Hygienist
dBA – decibels, A-scale
EHS – Environmental Health and Safety
GFCI – ground fault circuit interrupter
MPPEH – material potentially presenting an explosive hazard
MSDS – Material Safety Data Sheet
PPE – personal protective equipment
SHSS – Site Health and Safety Specialist
UXO – unexploded ordnance
SUXO – Senior Unexploded Ordnance Supervisor

ACTIVITY HAZARD ANALYSIS (AHA) # 9

Material Potentially Presenting an Explosion Hazard

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
1. Geophysical Survey (See AHA #7)	Carrying heavy survey equipment could cause injury.	Use proper lifting techniques when carrying equipment. Take frequent rest breaks. Share the load.
2. Intrusive Operations	Contact MPPEH materials could cause injury.	Evacuate all non-essential personnel from area before any intrusive operations. Use remote sensing equipment to detect UXO. Mark and avoid positive targets.
	Hand excavation could unearth MPPEH.	Use probes prior to use of hand tools. Hand excavation will be performed by UXO-qualified personnel only.
	Backhoe excavation could unearth MPPEH.	Remove only the soil 12 inches from the identified item. Excavation will be supervised only by a SUXOS. Stockpile spoils no closer than 3 feet to the edge of the excavation.
	Handling MPPEH could cause unplanned detonation.	Ensure that the SUXOS is present. Handling of MPPEH will be performed by a UXO-qualified person only. Under no circumstances will personnel work alone. Keep all spark- and flame-producing materials away from energetic materials. Do not handle ammunition and explosives roughly or carelessly. Extra care should be taken because in most cases, the hazards of the ammunition and/or explosives increase with age, deterioration, or damage.
	Improper explosive transport vehicle operation could cause injury.	Driver training is required. Ensure that vehicle meets the requirements of 49 CFR, Parts 100 to 199 and is operated under the guidance of NAVSEA OP-2239. Only the driver and one helper shall ride in a vehicle transporting explosive material.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles, equipment, hand tools	Daily and before use. Use the equipment safety checklist.	Only Department of Motor Vehicles-licensed personnel will operate vehicles. Specific training for power tools and hand tools will be provided.

Notes:

AHA – Activity Hazard Analysis
CFR – Code of Federal Regulations
CIH – Certified Industrial Hygienist
MPPEH – material potentially presenting an explosive hazard
NAVSEA – Naval Sea Systems Command
SUXOS – Senior Unexploded Ordnance Supervisor
UXO – unexploded ordnance

ACTIVITY HAZARD ANALYSIS (AHA) #10

Sampling Activities at Alameda Point

Created by: Cliff Stephan, CHP **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
The intent of this AHA is to sample areas of IR Sites 1, 2 and 32. Sampling may include but not be limited to area, personal, bulk, random, and swipe samples.		
1. Inspect work area.	Failure to inspect work area may result in trips and falls from the same level due to uneven work surfaces.	Ensure that work area is free from potential trip hazards and that only a minimum number of authorized personnel are permitted in the work zone.
2. Inspect first aid kit, eye wash station, and fire extinguisher.	Failure to have proper medical supplies during emergency could result in inadequate treatment of personnel or potentially increase injuries.	Ensure that first aid kit contains all necessary supplies and that eye wash station is capable of supplying 15-minute steady supply of solution.
3. Inspect and calibrate sampling equipment daily.	Failure to conduct daily inspection and calibrations may result in false or inaccurate readings.	Ensure that all operating components, parts, systems, and mechanisms are inspected by a qualified person and will operate as intended Ensure that a copy of the inspection and calibration form is available and on file.
4. Collect samples.	Local vehicle traffic could strike and injure samplers.	Ensure that all individuals participating in the survey wear reflective vests. Workers will not work in street areas unless flaggers, signs, barricades and/or cones are used.
	Workers could come in contact with radioactive material contaminating vegetation, soil, office furniture, equipment, etc.	Wear appropriate protection defined in the Health and Safety Plan. Ensure that good hygiene practices are followed such as washing thoroughly prior to eating meals.
	Sampling tools such a knives, scoops, spoons, augers, etc., can cause injury to personnel if used incorrectly.	Ensure that all samplers are familiar with the tools and equipment selected for sampling. All samplers should be able to demonstrate to the Sampling Lead that they are familiar with the tools and their function.
	Failure to decontaminate sampling tools may cross-contaminate future samples.	Ensure that the protocol defined in the SAP is followed.
	Cut vegetation can cause injury while samples are being collected.	Vegetative grasses, brush, etc., can cause cuts and puncture wounds if handled improperly.
	Workers could be exposed to dust, potentially biologically contaminated dust, radioactive dust, chemically contaminated dust, and asbestos-contaminated dust.	Minimize the area that is to be disturbed for sampling. Wear appropriate PPE as prescribed by the Health and Safety Plan.
5. Label samples.	Failure to label sample jars, cores, containers, etc., may result in false identification.	Ensure that samplers are familiar with the identification system defined in the SAP.
	Failure to affix chain-of-custody labels may result in noncompliance with established work protocol.	Ensure that application of chain-of-custody seals follow the SAP protocol.
6. Decontaminate tools.	Failure to decontaminate sampling tools may cross-contaminate future samples.	Ensure that the protocol defined in the SAP is followed.
7. Document findings.	Failure to document findings could result in additional sampling or surveys.	Ensure that qualified technicians are aware of documentation procedures.

ACTIVITY HAZARD ANALYSIS (AHA) #10

Sampling Activities at Alameda Point

Created by: Cliff Stephan, CHP **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
8. Demobilize.	Slips, trips, falls, pinch points, or back/muscle strain could occur.	Use proper lifting techniques when demobilizing. Be aware of pinch points and use leather gloves. Get help with loads in excess of 50 pounds. Ensure that good hygiene practices are followed and that all samplers wash thoroughly prior to taking any food or drink.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles – pickup trucks	Daily and before use.	Only Department of Motor Vehicles-licensed personnel will operate vehicles
Equipment – pumps	Inspect pump according to manufacturers' directions.	Use pump as directed in operator's manual.
Hoses	Inspect hose for connections and integrity.	Training on hoses and connection of hoses will be provided.
Sample jars	Inspect jars for cracks or breaks. Discard defective jars or containers	Training on use of sampling supplies will be provided.
Hand tools- pry bar, hammers, pliers, etc.	Inspect each tool before use. Discard damaged tools.	Specific training for use of tools will be provided.

Notes:

AHA – Activity Hazard Analysis
CHP – Certified Health Physicist
CIH – Certified Industrial Hygienist
IR – Installation Restoration
PPE – personal protective equipment
SAP – Sampling and Analysis Plan

ACTIVITY HAZARD ANALYSIS (AHA) #11

Surveying Activities at Alameda Point

Created by: Cliff Stephan, CHP **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
The intent of this AHA is to survey select areas of Alameda Point. Surveying may include but not be limited to radiological, chemical, biological, geophysical, bathymetric, and land surveys.		
1. Inspect work area.	Failure to inspect work area may result in trips and falls from the same level.	Ensure that work area is free from potential trip hazards and that only a minimum number of authorized personnel are permitted in the work zone.
2. Inspect first aid kit, eye wash station, and fire extinguisher.	Failure to have proper medical supplies during emergency could result in inadequate treatment of personnel or potentially increase injuries.	Ensure that first aid kit contains all necessary supplies and that eye wash station is capable of supplying a 15-minute steady supply of solution.
3. Inspect and calibrate survey equipment daily.	Failure to conduct daily inspection and calibrations may result in false or inaccurate readings.	Ensure that all operating components, parts, systems, and mechanisms will operate as intended and are inspected by a qualified person. Ensure that a copy of the inspection and calibration form is available and on file.
4. Survey.	Local vehicle traffic could strike and injure surveyors.	Ensure that all individuals participating in the survey wear reflective vests. Workers will not work in street areas unless flaggers, signs, barricades and/or cones are used.
	Workers could come in contact with radioactive material contaminating office furniture and equipment, etc.	Wear appropriate protection defined in the SHSP. Ensure that good hygiene practices are followed such as washing thoroughly prior to eating meals.
	Workers could be exposed to dust, potentially biologically contaminated dust, radioactive dust, chemically contaminated dust, and asbestos-contaminated dust.	Minimize the area that is to be disturbed for sampling. Wear Level D PPE at a minimum or what is prescribed in the Health and Safety Plan.
5. Conduct radiological survey.	Ensure that RCTs performing the surveys are qualified.	Ensuring that RCTs are qualified. This will minimize incorrect calibration and sampling procedures.
	Non-use of dosimetry could cause injury to worker.	Ensure that all workers are wearing dosimeters if required by the Health and Safety Plan.
	Failure to establish background readings could cause injury to worker.	Ensure that background readings are established prior to actual survey to properly interpret data.
6. Decontaminate all reusable materials and equipment.	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
7. Document findings.	Failure to document survey findings could result in additional surveys.	Ensure that qualified RCTs are aware of documentation procedure.
8. Demobilize site.	Slips, trips, falls, pinch points, or back/muscle strain could occur.	Use proper lifting techniques when demobilizing. Be aware of pinch points and use leather gloves. Get help with loads in excess of 50 pounds.

Equipment to be Used	Inspection Requirements	Training Requirements
Hand tools	Daily and before use.	Specific training for hand tools will be provided.
Survey equipment	Daily or before use. All equipment must be inspected and be current in calibration.	All personnel will be trained in the operation of survey equipment.

Notes:

AHA – Activity Hazard Analysis
CHP – Certified Health Physicist
CIH – Certified Industrial Hygienist
PPE – personal protection equipment
RCT – Radiological Control Technician

ACTIVITY HAZARD ANALYSIS (AHA) #12

Waste Characterization, Transport, and Disposal for Alameda Point

Created by: Jennifer Amdursky **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
The intent of this AHA is to outline the safety procedures for carrying out waste characterization, transport, and disposal for IR Sites 1, 2 and 32.		
1. Place/pour waste into containers (e.g., 55-gallon drums, roll-off bins, etc.).	Lifting of wastes could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. If possible, do not create loads greater than 50 pounds. If loads are greater than 50 pounds, use two people to lift.
	Worker could be exposed to chemical contaminants.	Wear required PPE. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Decontaminate exteriors of tools or buckets used to transport wastes to containers. Avoid spills. Ensure that spill cleanup supplies are available.
2. Load drums onto vehicle.	Handling of drums can expose worker to injury (including, but not limited to, strains, lacerations, and pinch points).	Ensure that each drum is properly labeled and when drums are placed on truck, labels are visible. Use truck that has "Tommy Lift" and move drum using drum dolly onto lift. Ensure that drum is secure and will not roll when lift is raised. Wheel drum to appropriate location on truck for transport. Be sure to evenly distribute load weight on bed of truck. Secure drums in place on the truck. If drums are loaded with drum handling device, attached to backhoe or excavator, stand away from truck when drum is placed on truck. Once drum is in place and "loader" moves away from truck, use drum dolly on truck to position drum. Avoid placing pallets of drums on truck, unless pallets can be positioned where they will remain for transport. (It is very difficult to move loaded pallets manually.)
	Worker could be struck by vehicles.	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Post an observer, as needed, when loading drums close to busy streets. Use traffic controls or barricades, if necessary, to keep traffic away from workers.
3. Transport drums to temporary storage location.	Drums may leak presenting spill and slip hazards.	Inspect all drums prior to and following transport. Have spill cleanup supplies and equipment readily available. Surface may become slippery. Wear work boots with good traction soles. Avoid exposure to material. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.

ACTIVITY HAZARD ANALYSIS (AHA) #12

Waste Characterization, Transport, and Disposal for Alameda Point

Created by: Jennifer Amdursky **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
	Handling of drums can expose worker to injury (including, but not limited to, strains, lacerations, and pinch points).	If handling drums, use drum dolly, pallet on forklift, or drum grabber attached to backhoe or excavator to move drums into storage. If handling drums, inspect path that drum must be moved over. Ensure that there are no ruts or other obstacles that can cause drum to tip over or be difficult to handle over surface being traversed. Place drums in approved storage area. When manually handling drums, avoid placing hands between drums and pinching fingers. Wear leather work gloves. If drums have to be manually positioned, know how to "break and roll" drum. Avoid manually positioning drums if at all possible. Only one person should "break and roll" drum if necessary to manually move drum without mechanical assistance.
	Slip, trip, and fall hazards could be present.	Maintain good housekeeping and proper illumination in storage area.
4. Store drums in temporary storage location pending characterization.	Drums may leak presenting spill and slip hazards.	Inspect all containers on a regular basis (weekly for non-hazardous materials, daily for hazardous materials). Have spill cleanup supplies and equipment readily available. Surface may become slippery. Wear work boots with good traction soles. Avoid exposure to material. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.
5. Remove cover of containers for sampling.	Lifting drum lids may cause injury, particularly to fingers and hands.	Identify and avoid pinch points, such as placing hands between drum lid and drum. Wear leather work gloves when removing and replacing drum lids.
	Worker could experience strain from use of tools.	Inspect all tools for damage before use. Do not use damaged tools (mark and tag "out of service"). Select hand tools to minimize following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; or excessive gripping, pinching, or pressing with hands and fingers.
	Containers could contain atmospheric hazards, thus exposing worker to vapors.	Before fully lifting container covers, place probe through small opening and measure air inside using a PID or FID. If reading is less than 10 ppm, open cover and proceed with sampling. If reading is greater than 10 ppm, remove cover slowly and stand back to allow cover to ventilate. Measure air inside again after 5 minutes, and if readings are still above 10 ppm, contact the SHSS.
6. Collect sample of waste.	Worker could be exposed to chemical contaminants.	Wear required PPE. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Decontaminate exteriors of sample containers. Avoid spills. Ensure that spill cleanup supplies are available.

ACTIVITY HAZARD ANALYSIS (AHA) #12

Waste Characterization, Transport, and Disposal for Alameda Point

Created by: Jennifer Amdursky **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
7. Replace container covers.	Replacing drum lids may cause injury, particularly to fingers and hands.	Use care when replacing drum lids. Wear leather gloves when handling lids.
	Worker could experience strain from use of tools.	Inspect all tools for damage before use. Do not use damaged tools. Mark and tag "out of service." Select hand tools to minimize the following stressors: chronic muscle contraction or steady force; extreme or awkward finger/hand/arm positions; repetitive forceful motions; or excessive gripping, pinching, or pressing with hands and fingers.
8. Pack samples for shipment.	Manually moving materials and equipment could cause strains.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 50 pounds. For loads greater than 50 pounds, use two people to carry.
	Contents of sample containers could leak, causing exposure to worker and possibly to people handling shipping box.	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping box and during transportation. Ensure that boxes meet required packaging standards based on mode of transportation used for shipping.
9. Decontaminate all reusable materials and equipment.	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Worker could be exposed to chemical contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE and respiratory protection as specified in the Health and Safety Plan. Visual inspection and ambient air monitoring will determine selection of PPE and respiratory protection. Remove PPE properly and wash hands.
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.

ACTIVITY HAZARD ANALYSIS (AHA) #12

Waste Characterization, Transport, and Disposal for Alameda Point

Created by: Jennifer Amdursky **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
10. Load containers for transport.	Handling of containers can expose worker to injury (including, but not limited to, strains, lacerations, and pinch points).	Ensure that each drum is properly labeled and when drums are placed on truck, that labels are visible. (Use new labels as appropriate based on analytical results.) Use truck that has "Tommy Lift" and move drum using drum dolly onto lift. Ensure that drum is secure and will not roll when lift is raised. Wheel drum to appropriate location on truck for transport. Be sure to evenly distribute load weight on bed of truck. Secure drums in place on the truck. If drums are loaded with drum handling device attached to backhoe or excavator, stand away from truck when drum is placed on truck. Once drum is in place and "loader" moves away from truck, use drum dolly on truck to position drum. Avoid placing pallets of drums on truck, unless pallets can be positioned where they will remain for transport. (It is very difficult to move loaded pallets manually.)
	Worker could be struck by vehicles.	Wear high-visibility reflective vests at all times in work areas. Make eye contact with operators of vehicles. Post an observer, as needed, when loading drums close to busy streets. Use traffic controls or barricades, if necessary, to keep traffic away from workers.
	Containers may leak.	Inspect all containers prior to transport. Have spill cleanup supplies and equipment readily available. Surface may become slippery. Wear work boots with good traction soles. Avoid exposure to material. Wear appropriate PPE. Clean up all spills immediately. Notify supervisor.

Equipment to be Used	Inspection Requirements	Training Requirements
Hand tools	Daily and before use.	Specific training for hand tools will be provided.
Heavy equipment, dump trucks, tarping rack, loader	Daily or before use. All equipment must be inspected and certified by a competent mechanic.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles-licensed personnel will operate trucks.
Forklifts, drum lifters, drum dollies	Daily and before use.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles-licensed personnel will operate trucks. Fork lift operators must have a training certificate.

Notes:

AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
FID – flame ionization detector
IR – Installation Restoration
PID – photoionization detector
PPE – personal protective equipment
ppm – parts per million
SHSS – Site Health and Safety Specialist

ACTIVITY HAZARD ANALYSIS (AHA) #13

MPPEH Demilitarization

Analyzed By: R. Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Protection Against Hazards
1. Survey site.	Slips, trips, and falls from various agents could occur.	Work areas shall be visually inspected and pre-existing slip, trip, and fall hazards shall be marked, barricaded, or eliminated as is feasible. Work areas shall be kept neat and in an orderly state of housekeeping. Proper illumination shall be maintained in work areas.
2. Unload equipment and sandbags from vehicle and set up base station.	Lifting of equipment from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
3. Demilitarize MPPEH.	Contacting MPPEH or handling MPPEH could result in an unplanned explosion	Ensure proper PPE (Level D) is worn. Ensure that an exclusion zone is established and maintained while work is taking place. Evacuate all nonessential personnel from the exclusion zone before beginning operations. Conduct operations only under the direct supervision of qualified UXO personnel. Ensure that the SUXOS is present. Use proper handling equipment and packaging materials Ensure required safety equipment is available. Allow only UXO-qualified personnel on site. Follow the two-person rule – under no circumstances will personnel work alone. Keep all spark and flame-producing materials away from energetic materials. Do not handle ammunition and explosives roughly or carelessly. Extra care should be taken, because in most cases, the hazards of the ammunition and/or explosives increase with age, deterioration, or damage. Ensure that HERO precautions are used around radios and cellular telephones. Take appropriate precautions to minimize the potential of electrostatic energy. Conduct operations only under favorable weather conditions. Ensure that proper safety and handling equipment is used. Operations will be conducted only during daylight hours. All personnel will attend a daily safety meeting prior to entering the project site. Anyone can stop operations for any unsafe act or situation. Safety violations and/or unsafe acts will be immediately reported to the SHSS. Ensure that all employees have reviewed and understood AHAs associated with MPPEH activities; additional review may be necessary if there are any changes to the tasks.
	Strains from manually moving materials and equipment could occur.	Use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of lifting devices whenever possible. Refer to EHS Procedure 3-1, Ergonomics. Do not lift more than 50 pounds without help.

ACTIVITY HAZARD ANALYSIS (AHA) #13

MPPEH Demilitarization

Analyzed By: R. Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Protection Against Hazards
Demilitarize MPPEH. (Continued)	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only work on walking/working surfaces that have the strength and integrity to support employees safely. Avoid walking on uneven or slippery surfaces.
	Electric or hydraulic shear hazards could be present.	Ensure the cutter is in good working order, that it functions properly and that there are no exposed electrical wires. When placing the projectile into the cutting jaw, do not place fingers or hands between the blades of the cutter. Ensure that the person operating the cutter is the only person inside the exclusion zone.
	Workers could be struck by heavy equipment.	Use back-up alarms and spotters to avoid injury. Always make eye contact with the operator before approaching. Never approach from the operator's blind side.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles, equipment, hand tools	Daily and before use. Use equipment safety checklist.	Only Department of Motor Vehicles-licensed personnel will operate vehicles. Specific training for power tools and hand tools will be provided. Ensure there is an operator's manual for each piece of equipment and that operators have reviewed the manual for the equipment they are operating.

Notes:

AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
EHS – Environmental Health and Safety
HERO – hazards of electromagnetic radiation to ordnances
MPPEH – material potentially presenting an explosive hazard
PPE – personal protective equipment
SHSS – Site Health and Safety Supervisor
SUXOS – Senior Unexploded Ordnance Supervisor
UXO – unexploded ordnance

ACTIVITY HAZARD ANALYSIS (AHA) #14

Field Surveying

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Protection Against Hazards
1. Park contractor vehicle at site.	Vehicle could hit someone or something.	Use spotters when positioning vehicle if needed. Ensure that spotters know how to communicate with driver of vehicle.
	Location could create a traffic hazard.	Locate vehicle in an area that will not obstruct traffic.
2. Unload equipment from vehicle.	Lifting of instruments from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky and heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
3. Move equipment to designated survey location.	Handling of instruments could cause strain to worker.	Carry instruments as required by the manufacturer of the instrument. Use straps when provided and adjust for comfort. Use care when walking so that there are no sudden jerks or mis-steps that can cause the worker to strain to maintain control of the instrument. Get assistance from other workers if several instruments must be carried. For loads greater than 50 pounds, use two people to carry.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only work on walking/working surfaces that have the strength and integrity to support employees safely. Openings 18 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded. Establish good footing. Wear work boots with soles that have good traction. Work carefully in non-level steep slope areas. Consider use of clamp-on shoe spikes for walking on slopes. Workers will not climb slopes greater than 45°, unless they are wearing a full-body harness tied off to a lifeline (attached to a stationary object and system designed to support 5,000 pounds).
4. Drive to (and from) various locations.	The area is not paved and dust could be generated. Some areas could have a lot of dry vegetation, which could catch on fire if allowed to contact muffler of vehicle for extended time.	Use a spotter whenever backing up or turning vehicle around, especially in the vicinity of open excavations Observe for obstructions and ruts that could cause vehicle to "jar" off road. Drive slowly to avoid generating dust. When parking vehicle, ensure that there is no brush under the truck at the place where the truck is parked. Ensure there is a fire extinguisher on truck. Inspect for soft soil and spots along road where edges have a potential to "give" way.
	Communications in an emergency may be weak due to distance from main roads.	Verify that cell phones work in the area. If they do not, use a radio that is communicating with someone near a phone that functions.
5. Survey site.	Slips, trips, and falls from various agents are potential hazards.	Work areas will be visually inspected and pre-existing slip, trip, and fall hazards will be marked, barricaded, or eliminated as feasible. Work areas will be kept neat and orderly. Proper illumination will be maintained in work areas. Inspect each work area for ground squirrel holes, other ruts, and obstructions. Visually inspect for soft soil.

ACTIVITY HAZARD ANALYSIS (AHA) #14

Field Surveying

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Protection Against Hazards
Survey site. (Continued)	Failure to properly survey site could cause exposure to ground hazards.	Ensure that ground has no hazards such as unstable soil. Ensure that the findings of the survey and controls for all potential hazards become part of this hazard analysis.
	Failure to observe and prepare for encounter with insects (black widow and brown recluse spiders, mosquitoes), rodents, or snakes could cause injury to worker.	Observe for insects, rodents and snakes. Use a "tapping" stick if necessary in any brush area to flush out or expose snakes before walking in brushy areas. Use insect repellant as necessary. Observe for any possible bird habitation and other flora and fauna of biological significance. Note locations and identify for future reference by the remediation team. Avoid placing hands in concealed areas. Wear protective gloves. Use tools wherever possible to dislodge objects first, before placing hands low to ground to move objects.
	In brushy areas, poison oak could be encountered.	Be aware of the characteristics of poison oak (three leaves; in fall, reddish in color). Avoid contact with poison oak. Although clothing may initially protect, contaminated clothing, when handled, could still expose the worker. Always wash hands thoroughly after working in areas with poison oak. Use protecting creams.
6. Don required protective equipment.	If employees do not wear the required PPE, they could be injured.	All workers will wear steel-toe boots with slip-resistant sole, hard hat, safety glasses, and a high-visibility vest or shirt. The surveyor will wear a full body harness, with an attached lifeline when surveying points located in excavated areas greater than 4 feet. The attachment will be a double-locking ring that latches to the "D" ring of the full-body harness. The lifeline will be attached by tie-off using a knot to an anchor point on the Site Superintendent/Foreman's truck that can support a 500-pound force. (It is preferred that the tie-off line to the truck be secured using a double-locking D-ring.)
	Heat stress could occur while working and wear PPE.	Be sure to drink plenty of liquids such as water or Gatorade®. Take frequent rest breaks depending on temperature and level of work effort.
7. Survey for utilities.	Installation of wooden stakes presents puncture and splinter hazards.	Keep stake tip pointed at ground. Wear leather gloves. Use caution when using tools to pound stake in. Wear safety glasses when pounding stakes.
	Use of spray paint to mark locations could expose employees to paint fumes or paint itself.	Follow manufacturers' instructions on use of paint. Review MSDSs. Never point spray paint canisters at another person.
	When carrying stakes, worker could trip and impale body.	Carry stakes in leather or canvas bag that is puncture proof, and carry bag to side of body. Ensure that all tips are pointed toward ground at all times.
	Installation of wooden stakes presents puncture and splinter hazards.	Keep stake tip pointed at ground. Wear leather gloves. Use caution when using tools to pound stake in. Wear safety glasses when pounding stakes.

ACTIVITY HAZARD ANALYSIS (AHA) #14

Field Surveying

Analyzed By/Date: R. Margotto, CIH

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles – pickup trucks	Daily and before use.	Only Department of Motor Vehicles-licensed personnel will operate vehicles.
Equipment – survey equipment	Inspect equipment before each use following manufacturers' requirements. Document inspection on an inspection form or in a logbook.	Specific training for use of survey equipment will be provided or worker already has documented training.
Fall protection equipment	Inspect before each use.	Documented training in use of fall protection equipment.
Hand tools – basic screwdrivers, hammers, pliers, etc.	Inspect hand tools before each use following manufacturers' requirements. Discard or tag out-of-service, any tools that are damaged. Do not use power tools that have frayed cords or exposed wiring. All power tools must have a grounding plug or be double-insulated.	Personnel must have reviewed operators' manual and have been trained on power tools. Only qualified person will operate generator or compressor, if used.

Notes:

AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
MSDS – Material Safety Data Sheet
PPE – personal protective equipment

ACTIVITY HAZARD ANALYSIS (AHA) #15

Soil Excavation, Backfilling and Hauling

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Protection Against Hazards
1. Excavate.	Contact with underground utilities or unknown debris could cause injury to worker and damage to property or equipment.	Physically verify the location and depth of existing utilities prior to starting excavation through geophysical and utility survey. Call Underground Services Alert (800) 642-2444, prior to any disturbance of ground. Scan the excavation area with electromagnetic and sonic equipment and mark ground where existing underground utilities or debris are discovered. Protect all existing utilities during excavation. Perform excavation within 4 feet of existing utilities by hand and/or non-aggressive methods per EHS Procedure 3-15, Underground Utilities. (Cal-OSHA requires an 18-inch buffer zone on each side of existing utility lines.) Protect all underground utilities as soil is removed around or under the utility line. Complete and submit activity notification form for Cal-OSHA if any personnel are planning to enter excavation that is 5 feet or greater in depth. (Must have a state excavation permit posted.) In areas where there is a potential buried debris, excavation should be performed in 8- to 12-inch layers and prior to each layer, the area need to be scanned with electromagnetic and sonic equipment. Should drums or containers or be encountered during excavation, the procedures outlined in the TCRA Work Plan dealing with this topic will need to be followed.
	Workers could be struck by or against heavy equipment.	Wear reflective warning vests when exposed to vehicular traffic. Avoid equipment swing areas. Make eye contact with operators before approaching equipment. Understand and review posted hand signals. Workers must always be in visual sight of the operators. Use trained spotters.
	Workers could be exposed to chemical contaminants or potential gases, such hydrogen sulfide.	Conduct air monitoring for contaminants as excavation activities proceed according to the HASP. If odors are detected, immediately check for the presence of potentially explosive gas concentrations, including methane, hydrogen sulfide, volatile organic compounds, etc. Wear PPE as required.

ACTIVITY HAZARD ANALYSIS (AHA) #15

Soil Excavation, Backfilling and Hauling

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Protection Against Hazards
Excavate (continued).	Excavation hazards, such as collapsed sides, equipment tipping over, flooding, falling, or dust generation, could be present.	Follow EHS Procedure 6-3, Excavation and Trenching. Ensure proper shoring or sloping. Spoil banks and equipment must be at least 3 feet away from the excavation (EHS Procedure 6-3). (Cal-OSHA requires at least 2 feet from the edge of the excavation.) Use diversion ditches, dikes, or other means to prevent surface water from entering an excavation and to provide good drainage of the area adjacent to the excavation. Daily inspections of excavation, the adjacent areas and protective systems shall be made by the project assigned competent person. The excavation/trenching permit must also be completed by the competent person each day. Maintain eye contact with operators. Personnel must wear visible vests. Avoid climbing on berms and stockpiles. Cover all stockpiles. Workers will not work under any equipment or loads. Barricade all open excavations as required by the TCRA Work Plan. Handle soil carefully to avoid dust generation.
	Strains from use of tools, such as shovels, could occur.	Maintain steady pace when using tools and take adequate rest periods. If possible, rotate tasks among the workers. Use appropriate tools for the task and maintain tools in good condition.
	Heavy equipment hazards could be present.	Equip all heavy equipment on this project with rollover protection systems and backup alarms. Stay clear of moving equipment, unless necessary. If working near equipment, workers must be in visual contact with the operator. Inspect all equipment daily, before use, to ensure that proper maintenance is being performed. Make eye contact with operator; heavy equipment has right-of-way.
2. Complete shoring, should employees need to enter the excavation.	Improper construction or installation could lead to collapse of excavation wall.	Follow the requirements of Cal-OSHA. Ensure that appropriate support system, designed by a registered civil engineer, is installed, if needed, is capable of supporting the sidewall of the excavation. All support systems are to be inspected by a qualified engineer.
3. Remove debris.	Debris may be hazardous materials.	Avoid contact with materials. Wear PPE as specified in the HASP.
	Debris could drop during removal.	Avoid area as debris is excavated.
4. Backfill.	Workers could be struck by or against heavy equipment or trucks.	Wear reflective warning vests. Avoid equipment swing areas. Make eye contact with operators before approaching equipment or trucks. Understand and review posted hand signals.
	Damage to utilities could occur.	Ensure that utilities are protected from the fill material as it is being placed. Be sure that fill material does not contain rocks or objects that could damage the utilities. Follow TCRA Work Plan for proper placement and compaction of backfill.

ACTIVITY HAZARD ANALYSIS (AHA) #15

Soil Excavation, Backfilling and Hauling

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Protection Against Hazards
5. Haul material from the excavation and haul backfill to the excavation.	Workers could be struck by or against heavy equipment or trucks.	Establish and follow a traffic procedures outlined in the Work Plan. Wear reflective warning vests. Avoid equipment swing areas and designated traffic routes. Make eye contact with operators before approaching equipment or trucks. Understand and review posted hand signals. Use spotters and flaggers as necessary to direct trucks as well as any nearby traffic.
	Truckers and ground workers could be struck by load as it is loaded.	Prohibit truck drivers from standing near trucks as they are being loaded. Prohibit truck drivers from sitting in the cab of trucks as they are being loaded, unless the truck is equipped with a cab protector (FOPS).
	Dirt and dust can accumulated on roads used for transport of material.	Brush off trucks before they enter a paved road. Tarp truck or load truck in such a manner to prevent dust and dust from getting onto paved roads.

Equipment to be Used	Inspection Requirements	Training Requirements
Heavy equipment, dump trucks	Daily or before use.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles-licensed personnel will operate trucks.

Notes:

AHA – Activity Hazard Analysis
Cal-OSHA – California Occupational Safety and Health Administration
CIH – Certified Industrial Hygienist
EHS – Environmental Health and Safety
FOPS – falling object protective system
HASP – Health and Safety Plan
PPE – personal protective equipment
TCRA – time-critical removal action

ACTIVITY HAZARD ANALYSIS (AHA) #16

Use of All-Terrain Vehicles at Alameda Point

Created by: Jennifer Amdursky **Reviewed by:** Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
The intent of this AHA is to detail the proper use of ATVs.		
1. Receive vehicles and inspect.	Defective vehicle could cause injury to workers.	Using operator's manual, inspect vehicle as specified by the manual. Pay particular attention to the steering, brakes and tires. Check function of horn, tail lights, and stop lights.
	ATV without muffler could cause noise and fires. A fire could occur from sparks from vehicles.	Vehicles must have mufflers and spark arrestors.
	An ATV that does not meet the requirements of EM 385-1-1 could result in injury.	Class I ATV must be less than 800 pounds and less than 50 inches wide. Vehicle must have four wheels.
2. Verify training of operators.	Operators who are not trained could have accidents and injure themselves or other workers.	All operators will have completed a nationally recognized ATV training course. The operator must pass an operating skills test. Proof of training must be available.
3. Connect trailer with survey equipment to the ATV.	Trailer connection could fall on workers' feet causing injury.	Keep feet away from the connection, wear steel-toe boots.
	Connection of trailer to ATV could fail, causing damage to equipment or injury to workers.	Keep feet away from the connection, wear steel-toe boots.
	Lifting trailer hitch end could cause strain or back injury to the worker.	Use only an approved trailer hitch for the type of ATV. Payload will not exceed the capacity of the ATV. Get help in raising trailer to the hitch.
4. Operate vehicle.	Failure to operate vehicle could cause damage to property or injury of workers.	Use training and follow manufacturer's requirements for operation. Operate vehicle only at safe speeds.
	Carrying passengers could cause injury to the passengers.	Carrying passengers is prohibited.
	Vehicle may not be visible in all areas.	Vehicles will have a high-visibility flag or windsock so that their location can be readily ascertained by workers in the area. ATVs will be operated only during daylight hours.
	Failure to wear proper PPE could result in injury.	Workers will wear gloves and an approved motorcycle helmet with full faceshield or goggles.
5. Refuel vehicle.	When refueling vehicles, there is potential for exposure to gasoline, fires, and damage to environment.	Wear appropriate PPE. Refuel only when engine is off and has been cooled slightly. Have fire extinguisher 20-pound dry chemical ABC within 75 feet of refueling point (but not too close). No smoking or source of heat or flame is permitted. Have spill control supplies available and ready for use. Refuel only in a designated area.
6. Store fuel (it is presumed that gasoline is used for the ATVs).	Improper storage could cause spill or potential fires.	Gasoline will be stored only in approved metal safety cans not exceeding 5 gallons each.

ACTIVITY HAZARD ANALYSIS (AHA) #16

Use of All-Terrain Vehicles at Alameda Point

Created by: Jennifer Amdursky **Reviewed by:** Roger Margotto, CIH

Equipment to be Used	Inspection Requirements	Training Requirements
Hand tools	Daily and before use.	Specific training for hand tools.
All terrain vehicle	Daily or before use. All equipment must be inspected and certified by a competent mechanic upon receipt.	Only trained equipment operators may operate ATV; only Department of Motor Vehicles-licensed personnel will operate ATVs.

Notes:

AHA – Activity Hazard Analysis
ATV – all-terrain vehicle
CIH – Certified Industrial Hygienist
EM – Engineer Manual
PPE – personal protective equipment

ACTIVITY HAZARD ANALYSIS (AHA) #17

Demobilization and Site Restoration

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
1. Demobilize and restore site.	Workers could be struck by or against heavy equipment.	Wear high visibility reflective vests when exposed to vehicle traffic. Make eye contact with operators before approaching equipment. Understand and review posted hand signals. Use traffic barricades, signs, flags, and backup spotters during demobilization.
	Electrocution hazards could be present.	Allow only qualified electricians to disconnect electrical circuits. Follow lock-out, tag-out protocols. Inspect all extension cords daily for structural integrity, ground continuity, and damaged areas. Document extension cord inspection. Use GFCIs on all outdoor 115- to 120-volt, 20-ampere or less, circuits. Cover or elevate electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching. Keep plugs and receptacles out of water unless they are approved- submersible types. Ground all electrical circuits in accordance with the National Electrical Code or other applicable regulations or standards. Temporary wiring is not allowed to pass through walls, doors, or windows (extension cords are one type of temporary wiring). If a generator is used, be sure it is a type that does not require grounding. If it requires grounding, follow manufacturer's directions. NEC 250-6 lists the exceptions for grounding portable and vehicle mounted generators.
	Strains from manually moving materials and equipment could occur.	Use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use lifting devices whenever possible. Surveys shall be performed by qualified persons to identify and evaluate tasks which might result in injuries due to ergonomic hazards. The focus of the surveys will be operations which involve the manual lifting and moving of objects of excessive weight or asymmetric size. Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force, extreme or awkward finger/hand/arm positions, repetitive forceful motions, excessive gripping, pinching, pressing with hand and fingers. Do not lift more than 50 pounds without assistance.

Equipment to be Used	Inspection Requirements	Training Requirements
Heavy equipment, hand tools, power tools	Daily or before use. Equipment must be inspected and certified as operational by a competent person.	Only trained equipment operators may operate heavy equipment; only Department of Motor Vehicles-licensed personnel will operate trucks. Specific training for power tools, hand tools, and electrical safety.

Notes:
AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
GFCI – ground fault circuit interrupter
NEC – National Electrical Code

ACTIVITY HAZARD ANALYSIS (AHA) #18

Removal of Containers/Drums

Analyzed By: Roger Margotto, CIH

Principle Steps	Potential Safety/Health Hazards	Recommended Controls
This is a supplemental AHA that specifically addresses the removal of containers and drums containing chemicals that may be encountered in the disposal trench or during the excavation of radiological point sources. All other AHAs still apply.		
1. Inspect work area/excavation.	Area has debris, containers, and is uneven creating a footing hazard and a potential to be cut by sharp glass and objects.	Level area as much as possible with an excavator, but avoid breaking any containers or contact with containers.
2. Inspect containers already exposed for crystal formation.	Crystals indicate a potential explosion hazard. Other containers have unknown chemicals.	Wear PPE specified in recent directive from the project CIH. When drums are encountered, a reconnaissance team, usually in Level B if the drum is leaking, will inspect the drums and collect the proper samples to characterize the drum's contents using HazCat kit. Avoid handling containers of liquid with crystal formation. Contact CIH immediately if these are observed.
3. Remove containers already exposed.	Container can break while lifting. Container may spill remaining contents.	Avoid contact with sharp glass and other objects. Keep container away from body while lifting. Have an over-pack container available nearby to place the removed container into immediately. Do not remove any container from the site until it is placed inside a secondary container. Use construction equipment, equipped to handle drums, to transfer leaking drums in over-packs.
4. Carefully hand shovel or use scoops to expose additional containers.	Be aware that these containers may be open or already broken.	Do not work close to containers, always keep an elbow's length away from the containers. Carefully remove the soil away from the container and as noted above, place the containers into a secondary container to carry the removed container from the site. As always, observe for crystal formation.
5. Carry containers from location to HazCat area.	Carrying more than one container at a time could cause spills and potential inadvertent chemical reactions with materials in other containers.	Carry one container in secondary containment at a time into the HazCat area. Segregate all containers until initial hazardous categorization has been performed.

Notes:
AHA – Activity Hazard Analysis
CIH – Certified Industrial Hygienist
HazCat – Hazardous Category
PPE – personal protective equipment

APPENDIX B

SAMPLING AND ANALYSIS PLAN

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0015

APPENDIX B

FINAL

SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)

March 2, 2007

INSTALLATION RESTORATION SITES 1, 2, AND 32
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-07-0748

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, CA 92101-8536
(619) 234-8696

02/27/07	
Lisa Bienkowski Program Chemist	Date
2/27/2007	
Narciso A. Ancog NAVFAC SW Quality Assurance Officer	Date

ELEMENTS OF THE UFP-QAPP AND EPA QA/R-5 IN RELATION TO THIS SAP

UFP-QAPP Worksheet	EPA QA/R-5	This SAP	Variance from UFP-QAPP
#1 Title and Approval Page	A1. Title and Approval Sheet	Title and Approval Page	None
#2 QAPP Identifying Information	N/A	Section 1.2 and 3.1, Table B.1-1 and B.2-1, Work Plan Section 2.0 and 3.0	None
#3 Distribution List	A3. Distribution List	Table B.1-1	None
#4 Project Personnel Sign-off Sheet	N/A	Table B.2-4	None
#5 Project Organization Chart	A4. Project Task/Organization	Figure B.2-1	None
#6 Communication Pathways	N/A	Table B.2-2	None
#7 Personnel Responsibilities and Qualifications Table	A4. Project/Task Organization	Table B.2-1	None
#8 Special Personnel Training Requirements Table	A8. Special Training/Certification	Table B.2-3	None
#9 Project Scoping Sessions Participants Sheet	N/A	N/A	Sign-in sheets and meeting minutes of scoping sessions are maintained in the DON project file.
#10 Problem Definition	A5. Problem Definition/Background A6. Project/Task Description	Step 1 of Sections 3.1 and 3.2, Table B.3-1	None
#11 Project Quality Objectives/Systematic Planning Process Statements	A7. Quality Objectives and Criteria	Section 6.0 and 7.0	None
#12 Measurement Performance Criteria Table	B5. Quality Control	Table B.7-4	None
#13 Secondary Data Criteria and Limitations Table	N/A	Section 2.4 and 2.5 of the TCRA Work Plan	Previous radiological surveys and MPPEH characterizations are presented in the TCRA Work Plan.

ELEMENTS OF THE UFP-QAPP AND EPA QA/R-5 IN RELATION TO THIS SAP

UFP-QAPP Worksheet	EPA QA/R-5	This SAP	Variance from UFP-QAPP
#14 Summary of Project Tasks	A6. Project/Task Description	Section 5.0, Table B.5-1, Sections 8.1, 8,2, and Table B.8-1	None
#15 Reference Limits and Evaluation Table	N/A	Table B.7-1 and B.7-2	None
#16 Project Schedule/Timeline Table	N/A	Addressed in Figure 10-1 of the Work Plan	None
#17 Sampling Design and Rationale	B1. Sample Process Design	Section 5.1 and Table B.3-1	None
#18 Sampling Locations and Methods/SOP Requirement Table	N/A	Table B.5-1	None
#19 Analytical SOP Requirement Table	N/A	Table B.6-2	None
#20 Field Quality Control Sample Summary Table	B5. Quality Control	Table 7-5	None
#21 Project Sampling SOP Reference Table	B2. Sampling Methods	Section 6.3	None
#22 Field Equipment Calibration, Maintenance, Testing, and Inspection Table	B6. Instrument/Equipment Testing, Inspection, and Maintenance B7. Instrument/Equipment Calibration and Frequency	Section 5.4 of the Work Plan	None
#23 Analytical SOP Reference Table	B4. Analytical Methods	Not included.	Laboratory to be used has not been identified. Information will be provided with the laboratory data packages.
#24 Analytical Instrument Calibration Table	N/A	Section 7.1.4.1	None

ELEMENTS OF THE UFP-QAPP AND EPA QA/R-5 IN RELATION TO THIS SAP

UFP-QAPP Worksheet	EPA QA/R-5	This SAP	Variance from UFP-QAPP
#25 Analytical Instrument and Equipment, Maintenance, Testing, and Inspection Table	N/A	Not Included	Laboratory to be used has not been identified. Information on analytical instruments will be in accordance with laboratories QA plan as described in Section 7.1.4.9.
#26 Sampling Handling System	B3. Sample Handling and Custody	Section 6.5	None
#27 Sample Custody Requirements	B3. Sample Handling and Custody	Section 4.1.4 and 7.1.2	None
#28 Quality Control Samples Table	B5. Quality Control	Section 7.1.4	None
#29 Project Documents and Records Table	A9. Project Documents and Records	Table B.4-1	None
#30 Analytical Services Table	N/A	Not Included	Laboratory has not been identified. However, analytical data package turnaround time is identified in Section 8.1.2.
#31 Planned Project Assessment Table	C1. Assessment and Response Actions	Table B.9-1	None
#32 Assessment Findings and Response Actions	C1. Assessment and Response Actions	Table B.9-2	None
#33 QA Management Reports Table	C2. Reports to Management	Table B.9-3	None
#34 Sampling and Analysis Verification (Step 1) Process Table	D1. Data Review, Verification, and Validation D2. Verification and Validation Methods	Table B.8-1	None
#35 Sampling and Analysis Validation (Steps 2a and 2b) Process Table	D1. Data Review, Verification, and Validation	Table B.8-2	None
#36 Sampling and Analysis Validation (Steps 2a and 2b) Summary Table	D1. Data Review, Verification, and Validation	Section 8.2	None

ELEMENTS OF THE UFP-QAPP AND EPA QA/R-5 IN RELATION TO THIS SAP

UFP-QAPP Worksheet	EPA QA/R-5	This SAP	Variance from UFP-QAPP
#37 Data Usability Assessment	D3. Reconciliation with User Requirements	Section 8.2	None

Notes:

DON – Department of the Navy
EPA – U.S. Environmental Protection Agency
MPPEH – material potentially presenting an explosive hazard
N/A – not applicable
QA – quality assurance
QAPP – Quality Assurance Project Plan
QCPM – Quality Control Program Manager
SAP – Sampling and Analysis Plan
SOP – Standard Operating Procedure
TCRA – time-critical removal action
TtEC – Tetra Tech EC, Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

I certify that this SAP is in compliance with the latest version of the UFP-QAPP and the EPA QA/R-5

Lisa A.Bienkowski	Lisa A. Bienkowski	02/27/07
PRINT NAME (TtEC Program Chemist)	SIGNATURE	DATE

N00236.002692
ALAMEDA POINT
SSIC NO. 5090.3

DRAFT
ADDENDUM 1 TO THE FINAL SAMPLING
AND ANALYSIS PLAN
(FIELD SAMPLING PLAN AND
QUALITY ASSURANCE PROJECT PLAN)

DATED 08 AUGUST 2007

IS FILED AS ADMINISTRATIVE RECORD NO.
N00236.002812

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ATTACHMENTS

ABBREVIATIONS AND ACRONYMS

°C	degree Celsius
%R	percent recovery
bgs	below ground surface
^{226}Ra	radium-226
^{90}Sr	strontium-90
BHC	benzene hexachloride
CA LUFT	California Leaking Underground Fuel Tank
Cal/EPA	California Environmental Protection Agency
CAS	Chemical Abstract Service
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chain of custody
CTO	Contract Task Order
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDESB	Department of Defense Explosives Safety Board
DDT	dichlorodiphenyltrichloroethane
DHS	Department of Health Services
DoD	Department of Defense
DOE	Department of Energy
DON	Department of the Navy
DQO	data quality objective
DTSC	Department of Toxic Substances Control
E&E	Ecology and Environment
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EM	Engineering Manual
EPA	U.S. Environmental Protection Agency
EWI	Environmental Work Instruction

ABBREVIATIONS AND ACRONYMS
(Continued)

FCR	Field Change Request
g	gram
GC/MS	gas chromatograph/mass spectrometer
HASL	Health and Safety Laboratory
HASP	Health and Safety Plan
HCl	hydrochloric acid
HDPE	high-density polyethylene
HNO_3	nitric acid
ICAL	initial calibration
ICP	inductively coupled plasma
ICP-AES	inductively coupled plasma-atomic emission spectrometer
IR	Installation Restoration
IRP	Installation Restoration Program
L	liter
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LLRW	low-level radiological waste
MDL	method detection limit
mL	milliliter
MPPEH	material potentially presenting an explosive hazard
MS/MSD	matrix spike/matrix spike duplicate
MSA	Method of Standard Addition
N/A	not applicable
NAD	North American Datum
NaOH	sodium oxide
NAVD	North American Vertical Datum
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NCR	Nonconformance Report
NE	none established

ABBREVIATIONS AND ACRONYMS
(Continued)

NEDD	Navy electronic data deliverable
NFECSW	Southwest Division, Naval Facilities Engineering Command
NFESC	Naval Facilities Engineering Service Center
NIST	National Institute for Standards and Testing
OEW	ordnance and explosive waste
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PQCM	Project Quality Control Manager
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QCM	Quality Control Program Manager
QL	quantitation limit
RAC	Remedial Action Contract
RASO	Radiological Affairs Support Office
RL	reporting limit
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SOP	Standard Operating Procedure
SOW	scope of work
STLC	Soluble Threshold Limit Concentration
SUXOS	Senior Unexploded Ordnance Supervisor

ABBREVIATIONS AND ACRONYMS
(Continued)

SVOC	semivolatile organic compound
TBD	to be determined
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	Time-critical Removal Action
TPH	total petroleum hydrocarbons
TPH-extractable	total extractable petroleum hydrocarbons
TPH-purgeable	total purgeable petroleum hydrocarbons
TtEC	Tetra Tech EC, Inc.
TtFW	Tetra Tech FW, Inc.
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USFWS	United States Fish and Wildlife Service
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 INTRODUCTION

This project-specific Sampling and Analysis Plan (SAP) has been prepared by Tetra Tech EC, Inc. (TtEC) (formerly Tetra Tech FW, Inc. [TtFW]), under the Naval Facilities Engineering Command, Southwest (NAVFAC SW) Remedial Action Contract (RAC) IV No. N62473-06-D-2201, Contract Task Order (CTO) No. 0015. The purpose of the SAP is to provide guidance on sampling, analysis, and quality assurance (QA) for specific sampling activities pertaining to the radiological remediation work at Installation Restoration (IR) Sites 1, 2, and 32 at Alameda Point, Alameda, California.

This SAP will be used as a reference document by all field and laboratory personnel engaged in the sampling and analysis for this project. This document will be provided to individuals listed in Table B.1-1. Included in this SAP are data quality objectives (DQOs), field sampling procedures, QA/quality control (QC) requirements, and data gathering methods that will be used during this project. The QA elements of this SAP were prepared in accordance with the *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP)* (U.S. Environmental Protection Agency [EPA], 2005) and *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, QAMS* (EPA, 2006) to ensure that all data collected are precise, accurate, representative, complete, and comparable to meet their intended use. Table B.1-2 is a cross-walk table that lists the elements of the UFP-QAPP and EPA QA/R-5 and their relation to this SAP.

1.1 OBJECTIVES

The objectives of this SAP are to: 1) provide guidance for the field sampling activities; 2) describe and establish consistent field sampling procedures; 3) establish data gathering, handling, and documentation methods; and 4) define QA/QC measures to ensure consistency and confidence in the data obtained.

The primary objectives of the project are to excavate the previously identified radiological anomalies, the material potentially presenting an explosive hazard (MPPEH), and soil impacted by radiological sources and MPPEH. Specific objectives will include the following:

- Remove previously identified radiological anomalies in IR Sites 1 (exclude anomalies identified within proposed cover area), IR Site 2, and IR Site 32.
- Remove the former Firing-range Berm in IR Site 1.
- Remove debris pits containing MPPEH in IR Site 1.
- Remove the disposal trench in IR Site 1 where radiological waste was reportedly disposed.

1.2 REGULATORY OVERSIGHT

The Department of the Navy (DON) is the lead agency responsible for implementation of the Installation Restoration Program (IRP), and the EPA, California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances (DTSC), Regional Water Quality Control Board, Radiological Affairs Support Office (RASO), and United States Fish and Wildlife Service (USFWS) (for sensitive species) will provide regulatory oversight and guidance for the removal action.

TABLE B.1-1

DISTRIBUTION LIST
(UFP-QAPP Worksheet #3)

This document will be distributed to the following project participants listed below once all approval signatures have been received.

SAP Recipients	Title	Organization	Telephone Number	E-mail Address
Mr. Andrew Baughman	Remedial Project Manager	NAVFAC SW	(619) 532-0902	andrew.baughman@navy.mil
Mr. Mathew Slack	RASO	RASO	(757) 887-4692	mathew.slack@navy.mil
Mr. Narciso Ancog	QAO	NAVFAC SW	(619) 532-3046	narciso.ancog@navy.mil
Ms. Anna-Marie Cook	EPA-RPM	EPA	(415) 972-3029	cook.anna-marie@epa.gov
Ms. Rachel Hurt	Field Biologist	USFWS	(510) 377-8375	rachel_hurt@fws.gov
Mr. Gregory Grace	ROICC	NAVFAC SW	(510) 749-5940	gregory.grace@navy.mil
Mr. Abram Eloskof	Project Manager	Tetra Tech EC, Inc.	(949) 756-7521	abram.eloskof@tteci.com
Ms. Mary Schneider	QC Program Manager	Tetra Tech EC, Inc.	(949) 756-7586	mary.schneider@tteci.com

Notes:

EPA – U.S. Environmental Protection Agency
NAVFAC SW – Naval Facilities Engineering Command, Southwest
QAO – Quality Assurance Officer
QC – quality control
RASO – Radiological Affairs Support Office
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans
USFWS – United States Fish and Wildlife Service

2.0 PROJECT ORGANIZATION

This section describes project organization, the communication pathway that will be used, and general and specialized training requirements.

2.1 PROJECT ORGANIZATION

Key personnel from DON and TtEC who are responsible for the oversight and/or implementation of the proposed field activities include the Remedial Project Manager (RPM), NAVFAC SW Quality Assurance Officer (QAO), Project Manager, Quality Control Program Manager (QCM), Program Chemist, and Project Chemist. The project organization chart shown in Figure B.2-1 provides lines of responsibility and communication. In addition, responsibilities of each of the key personnel are listed in Table B.2-1.

Table B.2-2 describes the communication pathways and modes of communication that will be used during the project. These pathways include obtaining approval between project personnel, subcontractors, and the DON.

2.2 TRAINING REQUIREMENTS

Project on-site personnel are required to meet the Occupational Safety and Health Administration (OSHA) training requirements defined in Title 29 Code of Federal Regulations (CFR), Part 1910.120(e). These requirements include 40 hours of formal off-site instruction, a minimum of 3 days of actual on-site field experience under the supervision of a trained and experienced field supervisor, and 8 hours of annual refresher training.

Before work begins, project personnel will receive the following site-specific training:

- Names of personnel and alternates responsible for health and safety at the project site
- Health and safety hazards present on site
- Selection of the appropriate personal protection levels
- Correct use of personal protective equipment (PPE)
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment on site
- Medical surveillance requirements, including recognition of symptoms and signs that might indicate over-exposure to hazardous substances

Copies of health and safety training records, including course completion certifications for the initial and refresher health and safety training, specialized supervisor training, and first aid and CPR training, are to be maintained in the project files.

In addition to the health and safety training, sampler(s) will be provided with field methods and sampling procedures outlined in this SAP. This training includes but is not limited to:

- Soil, sediment, debris or water sampling as applicable to the project
- Sample handling, packaging, and shipping
- Use of related field equipment
- Handling of project-derived waste

If the project scope or type of sampling to be performed changes, the sampler(s) will be provided with additional training prior to field activities. All training will be documented, and the training record will be maintained in the project file. Sampling personnel will be required to read and understand the SAP prior to any sample collection activities. The project personnel sign-off sheet (Table B.2-4) will be signed by any onsite personnel conducting sampling to indicate that they have read the SAP and will perform the task as described. The sign-off sheet will be maintained in the project file.

2.2.1 Specialized Training

In addition to the general training described above, the sampler(s) must receive general awareness training for radiation and MPPEH prior to any field activities. The specialized training requirements are listed in Table B.2-3.

TABLE B.2-1

PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS
(UFP-QAPP Worksheet #7)

Name	Title	Organizational Affiliation	Responsibilities
Narciso Ancog	Quality Assurance Officer	NAVFAC SW	• Reviewing and approving Sampling and Analysis Plan • Providing DON oversight of TtEC's Quality Assurance Program • Providing quality-related directives through the Contracting Officer • Providing technical and administrative oversight of TtEC's surveillance audit activities • Acting as point of contact for matters concerning quality assurance and the DON's Laboratory Quality Assurance Program • Authorizing the suspension of project execution if quality assurance requirements are not adequately followed
Andrew Baughman	Remedial Project Manager	NAVFAC SW	• Performing project management for the DON • ~~Ensuring that the project scope of work requirements are fulfilled~~ • Overseeing the project cost and schedule • Providing formal technical direction to the TtEC project team, as needed • Acting as lead interface with agencies
Abram Eloskof	Project Manager	TtEC	• Coordinating work activities of subcontractors and TtEC personnel and ensuring that all personnel adhere to the administrative and technical requirements of the project • Monitoring and reporting the progress of work and ensuring that the project deliverables are completed on time and within project budget • Monitoring the budget and schedule and notifying the client and the RPM of any changes that may require administration actions • Ensuring adherence to the quality requirements of the contract, project scope of work, and the SAP • Ensuring that all work meets the technical requirements of TCRA Work Plan and complies with applicable codes and regulations • Ensuring that all work activities are conducted in a safe manner in accordance with the HASP, USACE's *Safety and Health Requirements* (EM 385-1-1), and all applicable OSHA regulations

TABLE B.2-1

PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS
(UFP-QAPP Worksheet #7)

Name	Title	Organizational Affiliation	Responsibilities
			• Serving as the primary contact between the DON and TtEC for actions and information related to the work and including appropriate TtEC technical personnel in the decision-making • Coordinating satisfactory resolution and completion of evaluation and acceptance report for Nonconformance Reports
Mary Schneider	Quality Control Program Manager	TtEC	• Establishing and maintaining the Quality Program • Overseeing program QC, including construction and chemical data acquisition • Acting as a focal point for coordination for quality matters across all projects and resolving quality issues • Suspending project activities if quality standards are not maintained • Interfacing with the DON, including NAVFAV SW Quality Assurance Officer, on quality-related items • Conducting field QC audits to ensure that project plans are being followed • Performing reviews of audit and surveillance reports conducted by others • Implementing DON technical direction letters related to quality topics
Lisa Bienkowski	Program Chemist	TtEC	• Implementing contract requirements for chemical data collection • Supporting projects as the technical lead for chemical data collection and analysis • Ensuring that Project Chemist has adequate training in sample collection and analytical methods • Monitoring performance of subcontract laboratory and data validator
Nicholas Weinberger	Project Chemist	TtEC	• Developing SAP • Ensuring that sampling personnel have documented training on sampling procedures for specific project requirements • Evaluating and selecting a qualified subcontract laboratory • Performing surveillance of sample collection activities • Reviewing laboratory data prior to use against requirements in this SAP • Evaluating and selecting a qualified data validation subcontractor

TABLE B.2-1

PERSONNEL RESPONSIBILITIES AND QUALIFICATIONS
(UFP-QAPP Worksheet #7)

Name	Title	Organizational Affiliation	Responsibilities
			• Reviewing data validation reports • Assessing data to ensure that the quality of the data meets the intended use of the data
Jonathan Karnath	Data Manager	TtEC	• Uploading field information and laboratory data into the database • Checking all data for completeness such that all required fields are entered and providing output to the project team in the format requested. • Submitting NEDD formatted data to the DON in accordance with the requirements set forth in *Environmental Work Instruction (EWI) EVR.6, Environmental Data Management and Required Electronic Delivery Standards* (NFECSW, 2005).

Notes:

DON – Department of the Navy
EM – Engineering Manual
EWI – Environmental Work Instruction
HASP – Health and Safety Plan
NAVFAC SW – Naval Facilities Engineering Command, Southwest
NEDD – Navy electronic data deliverable
NFECSW – Southwest Division, Naval Facilities Engineering Command
OSHA – Occupational Safety and Health Administration
QC – quality control
RPM – Remedial Project Manager
SAP – Sampling and Analysis Plan
TCRA – time-critical removal action
TtEC – Tetra Tech EC, Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans
USACE – United States Army Corps of Engineers

TABLE B.2-2

COMMUNICATION PATHWAYS
(UFP-QAPP Worksheet #6)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Coordination of laboratory supplies for field activities	Project Chemist	Nicholas Weinberger	(949) 756-7588	The Project Chemist will contact the laboratory to provide all necessary sample containers and appropriate shipping materials (such as coolers and bubble wrap) to be delivered on site prior to commencement of field sampling activities and throughout the course of the project.
Submittal of samples to the laboratory	Sampling Personnel	TBD	TBD	Sampler will fax COCs to the laboratory after samples have been picked up by commercial courier.
Daily COC reports and shipping documentation	Sample Personnel	TBD	TBD	COCs and shipping documentation will be submitted via fax or e-mail to the Project Chemist at the end of each day that samples are collected.
Reporting laboratory data quality issues	Laboratory Project Manager	TBD	TBD	All QA/QC issues will reported by the Laboratory Project Manager to the Project Chemist in writing within 2 business days.
Field and analytical corrective actions	Project Chemist	Nicholas Weinberger	(949) 756-7588	The Project Chemist will notify the PQCM, QCM, and Program Chemist in writing of any field or analytical procedures that were performed not in accordance with this SAP immediately. The Project Chemist in coordination with the PQCM will complete documentation of the non-conformance and corrective actions to be taken. The Project Chemist will verify that the corrective actions have been implemented.
Release of analytical data	Project Chemist	Nicholas Weinberger	(949) 756-7588	The Project Chemist will review faxed/e-mailed data to verify that data quality is met as described in this SAP prior to releasing the data. Analytical data will be released to the Project Manager (or their designee) after the Project Chemist has verified that the data is in accordance the SAP requirements.
SAP procedure revision during field activities	Project Chemist	Nicholas Weinberger	(949) 756-7588	The Project Chemist or designee will prepare an FCR for any changes in sampling procedures that occur due to conditions in the field.

TABLE B.2-2

COMMUNICATION PATHWAYS
(UFP-QAPP Worksheet #6)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
SAP amendments	Project Chemist	Nicholas Weinberger	(949) 756-7588	Any changes to the SAP will require that the Project Chemist prepare an addendum, which will be approved by NAVFAC SW prior to any field activities.

Notes:

COC – chain of custody
FCR – Field Change Request
NAVFAC SW – Naval Facilities Engineering Command, Southwest
PQCM – Project Quality Control Manager
QA – quality assurance
QC – quality control
QCM – Quality Control Program Manager
SAP – Sampling and Analysis Plan
TBD – to be determined
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

TABLE B.2-3

SPECIAL PERSONNEL TRAINING REQUIREMENTS
(UFP-QAPP Worksheet #8)

Project Function	Specialized Training – Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records and Certificates
Soil surface sampling	General awareness training for radiation	CHP	Prior to field work	Samplers	CHP, TtEC	TtEC project files
Soil surface sampling	MPPEH briefing	SUXOS	Prior to field work	Samplers	SUXOS, TtEC	TtEC project files
Soil surface sampling	Protection of natural resources	Project Biologist	Prior to field work	Samplers	Project Biologist, TtEC	TtEC project files
En Core Sampler	On site demonstration of sampling technique	Project Chemist	Prior to sampling activities	Sampling personnel	Sampler, TtEC	TtEC Project file

Notes:

CHP – Certified Health Physicist
MPPEH – material potentially presenting an explosive hazard
SUXOS – Senior Unexploded Ordnance Supervisor
TtEC – Tetra Tech EC, Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

TABLE B.2-4

PROJECT PERSONNEL SIGN-OFF SHEET
(UFP-QAPP Worksheet #4)

I have read and understood the SAP and perform the task as described in the SAP.

Project Personnel	Organization	Title	Signature	Date SAP Read

Notes:

SAP – Sampling and Analysis Plan
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

3.0 PROJECT OVERVIEW

This section describes the project background, scope, and DQOs.

3.1 BACKGROUND

Alameda Point is located on the western end of Alameda Island, which lies on the eastern side of San Francisco Bay, adjacent to the city of Oakland. Alameda Point is rectangular in shape, approximately 2 miles long east-to-west, 1 mile wide north-to-south, and was occupied by the 1,734-acre former Naval Air Station Alameda until its closure in 1997. IR Sites 1 and 32 are located at the northwestern corner, while IR Site 2 is located at the southwest corner of Alameda Point, Alameda, California.

3.1.1 Site Description

IR Site 1

IR Site 1 encompasses approximately 78 acres. San Francisco Bay borders the site to the west and the Oakland Inner Harbor borders the site to the north. IR Site 1 was previously used as a waste disposal site and consisted of several disposal areas. The former small arms firing-range is located near the center of the western border. An earthen berm (dike) 10 to 15 feet high is located adjacent to the shoreline near the former small arms firing range area. A site detail map of IR Site 1 is provided as Figure 2-1 of the Time-critical Removal Action (TCRA) Work Plan.

IR Site 2

IR Site 2 encompasses approximately 110 acres and is bordered by San Francisco Bay to the south and west. The disposal area at IR Site 2 covers approximately 77 acres in the most southwestern portion of Alameda Point. IR Site 2 was used as the main disposal area for Alameda Point from approximately 1952 through 1978. An estimated 1.6-million tons of waste were deposited (Ecology and Environment [E&E], 1983). The wastes included municipal solid waste, waste chemical drums (contents unknown), solvents, oily waste and sludge, paint waste, plating wastes, industrial strippers and cleaners, acids, mercury, polychlorinated biphenyl (PCB)-containing liquids, batteries, low-level radiological waste (LLRW) from radium dials and dial painting, scrap metal, inert ordnance, asbestos, several pesticides (solid and liquid), tear gas agent, biological waste from the Oak Knoll Naval Hospital, creosote, dredge spoils, and waste medicines and reagents (E&E, 1983). MPPEH may have also been deposited in the 2.5-acre (approximate) Possible Ordnance and Explosives Waste (OEW) Burial Site located in the southern part of the disposal area. A seawall was constructed along the southern and western edges of the site, and a 36-inch culvert was installed in the seawall to hydraulically connect San Francisco Bay to waters within the seawall. A substantial (10- to 15-foot) dike was installed around the perimeter of the site when disposal operations ceased.

IR Site 32

IR Site 32 is approximately 5.8 acres in size and includes three environmental baseline survey subparcels (Subparcels 8A, 5E, and a portion of 5D). The historical use for IR Site 32 was ordnance storage. An open space area in the eastern portion of the site was used for equipment, vehicle, and aircraft storage. Two buildings are located within IR Site 32: Buildings 594 and 82. Building 594 contains dormitory rooms, a kitchen, and a security-monitoring panel and was previously used as a storage and repair shop for underwater weapons. Building 82 is a concrete guard shack. Buildings 594 and 82 were constructed in 1979. There are no documented releases of hazardous substances in either of these buildings. Recently, the DON expanded the boundaries of IR Site 32 north to the Oakland Inner Harbor by annexing the northern portion of Subparcel 5D.

3.2 SCOPE

The scope for this project includes the following:

- Excavating previously identified radiological anomalies in IR Sites 1 (except anomalies within the proposed cover areas), IR Site 2 and IR Site 32
- Excavating the former Firing-range Berm in IR Site 1
- Excavating debris pits that contain MPPEH in IR Site 1
- Excavating a disposal trench in IR Site 1 where radiological waste was reportedly disposed
- Collecting and analyzing confirmation soil samples to establish condition after excavation
- Collecting and analyzing backfill material sources to ensure that material used on site for backfill meets criteria, as necessary
- Conducting waste characterization sampling of project-derived wastes generated during field activities for disposal purposes, as necessary

3.3 DATA QUALITY OBJECTIVES

The DQOs specify the project objectives, the data collection boundaries and limitations, the most appropriate type of data to collect, and the level of decision error that will be acceptable for the decision. The quality and quantity of data required to implement environmental remedial action are also defined. The scope, level of detail, and verification for the design and planning documents may vary from project to project, depending on the project-specific conditions and the nature and complexity of the proposed activities. The project-specific DQOs, as defined through the seven-step process (EPA, 2006), are as follows:

1. State the problem.
2. Identify the goals of the study.

3. Identify information inputs.
4. Define the boundaries of the study.
5. Develop the analytic approach.
6. Specify performance or acceptance criteria.
7. Develop the plan for obtaining data.

The DQOs are presented in Table B.3-1.

TABLE B.3-1

SUMMARY OF DATA QUALITY OBJECTIVES

State the Problem	Identify the Goals of the Study	Identify Information Inputs	Define the Boundaries of the Study	Develop the Analytic Approach	Specify Performance or Acceptance Criteria	Develop the Plan for Obtaining Data
STEP 1	**STEP 2**	**STEP 3**	**STEP 4**	**STEP 5**	**STEP 6**	**STEP 7**
The IR Site 1 Radiological Characterization Report (TtEC, 2005a) and IR Site 2 Radiological Characterization Report (TtEC, 2005b) indicate that ^{226}Ra was present at IR Sites 1 and 2 in soil above the background level. The radiological anomalies identified during these surveys will be removed, except where a cap is proposed in IR Site 1. In addition, a radiological survey of IR Site 32, the Shorelines of IR Sites 1 and 2 and the former Radiological Shack within IR Site 2 will be conducted in accordance with the Radiological Survey Work Plan (TtEC, 2006) in 2006. As part of remedial activities, soil will be excavated where radioactive anomalies are identified during this survey. In addition to the radiological anomalies identified at IR Sites 1, 2, and 32, the following areas have been identified as part of the remedial activities for this project: • A disposal trench located north of the former Firing-range Berm reportedly contains radiological waste. A geophysical survey will be conducted to delineate the boundaries of the trench, and radioactive waste will be removed (if present). • The former Firing-range Berm at IR Site 1, located at the former small arms firing range area, contains MPPEH. As part of the remedial action, the former Firing-range Berm will be removed. • The debris pits in the vicinity of the former Firing-range Berm contain debris and material that may contain radiological anomalies. These pits will be identified by a geophysical survey and excavated. Any radiological anomalies and/or MPPEH identified will be segregated into containers and disposed of separately. Import material to backfill the radiological anomaly excavations, disposal trench excavation, and debris pits will be identified and sampled prior to use onsite. (The Firing-range Berm will only be removed; therefore, backfill material is not required.) Waste characterization sampling will be performed on stockpile and wastewater samples for subsequent disposal purposes.	1. Is ^{226}Ra detected 3 sigma above background in post-excavation samples collected from the radioactive anomaly excavations or the disposal trenches? 2. Is the import material meet screening levels listed in Table B.7-1? 3. Are the analytical results for the waste characterization samples below the levels listed in Tables B.7-1 and B.7-2?	The established background concentration of ^{226}Ra for Alameda Point is reported in the IR Site 1 Radiological Characterization Report (TtEC, 2005a). The IR Site 1Radiological Characterization Report (TtEC, 2005a) and IR Site 2 Radiological Characterization Report (TtEC, 2005b) identify the locations of radiological anomalies at IR Sites 1 and 2, respectively. Additional radiological anomalies, if any, will be identified at IR Site 32, the Shorelines of IR Sites 1 and 2 and the former Radiological Shack within IR Site 2 prior to the start of excavation activities. A geophysical survey will identify the disposal trenches. Post-excavation samples will be collected at each radioactive anomaly excavation and within the disposal trenches. Post-excavation samples will be analyzed by gamma spectroscopy. A geophysical survey will be performed to locate the disposal trench and approximate trench boundaries. One post-excavation sample will be collected at random point within each 25 by 25-foot grid of the excavation floor, and one per every 25 linear feet along the walls of the trench. Post-excavation samples will be analyzed by gamma spectroscopy. Import material samples will be collected from each source and analyzed prior to use for VOCs, SVOCs, pesticides, PCBs, TPH-purgeable, TPH-extractable, and metals. All waste samples will be collected and analyzed for metals and ten percent of those samples will also be analyzed for gamma spectroscopy, ^{90}Sr, explosives, VOCs, SVOCs, PAHs, pesticides, PCBs, Title 22 metals, TPH-purgeable, and TPH-extractable. Analytical methods for analyses listed above are detailed in Table B.6-2.	Figure B.1-2 illustrates the boundaries of IR Site 1, 2, and 32. Figure B.2-1 and B.2-2 identify the areas of radiological anomalies at IR Site 1 and 2. The extent of the excavation is estimated to be 10 feet in diameter and 2 feet deep. The debris pits and disposal trench excavation boundaries will be determined in the field by geophysical survey. The debris pits and disposal trench will be excavated to 8 feet or until groundwater is encountered. The berm located at the former small arms firing range area is 10 to 15 feet high. This project is estimated to start December 2006 and end in June 2007.	If concentration of ^{226}Ra is reported 3 sigma above the background concentration for post-excavation samples from the radioactive anomaly excavations or disposal trenches, then over-excavation of the area will be conducted and another post-excavation sample will be collected. This process will continue until the concentration of ^{226}Ra is below 3 sigma above the background or until groundwater is encountered (approximately 8 feet bgs). Otherwise, the excavations or trenches will be backfilled. If the results of the import material are above the screening criteria listed in Table 7-1, then the material will not be used on site. Another import fill source will be identified, and samples will be collected and compared against the screening levels. Otherwise, the import material will be used as backfill on site. If the analytical results for the waste characterization samples are below the levels listed in Tables B.7-1 and B.7-2, the waste will be classified and disposed of as non-hazardous. Otherwise, applicable STLC and TCLP tests may be performed to potentially classify the waste as non-RCRA or RCRA hazardous.	To limit decision errors, analytical method requirements and project-specific DQOs were established. Published analytical methods and requirements in the QSM (DoD, 2006) are the primary determinants of DQOs by establishing limits for precision and accuracy. Field crews will review the SAP before collection of samples and sign-off on Table B.2-4. A copy of the SAP will be given to laboratories solicited during procurement to ensure that the laboratory can meet all SAP requirements. Third-party data validation will be performed on all samples, except waste characterization samples. Sample collection and analysis methods were chosen to minimize sampling errors. The precision and accuracy limits are listed in Table B.7-3.	One post-excavation soil sample will be collected at the floor of the excavated radiological anomaly areas. The disposal trench will be excavated up to 8 feet bgs or when groundwater is encounter. Depending on the lateral boundaries, one post-excavation sample will be collected at random point within a 25-foot by 25-foot grid at the floor of the excavation. For grids less than 25-feet square, a post-excavation sample will still be collected. One post-excavation sample may be collected from each 25 linear foot section along the sidewalls of the excavation. I Four random samples of each import material source will be collected and analyzed. Soil samples will be collected from the stockpiles at a frequency of two samples per 100 cubic yards, and one sample will be collected of the wastewater.

TABLE B.3-1

SUMMARY OF DATA QUALITY OBJECTIVES

Notes:

bgs – below ground surface
DoD – Department of Defense
DQO – data quality objective
IR – Installation Restoration
MPPEH – material potentially presenting an explosive hazard
PCB – polychlorinated biphenyl
QSM – Quality System Manual
^{226}Ra – radium-226
SAP – Sampling and Analysis Plan
SVOC – semivolatile organic compound
TPH-extractable – total extractable petroleum hydrocarbons
TPH-purgeable – total purgeable petroleum hydrocarbons
TtEC – Tetra Tech EC, Inc.
VOC – volatile organic compound

4.0 DOCUMENTATION AND RECORDS

This section discusses the types of documentation and records required for this project and Table B.4-1 lists where the documentation and records will be maintained.

4.1 FIELD DOCUMENTATION

Field documentation associated with sampling activities includes logbooks, field forms, sample labels, chain-of-custody (COC) records, field surveillance and Nonconformance Reports (NCRs), and Field Change Request (FCR) forms. Descriptions of each type of field documentation are described in the following sections.

4.1.1 Logbooks

A permanently bound field logbook with consecutively numbered pages, used for sampling activities only, will be assigned to this project. All entries will be recorded in indelible black or blue ink. At the end of each workday, the logbook pages will be signed by the responsible sampler and any unused portions of the logbook pages will be crossed out, signed, and dated. If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used and the person receiving the logbook will sign and date the next page to be used. At a minimum, the logbook will contain the following information:

- Project name and site location
- Date and time
- Personnel in attendance
- General weather information
- Work performed
- Field observations
- Sampling performed, including specifics such as location, type of sample, type of analyses, and sample identification
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments
- Problems encountered and corrective action taken
- Identification of field QC samples
- QC activities
- Verbal or written instructions
- Any other events that may affect the samples

4.1.2 Field Forms

In addition to field logbooks, on-site personnel will use calibration forms for any field instrumentation. Copies of forms applicable to this project are included in Attachment 1.

4.1.3 Sample Labels

Sample labels will be filled out in indelible black or blue ink and affixed to sample containers at the time of sample collection. An example sample label is provided in Attachment 2. Each sample label will be covered with clear tape. Each sample container will be labeled with the following, at a minimum:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock) from the start of sampling
- Sampler's initials
- Analyses required
- Preservative (if any)

4.1.4 Chain of Custody

An overriding consideration for data resulting from laboratory analyses is the ability to demonstrate that the data are legally defensible, i.e., that the samples were obtained from the locations stated and that they reached the laboratory without alteration. To accomplish this, evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal will be documented through the COC record.

A sample is considered to be in custody if the following conditions have been observed:

- In actual possession or in view of the person who collected the samples
- Locked in a secure area
- Placed in an area restricted to authorized personnel
- Placed in a container and secured with an official seal, such that the sample cannot be reached without breaking the seal

Attachment 2 presents an example of the COC record. The COC record lists each sample and the individuals performing the sample collection, shipment, and receipt. Attachment 2 also presents an example of a custody seal that will seal samples and the cooler during transportation to the laboratory.

The COC record will be the controlling document to ensure that the sample custody is maintained. Sampling personnel upon collecting a sample will initiate the COC record in the field. Each time the sample custody is transferred, the former custodian will sign the COC on the "Relinquished By" line, and the new custodian will sign the COC on the "Received By" line. The date, time, and the name of their project or company affiliation will accompany each signature. The waybill number and courier name will be recorded on the COC when a commercial carrier is used. The shipping container will be secured with two custody seals, thereby allowing for custody to be maintained by the shipping personnel until receipt of the laboratory.

Sample custody will be the responsibility of sampling personnel from the time of sample collection until the samples are accepted by either the commercial courier or laboratory-provided courier. After samples are received by the laboratory, custody of samples will be the responsibility of the laboratory staff in accordance with the laboratory Standard Operating Procedures (SOP).

In addition to providing a custody exchange record for the samples, the COC record serves as a formal request for sample analyses. The completed COC records will be processed as follows:

- The top two copies will be sent to the analytical laboratory with samples. The laboratory will include the top copy in the data packages.
- The third copy will be retained on site. The sampler must also fax a copy to the Project Chemist on the day samples are collected.
- The last copy will be sent to the Project Chemist.

4.1.5 Sample Shipping Records

Samples will be transported to the laboratory via laboratory-provided courier or FedEx®. For samples received by a laboratory courier, the courier will sign the COC and accept the samples. For samples shipped via FedEx, the COC will be included in the cooler, and the sender's copy of the airbill will serve as custody documentation and will be maintained on site in the project file. Detailed information on sample handling and shipping procedures are detailed in Section 6.6.

4.1.6 Field Surveillance Reports

On-site field inspections will be performed by the Project Chemist at a frequency of once, preferably at the beginning of field sampling activities for a project lasting less than 6 months. For projects longer than 6 months, two inspections may be conducted per year. The Project Chemist will use a surveillance checklist during inspections. A surveillance report will be prepared and provided to the Project Manager, PQCM and QCM.

4.1.7 Field Change Request

An FCR will be prepared by the Project Chemist or designee if a change to the SAP occurs during the project.

4.2 LABORATORY DOCUMENTATION

Laboratory records associated with project samples include the following at a minimum:

- Sample receipt and login
- Laboratory internal COC
- Instrument calibration logs
- Sample preparation logs
- Sample analysis/run logs
- Sample results
- Case narrative
- Sample disposal records
- NCRs including corrective actions

The laboratory will prepare analytical data packages comprised of documentation mentioned above for each sample and provide them to TtEC. Laboratory deliverables will include two copies of the hard-copy data package, submitted as either EPA Level III-equivalent or IV-equivalent packages as specified in the COC.

Detailed information on the requirement of the hard-copy data package is presented below.

The pages in the data package will be sequentially numbered. The package will contain a table of contents referencing individual sections, the original, (white copy) of COC records, a copy of all corrective action reports, and a narrative documenting the resolution of all corrective actions and nonconformances. All samples will be cross-referenced to the associated QC samples. The packages will be assembled in the following sequence:

- Cover page (with laboratory name, address, phone number, contact person, and sample delivery group number, as well as project name and project number)
- Table of contents
- Case narrative
- Sample management records including the original, white copy of COC records (including cooler temperature and sample condition), shipping documents, and laboratory sample receipt forms

- Cross-reference table
- Analytical results and QA/QC information by test as follows:
  - Radiological raw data sequence
    - Sample results forms, including method blanks
    - Sample raw data (EPA Level IV only)
    - QC summaries
    - Initial calibration (ICAL)
    - Calibration checks, including all related continuing calibration verifications (CCVs)
    - Instrument run log
    - Sample preparation log
  - Organic raw data sequence
    - Sample result forms, including method blanks
    - Sample raw data after each result form (EPA Level IV only)
    - Surrogate summaries (surrogate results may appear on the sample result forms)
    - QC summaries
    - Tune data (gas chromatograph/mass spectrometer [GC/MS] only)
    - ICAL
    - Daily calibration checks, including related CCVs
    - Resolution check standards (GC/MS and pesticides) (if applicable)
    - QC (laboratory control sample [LCS], matrix spike/matrix spike duplicate [MS/MSD]) raw data (EPA Level IV only)
    - Instrument run log
    - Sample preparation log
  - Inorganic raw data sequence
    - Sample results forms, including method blanks
    - Sample raw data (EPA Level IV only)
    - QC summaries
    - ICAL
    - Daily calibration checks, including all related CCVs
    - Calibration blanks, including all related continuing calibration blanks
    - Interference check standards A and B for inductively coupled plasma-atomic emission spectrometer (ICP-AES) only
    - QC raw data (EPA Level IV only)
    - Post-digestion spike results
    - Analytical spike results
    - Method of standard additions

- ICP-AES serial dilutions
- Instrument run log
- Sample preparation log

All relevant laboratory raw data and documentation, including, but not limited to, logbooks, data sheets, electronic files, and final reports, will be maintained by the laboratory for at least 7 years. TtEC will be notified 30 days before disposal of any relevant laboratory records.

In addition to the hard-copy data, an electronic data deliverable (EDD) will be submitted in ASCII format. The EDD will be compatible with the Navy electronic data deliverable (NEDD) standard. Both the EDD and the hard-copy report will present results to two or three significant figures. For radiological results, three significant figures will be used. For organic results, two significant figures will be used. For inorganic results, two significant figures will be used for results less than 10, and three significant figures will be used for results greater than 10. Results for QC analyses (method blanks, MS/MSD, LCS, and LCS duplicates [LCSD]) will be reported up to three significant figures.

When revisions to data reports are required, the revised pages will be stamped with the notation "amended or revised report." If revisions affect the EDD, then a revised EDD must be sent along with the revised hard-copy pages.

4.3 DATA VALIDATION REPORTS

All analytical data generated from laboratories, with the exception of waste characterization samples, will be validated by an independent data validation company. The validator shall provide one original and one copy of the Data Validation Reports, which include analytical result pages with appropriate qualifiers and the Data Validation Findings Worksheets. The original and copy reports will be submitted in separate sets. The reports will be arranged in increasing sample delivery group (SDG) numbers and grouped by the type of analysis; i.e., a group of reports will consist of SDGs with the same analysis arranged in increasing numerical order. Each SDG will be submitted as a separate data validation report.

The validation reports will contain the following information:

- Title page, which includes project name, sample collection date, validator subcontractor name, report date, type of analysis, laboratory, SDG, sample identifications (including MS/MSD, duplicate, reanalysis, or dilution samples), sample matrix (e.g., soil, water), and validation level (EPA Level III or IV)
- Introduction page, which includes the number of samples per matrix, analytical method reference, validation guideline reference, section references to summary qualification flags, and denotes QC samples; statements regarding flag classification (protocol/advisory) and whether raw data check was performed will also be included

- Section headings for each analytical method will include:
  - Technical holding times
  - GC/MS instrument performance check (tune) (if applicable)
  - Calibration
    a. ICAL
    b. Initial calibration verification (second source standard)
    c. CCV
  - Laboratory blanks
  - Accuracy and precision data
    a. Surrogate spike recoveries
    b. MS/MSD
    c. LCSDs
    d. Internal Standards
  - Target compound identification
  - System performance checks
  - Analyte quantitation and quantitation limits (QLs)
  - Field QC samples (if not applicable, report will note)
  - Overall assessment of data
  - Assessment of compliance with scope of work (SOW) requirements
- QC deviation summaries, which will include in a tabular format:
  - Unique identification of QC run (e.g., date/time, etc.)
  - Associated project and sample numbers (not the laboratory internal sample IDs)
  - Associated constituents
  - Actual value for noted deviation
  - Applicable QC criteria
  - Applicable qualifiers
  - Qualifier classifications (advisory or protocol)

- Copies of analytical result pages, which will be flagged with the appropriate changes in results/qualifiers based on the data validation findings; each analytical result page with changes will be initialed and dated; if there are no changes in results/qualifiers, the analytical result pages should still be included.
- Validation findings worksheets
- Qualifier classification

The following format will be used when preparing and submitting revised data validation reports and analytical result pages:

- The cover letter and revised text pages will clearly identify the revision number (i.e., **Revision 1**) typed in the upper-right hand corner of the page.

- A statement in the cover letter will be included indicating that an asterisk will be placed in the margin to the left of any revised item in the text.
- Every revised page in the text will have the following statement placed at the bottom of the page:

  ***Indicates revision based on report review.**

- The summary table will have an asterisk placed to the left of every revised item and a statement at the bottom of the page as follows:

  ***Indicates change as a result of report review.**

- The analytical result pages will be stamped as follows:

  ***Indicates change as a result of report review.**

Revisions will be submitted within 1 week of receiving the review comments from the Project Chemist. Report revision submittal packages will include an original and copy of the cover page, revised pages, and revised analytical result pages.

The data validation subcontractor will maintain validation records for at least 7 years. TtEC will be notified 30 days before disposal of any relevant records.

TABLE B.4-1

PROJECT DOCUMENTS AND RECORDS
(UFP-QAPP Worksheet #29)

Document	Where Maintained
Field logbook	Project file
Field forms	Project file
Chain of custody	Project file
Shipping records	Project file
Field surveillance and Nonconformance Reports	Project file
Laboratory data package including: Sample receipt and login Laboratory internal chain of custody Instrument calibration logs Sample preparation logs Sample analysis/run logs Nonconformance Reports including corrective actions	Laboratory and project file
Data validation report	Validator and project file

Notes:

UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

5.0 SAMPLING STRATEGY

This section provides a brief description of the approach that will be used to collect samples. Table B.5-1 provides a summary of the sampling locations, matrix, depths, and analytical requirements. The analytical methods used for this project will be in conjunction with the *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846*, Third Edition and final updates (EPA, 1986); the *Gamma Emitting Radionuclides by Gamma Ray Spectroscopy, Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA/600/4-80-032)* (EPA, 1980); and the *Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300* [Department of Energy (DOE), 1997].

5.1 POST EXCAVATION SAMPLING

The TCRA will be conducted to remove previously identified radiological anomalies (detection of radium-226 [^{226}Ra] at 1 pCi/g above background within IR Sites 1 (except in the proposed cap area), IR Site 2 and IR Site 32. In addition, the former Firing-range Berm and debris pits containing MPPEH as well as a disposal trench containing radiological material will be removed within IR Site 1. Figures B.5-1 and B.5-2 present areas to be excavated during this removal action. The radiological survey of IR Site 32 and the shorelines of IR Sites 1 and 2 will be performed in 2006 prior to the TCRA activities.

Detailed information on excavation activities at each area are discussed in Section 8.1 of the TCRA Work Plan.

Post-excavation samples for the disposal trench will be collected following establishment of a grid system along the excavation bottom, including sloped sidewalls. One sample will be collected at a randomly located point within a 25-foot by 25-foot grid cell of the excavation bottom, and one random sample will also be collected from the perimeter sidewall every 25 linear feet. For the radiological anomaly excavations, due to the limited lateral size of the excavation (5-foot radius), one sample will be collected from the floor of each excavation. Sample collection procedures are presented in Section 6.3.1 of the SAP. The primary contaminant of concern is ^{226}Ra and previous investigations have detected minimal amounts of ^{90}Sr. All samples will be analyzed for ^{226}Ra and radionuclides listed in Table 7-1 by gamma spectroscopy. In addition, 10 percent of the samples analyzed by gamma spectroscopy will be analyzed for ^{90}Sr. These post excavations will not be analyzed for chemical constituents. If the results of confirmation samples indicate that ^{226}Ra is above the remedial action objective (RAO), then RASO will be notified. If ^{226}Ra is found 3 sigma above background in a confirmation sample, additional excavation will be conducted and another post-excavation sample will be collected. This process will continue until ^{226}Ra is less than 3 sigma above background or until groundwater is encountered (approximately 8 feet bgs).. An RAO has not been not been established for ^{90}Sr.

Excavated soil that exhibits elevated levels of radiation but for which a point source cannot be identified will be placed into a roll-off container for storage and subsequent disposal by a certified waste broker through the DON's LLRW Program.

Excavated soil that is not radioactively impacted will be placed into a stockpile and characterized as described in Section 5.3 for proper disposal at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-approved landfills.

5.2 IMPORT FILL MATERIAL SAMPLING

Four randomly located material samples will be collected from each imported material source prior to use and analyzed for radionuclides by gamma spectroscopy, strontium-90 (^{90}Sr), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs, Title 22 metals, total purgeable petroleum hydrocarbons (TPH-purgeable), and total extractable petroleum hydrocarbons (TPH-extractable). Samples will be collected in accordance with the procedure described in Section 6.3.2. Frequency and analysis of import material were selected following the guidelines established by DTSC in the *Information Advisory on Clean Imported Fill Material* (DTSC, 2001). If the facility cannot provide a certificate stating that material does not contain asbestos, the four samples collected will also be analyzed for asbestos. Only soil or fine materials will be sampled. Gravel and rock will not be sampled but will be required to be cleaned, washed, free of fines, and from an approved/acceptable source (certified not to contain asbestos). If gravel or rock sources cannot provide a certificate, then four samples of the gravel or rock will be sampled for asbestos.

5.3 WASTE CHARACTERIZATION SAMPLING

Wastes generated during the field activities include: 1) soil generated during excavation activities, 2) wastewater from decontamination, and 3) PPE.

Stockpiled soil that does not exceed radiological readings of 3 sigma above background will be sampled to characterize the soil. Soil samples will be collected from this material at a frequency of two samples per 100 cubic yards. All samples collected from stockpiles generated from the former Firing-range Berm and from the debris pits will be analyzed for metals and ten percent of the samples will be analyzed for gamma spectroscopy, ^{90}Sr, explosives, VOCs, SVOCs, polynuclear aromatic hydrocarbon (PAHs), pesticides, PCBs, Title 22 metals, TPH-purgeable, and TPH-extractable. Samples collected from stockpiles generated from the radiological anomalies and the disposal trench will be analyzed for gamma spectroscopy and ten percent of the samples will be analyzed for alpha spectroscopy, ^{90}Sr, VOCs, SVOCs, polynuclear aromatic hydrocarbon (PAHs), pesticides, PCBs, Title 22 metals, TPH-purgeable, and TPH-extractable. In addition, one wastewater sample will be collected and analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, Title 22 metals, TPH-purgeable, TPH-extractable, cyanide, gamma spectroscopy, and ^{90}Sr. Soluble Threshold Limit Concentration (STLC) and Toxicity Characteristic Leaching Procedure (TCLP) analyses may be required. Additional analyses may also be required by the disposal facility. Waste characterization sampling procedures are detailed in Section 6.3.3.

Excavated soil that is radioactively impacted will be stored in B-25 boxes or similar and sampled to characterize the soil for disposal. Samples will be collected from the containers at a frequency of two samples per container for analyses required by the disposal facility.

PPE generated from field activities will be stored in containers on site. PPE will not be sampled for waste characterization, but will be characterized based on knowledge of the process generating the waste and the results of the sampling associated with this work.

TABLE B.5-1

SAMPLING LOCATIONS/IDS, SAMPLE DEPTHS, SAMPLE ANALYSES, AND SAMPLING PROCEDURES (UFP-QAPP Worksheet #18)

Sampling Location	Matrix	Depth (feet)	Analytical Group	Sampling Section Reference
Radioactive anomaly areas at IR Sites 1[a]:				
IR1-001	Soil	[h]	Gamma spectroscopy	SAP Section 6
Radioactive anomaly areas at IR Sites 2[a]:				
IR2-001	Soil	[h]	Gamma spectroscopy	SAP Section 6
Radioactive anomaly areas at IR Site 32[a]:				
IR32-001	Soil	[h]	Gamma spectroscopy	SAP Section 6
Disposal trench floor (per every 25-foot by 25-foot grid)[b]:				
IR1-Trench-001	Soil	0-8 feet bgs (or at groundwater table)	Gamma spectroscopy	SAP Section 6
Disposal trench walls (if lateral boundaries are greater than 25 feet)[b]:				
IR1-Trench-001	Soil	0-8 feet bgs (or at groundwater table)	Gamma spectroscopy	SAP Section 6
Stockpile of firing range berm[c]:				
IR1-Stockpile-001	Soil	N/A	Metals for all samples Gamma spectroscopy, Explosives, ^{90}Sr, VOCs, SVOCs, PAHs, pesticides, PCBs, TPH-extractable, TPH-purgeable for 10 percent of the samples	SAP Section 6
Stockpile of excavated debris pits (if present)[d]:				
IR1-Stockpile-100	Soil	N/A	Metals for all samples Gamma spectroscopy, ^{90}Sr, VOCs, SVOCs, PAHs, pesticides, PCBs, TPH-extractable, TPH-purgeable for 10 percent of the samples	SAP Section 6
Stockpile of excavated disposal trench[e]				
IR1-Stockpile-200	Soil	N/A	Gamma spectroscopy Gamma spectroscopy, ^{90}Sr, VOCs, SVOCs, PAHs, pesticides, PCBs, TPH-extractable, TPH-purgeable for 10 percent of the samples	SAP Section 6

TABLE B.5-1

SAMPLING LOCATIONS/IDS, SAMPLE DEPTHS, SAMPLE ANALYSES, AND SAMPLING PROCEDURES (UFP-QAPP Worksheet #18)

Sampling Location	Matrix	Depth (feet)	Analytical Group	Sampling Section Reference
Wastewater[f]	Water	N/A	VOCs, SVOCs, pesticides, PCBs, TPH-extractable, TPH-purgeable, metals, cyanide, gamma spectroscopy, and ^{90}Sr	SAP Section 6
WW-001				
Import Fill[g]	Soil	Random	VOCs, SVOCs, PAHs, pesticides, PCBs, TPH-extractable, TPH-purgeable, metals, gamma spectroscopy, and ^{90}Sr	SAP Section 6
Import-001				

Notes:

[a] Radiological survey scan at IR Sites 1, 2, and 32 have not been completed. Sample locations, once identified after radiological surface survey, will continue to be numbered sequentially.

[b] The boundaries and location of the disposal trench have will be determined in the field. Sample locations, once identified and after excavation is complete, will continue to be numbered sequentially.

[c] The size of stockpile is based on the amount of soil excavated from the berm that also passes the radiological scan. Once the stockpile has completely generated, sample locations will continue to be numbered sequentially.

[d] The boundaries and locations of the debris pits will be determined in the field. Sample locations, once identified and after excavation is complete, will continue to be numbered sequentially.

[e] The size of the stockpile will be based on the amount of soil excavated from the disposal trench that also passes the radiological scan. Once the stockpile has been completely generated, sample locations will continue to be numbered sequentially.

[f] Wastewater will be generated from decontamination. Extent of decontamination cannot be determined at this time. Once wastewater has been completely generated, sample locations will continue to be numbered sequentially.

[g] Extent of excavation cannot be determined at this time. Once amount of import fill has been determined, sample locations will continue to be numbered sequentially.

[h] The depth of the excavation, and thus post-excavation samples, will be based on the results of the radiological field screening such that all radioactive anomalies are removed/excavated prior to sampling.

^{90}Sr – strontium-90
bgs – below ground surface
IR – Installation Restoration
N/A – not applicable
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
SAP – Sampling and Analysis Plan
SVOC – semivolatile organic compound
TPH-extractable – total extractable petroleum hydrocarbons
TPH-purgeable – total purgeable petroleum hydrocarbons
VOC – volatile organic compound
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

6.0 SAMPLING PROCEDURES

The following section describes the field instrument calibration and maintenance procedures, inspection of supplies and consumables, and sample collection procedures.

6.1 FIELD INSTRUMENTATION

Field instruments to be used during this project are for radiation detection to conduct radiological surveys. Detailed information including calibration on radiation detection instruments is discussed in Section 5.4 of the TCRA Work Plan, and will not be included in the SAP.

6.2 SUPPLIES AND CONSUMABLES

Supplies and consumables necessary for field activities will be obtained through the appropriate commercial markets and will meet any supply-specific requirements outlined in this section. All supplies and consumables will be inspected by field sampling personnel prior to use. Any supplies and consumables that do not meet requirements will be discarded or returned to the supplier.

Supply-specific requirements include the following:

- Sample bottle containers will meet all guidelines specified in *Specification and Guidance for Obtaining Contaminant-Free Sample Containers*, EPA 540/R-93/051 and OSWER Directive 9240.0-05A (EPA, 1992). Certifications from the supplier will be retained in the project files.
- Deionized water will be used as the final step for equipment decontamination. Certification from the supplier will be retained in the project file.
- The laboratory water used for collecting equipment rinsate samples will be certified to be below project quantitation limits. Certification or sampling results from the supplier will be retained in the project files.

Supplies and consumables will be stored in a designated area. The storage area will be protected from adverse conditions (e.g., weather, heat, fuels, etc.) to protect the supplies/consumables from possible outside contamination and breakage.

6.3 SAMPLING PROCEDURES

The following sections provide the sampling procedures and sample handling protocols to be used for this project. Table B.6-1 lists the sample containers, preservatives, and holding time requirements for each analytical method.

6.3.1 Confirmation Sampling

This section describes procedures for the collection of confirmation soil samples from locations that are described in Section 5.1.

The following describes procedures for collecting soil confirmation samples from an excavator bucket:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting soil samples at each location.
2. Using a new, individually packaged, disposable plastic scoop or equivalent, remove approximately 2 inches of the topsoil in the excavator bucket.
3. With the same disposable scoop, collect soil into containers listed in Table B.6-1. Transfer soil into the sample jars with minimal soil disturbance and headspace. Additional sample containers may be collected to ensure sufficient sample quantity for analyses.
4. Each container will be labeled and clear packing tape will be placed over the label to secure it.
5. Samples will be custody sealed and packaged in accordance with Section 6.6 of this SAP.
6. Samples will be stored in a cooler after packaged with sufficient ice to maintain 4 +/- 2 degrees Celcius (°C).
7. Field documentation including field logbooks and COCs will be filled out during sample collection in accordance with Section 4.0.

6.3.2 Import Fill Material Sampling

For verification sampling of any necessary import materials, unless already certified, backfill samples will be collected as follows. If the site where the backfill is being imported from is accessible, then samples will be collected at the site. If the site is not accessible, then material will be sent to the TtEC project site, and samples will be collected.

1. Four samples per borrow area or quarry will be collected.
2. If the material is sampled on site, then four sample locations will be determined by generating random numbers for the pile. If the material is sent to the project site, then four bags/buckets of material will be sent and one sample per bag/bucket will be collected.
3. A hand auger or similar device will be used to access each x, y, and z coordinate in the pile. Due to limitations in accessing deep depths in a large stockpile, z-coordinates will be limited to 10 feet.
4. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting soil samples at each location.

5. Once the sample location has been accessed, grab samples will be collected by using a sampling core (containing a stainless steel liner) which will be driven with a slide hammer into the soil.
6. Six En Core samplers will then be collected for VOC and TPH-purgeable analysis directly from the undisturbed soil core in the stainless steel liner as follows:
   a. Holding the coring body, the plunger rod will be pushed down until the small o-ring rests against the tabs. This will ensure that the plunger will move easily.
   b. The locking lever on the En Core T-handle will be depressed. The coring body, with the plunger end first, will be placed into the open end of the T-handle, aligning the slots of the coring body with the locking pins in the T-handle. The coring body will be twisted clockwise to lock the pins in the slots. The sampler will be checked to ensure that it is locked in place. The sampler will now be ready for use.
   c. By holding the T-handle, the coring body will be pushed into the soil until the coring body is full. When full, the small o-ring will be centered in the T-handle viewing hole. The sampler will then be removed from the soil and any excess soil will be wiped from the coring body exterior.
   d. The coring body will be capped while it is still on the T-handle. The cap should be pushed over the flat area of the ridge. To lock the cap in place, the cap will be pushed and twisted so that it seals the sampler.
   e. The capped sampler will be removed by depressing the locking lever on the T-handle while twisting and pulling the sampler from the T-handle.
   f. The En Core sampler will be placed in its aluminum sealed bag. The sample label on the outside of the bag will be completed.
   g. This procedure will be performed five more times for a total collection of five En Core samplers for VOC and TPH-purgeable analysis. All five En Cores will be placed in one aluminum bag.
7. Each end of the liner will be covered with Teflon tape and capped.
8. Each container will be labeled and clear packing tape will be placed over the label to secure it.
9. Samples will be custody sealed and packaged in accordance with Section 6.6 of this SAP. Field documentation including field logbooks and COCs will be filled out in accordance with Section 4.0.
10. Samples will be stored in a cooler after being packaged with sufficient ice to maintain 4 +/- 2 °C).
11. Field documentation including field logbooks and COCs will be filled out during sample collection in accordance with Section 4.0.
12. Non-disposable sampling equipment will be decontaminated per Section 6.4 between each sample acquisition.

6.3.3 Waste Characterization Sampling

Soil and wastewater will be generated during field activities and will require proper disposal. Sampling of these materials will be performed as follows. Soil will be placed in stockpiles, and wastewater will be stored in containers. Soil samples will be collected using the stockpile sampling procedure described in Section 6.3.3.1. Wastewater samples will be collected using the container procedures described in Section 6.3.3.2.

6.3.3.1 Stockpiles Sampling Procedures

1. The volume of the stockpiles will be measured by a surveyor or calculated by sampling personnel using the following formula:

   V = A * H/27

   Where: V = volume in cubic yards

   A = Area of the base of the stockpile in square feet calculated using one of the following formulas:

   Rectangular = length * width

   Square = length * width

   Triangular = ½ base * height

   Circular = 3.14 * radius * radius

   Oval = 3.14 * long radius * short radius

   H = average height of the stockpile in feet

   27 = conversion factor for cubic feet to cubic yards

2. The stockpile will be divided into the number of sections equivalent to 250 cubic yards per sample.
3. The sample locations will be determined by generating random numbers.
4. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.
5. A hand auger or similar device will be used to access each x, y, and z coordinate. Due to limitations in accessing deep depths in a large stockpile, z-coordinates may be limited to 10 feet.
6. Once the sample location has been accessed, grab samples will be collected by using a sampling core (containing a stainless steel liner) which will be driven with a slide hammer into the soil.

7. Six En Core samplers will be collected for VOC and TPH-gasoline analysis directly from the undisturbed soil core in the stainless steel liner. En Cores will be collected as described in Step 6 of Section 6.3.2.
8. Each end of the liner will be covered with Teflon tape and capped.
9. Each container will be labeled and clear packing tape will be placed over the label to secure it.
10. Samples will be custody sealed and packaged in accordance with Section 6.6 of this SAP.
11. Samples will be stored in a cooler after they are packaged with sufficient ice to maintain 4 +/- 2 °C.
12. Field documentation including field logbooks and COCs will be filled out during sample collection in accordance with Section 4.0.
13. Non-disposable sampling equipment will be decontaminated per Section 6.4 between each sample acquisition.

6.3.3.2 Wastewater Sampling Procedures

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples.
2. The top of the drum or other approved container will be carefully opened.
3. Samples will be collected using disposable bailers into containers listed in Table B.6-1. Samples will be transferred from the bailers to VOC sample containers first as follows:
   a) Once the bailer is retrieved from the container, the small-diameter emptying tube (that is supplied with the bailer) will be placed in the bottom of the bailer to dislodge the ball holding the water in the bailer.
   b) As water begins to flow from the tube, it will be collected into a 40-milliliter (mL) volatile organic analysis (VOA) vial carefully to minimize aeration by allowing the water to flow down the inside of the vial instead of directly into the bottom of the vial.
   c) The vial will be filled up to the lid until a positive meniscus is formed.
   d) The vial will be capped immediately, but slowly.
   e) The sample will be checked for the presence of air bubbles by inverting the vial and gently tapping the side of the vial.
   f) If an air bubble is present, then the collected sample will be discarded and resampled using a new vial.
   g) Repeat the previous steps until three air-bubble-free vials are collected.
4. After collection of the VOA vials, sample collection will continue by placing the larger-diameter emptying tube (that is also supplied with the bailer) into the bottom of the bailer.

5. As the water begins to flow from the tube, glass containers for SVOCs, PCBs, and oil and grease will be collected. Then, plastic containers will be collected for metals and pH. Container size and preservation requirements are listed in Table B.6-1.
6. Each container will be labeled and clear packing tape will be placed over the label to secure it.
7. Samples will be custody sealed and packaged in accordance with Section 6.6 of this SAP.
8. Samples will be stored in a cooler after packaged with sufficient ice to maintain 4 +/- 2 °C.
9. Field documentation including field logbooks and COCs will be filled out during sample collection in accordance with Section 4.0.

6.4 DECONTAMINATION PROCEDURES

Prior to decontamination, sampling equipment will be screened using a hand-held alpha/beta survey meter. If radioactive contamination exceeds the release limits for equipment and materials of 1000 dpm/100 cm^2 fixed and 200 dpm/100 cm^2 removable for beta/gamma contamination and 100 dpm/100 cm^2 fixed and 20 dpm/100 cm^2 for alpha contamination, the equipment and local area will be secured and the Project Health Physicist will be notified.

Decontamination of non-disposable sampling equipment that comes in contact with samples (such as hand auger) will be performed to prevent the introduction of extraneous material into samples, and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by washing with a nonphosphate detergent such as Liquinox™ or equivalent as follows:

1. Dilute the nonphosphate detergent with potable water in a bucket as directed by the manufacturer. Wash the equipment with the nonphosphate detergent and potable water solution.
2. A second bucket with potable water will be used to rinse the equipment.
3. A third bucket with potable water will be used to rinse the equipment again.
4. A fourth bucket with deionized water will be used as a final rinse for the equipment. (Certificates from the supplier demonstrating that the deionized water is analyte-free will be kept in the project files for each lot.)

Equipment rinsate samples will be applicable to the collection of import material samples due to the use of a hand auger for sampling. Laboratory reagent-grade water (that is certified to be analyte-free by the supplier) will be used as an additional rinse after Step 4. Water that is falling off the sampling equipment as it is being rinsed will be collected in appropriate sample bottles and analyzed for the same parameters as the field samples. Equipment rinsate samples will not be collected with stockpile samples.

Decontamination water will be collected in containers on site and sampled for disposal purposes as described in Section 6.3.3.2.

6.5 SAMPLE NUMBER

Samples will be uniquely designated using a numbering system that identifies the CTO number and a sequential number (i.e., 15-001).

The sample number will be recorded in the field logbook, on the labels, and the COC record at the time of sample collection. A complete description of the sample and sampling conditions will be recorded in the field logbook and referenced using the unique sample identification number.

6.6 SAMPLE PACKAGING AND SHIPMENT

Sample packaging and shipment procedures for this project will conform to Department of Transportation/International Air Transport Association procedures as applicable for packaging.

Immediately after sample labeling, custody seals will be affixed to each sample container. For vials and En Cores, the custody seal will be placed on the outside of the first resealable bag; then the container will be placed in a second resealable bag. This will prevent any contact with the adhesive from the custody seal and the sample. Other sample containers will be placed in double-resealable plastic bags to protect the sample from moisture and to prevent breakage and potential cross-contamination during transportation to the laboratory. All glass sample containers will be protected with bubble wrap first if transported by a commercial carrier. Vials should be wrapped with bubble wrap, then placed in a resealable bag, a custody seal placed over the bag, and then placed in another resealable bag.

For radiological and asbestos samples, sample containers will be placed in a box, cooler, or similar container for shipment (ice is not required). For samples packed on ice, each cooler will be shipped with a temperature blank. A temperature blank is a vial filled with tap water and stored in the cooler during sample collection and transportation. The temperature of the cooler will be recorded by the laboratory on the COC record immediately upon receipt of the samples.

Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

Samples transported by a laboratory-assigned courier will be packed in a sample cooler with sufficient ice (as required according to Table B.6-1) to keep the samples at 4 +/- 2 °C. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. The COC record will be completed and signed by the courier. The cooler and the top two copies (white and pink) of the COC record will then be released to the courier for transportation to the laboratory.

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. Ice will be double-bagged and placed at the bottom of the cooler, one layer of sample containers will be placed on the ice, and more double-bagged ice will be placed on top of the containers. This will be repeated until the cooler is filled with ice as the top layer in the cooler. The COC record will include the airbill number, and the "Received By" box will be labeled with the commercial courier's name. The top two copies of the COC record will be sealed in a double-resealable bag and then taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipment. The pouch for the airbill will be placed on the cooler and secured with clear tape. The airbill will be completed for priority overnight delivery and placed in the pouch. If multiple coolers are being shipped, then the original airbill will be placed on the cooler with the COC record, and copies of the airbill will be placed on the other coolers. The number of packages should be included on each airbill (1 of 2, 2 of 2). Saturday deliveries should be coordinated with the laboratory in advance, and field sampling personnel or their designee must ensure that Saturday delivery stickers are placed on each cooler by the commercial courier. "Dangerous goods" declarations will also be completed as applicable.

TABLE B.6-1

ANALYTICAL METHODS, CONTAINERS, PRESERVATIVES, AND HOLDING TIMES REQUIREMENTS (UFP-QAPP Worksheet #19)

Matrix	Analytical Group	Analytical and Preparation Method	Container (number, size, type)	Preservation Requirements (chemical, temperature, etc.)	Maximum Holding Time (preparation/analysis)
Soil	Gamma Spectroscopy	EPA Method 901.1 M	250-mL or 500-mL plastic container	None	6 months
Soil	Alpha Spectroscopy	DOE HASL-300	250-mL or 500-mL plastic container	None	6 months
Soil	^{90}Sr	DOE Sr-01/Sr-02	250-mL or 500-mL plastic container	None	6 months
Soil	VOCs	EPA Method 5035A/8260B	Three 5-g En Core samples	4±2°C	48 hours/14 days
Soil	SVOCs	EPA Method 3550B/8270C	One 8-ounce glass jar or stainless steel liner	4±2°C	14 days/40 days
Soil	PAHs	EPA Method 3550B/8270C		4±2°C	14 days/40 days
Soil	Pesticides	EPA Method 3550B/8081A		4±2°C	14 days/40 days
Soil	PCBs	EPA Method 3550B/8082		4±2°C	14 days/40 days
Soil	Title 22 Metals	EPA Method 3050B/6010B		4±2°C	180 days
Soil	Mercury	EPA Method 7471A		4±2°C	28 days
Soil	TPH-extractable	EPA Method CA LUFT/8015		4±2°C	14 days/40 days
Soil	TPH-purgeable	EPA Method 5030B/8015	Three 5-g En Core samples	4±2°C	48 hours/14 days
Water*	Gamma Spectroscopy	EPA Method 901.1	Two 1-L HDPE	pH ≤ 2 w/HNO_3	6 months
Water*	Alpha Spectroscopy	DOE HASL-300	Two 1-L HDPE	pH ≤ 2 w/HNO_3	6 months
Water*	^{90}Sr	EPA Method 905.0	Two 1-L HDPE	pH ≤ 2 w/HNO_3	6 months
Water*	VOCs	EPA Method 5030B/8260B	Three 40-mL VOA vials	pH ≤ 2 w/HCl, 4±2°C	14 days
Water*	SVOCs	EPA Method 3510C /8270C	One 1-L amber bottles	4±2°C	7 days/40 days
Water*	Pesticides	EPA Method 3510C /8081A	One 1-L amber bottles	4±2°C	7 days/40 days
Water*	PCBs	EPA Method 3510C /8082	One 1-L amber bottles	4±2°C	7 days/40 days
Water*	TPH-purgeable	EPA Method 5030/8015	Three 40-mL VOA vials	pH ≤ 2 w/HCl, 4±2°C	14 days
Water*	TPH-extractable	EPA Method 3520/8015	One 1-L amber bottles	4±2°C	7 days/40 days

TABLE B.6-1

ANALYTICAL METHODS, CONTAINERS, PRESERVATIVES, AND HOLDING TIMES REQUIREMENTS (UFP-QAPP Worksheet #19)

Matrix	Analytical Group	Analytical and Preparation Method	Container (number, size, type)	Preservation Requirements (chemical, temperature, etc.)	Maximum Holding Time (preparation/analysis)
Water*	Title 22 Metals	EPA Method 3051B/6010B	One 500-mL Poly bottle	pH $\leq$ 2 w/HNO_3	180 days
Water*	Mercury	EPA Method 7470	One 500-mL Poly bottle	pH $\leq$ 2 w/HNO_3	28 days
Water*	Cyanide	EPA Method 335.4	One 500-mL Poly bottle	pH $\geq$12 w/NaOH	14 days

Notes:

* Water samples will be collected for the purpose of characterizing wastewater.

°C – degrees Celsius
CA LUFT – California Leaking Underground Fuel Tank
DOE – Department of Energy
EPA – U.S. Environmental Protection Agency
g – gram
HASL – Health and Safety Laboratory
HCl – hydrochloric acid
HDPE – high-density polyethylene
HNO_3 – nitric acid
L – liter
mL – milliliter
NaOH – sodium oxide
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
SVOC – semivolatile organic compound
TPH-extractable – total extractable petroleum hydrocarbons
TPH-purgeable – total purgeable petroleum hydrocarbons
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans
VOA – volatile organic analysis
VOC – volatile organic compound

7.0 ANALYTICAL DATA QUALITY OBJECTIVES

This section identifies the laboratory quality objectives, data quality indicators, and field quality objectives.

7.1 LABORATORY QUALITY OBJECTIVES

The following sections describe analytical laboratory requirements including qualifications, sample custody, and QC procedures.

7.1.1 Laboratory Qualifications

The laboratory that will provide analytical services for this project will be a State of California Department of Health Services (DHS) Environmental Laboratory Accreditation Program (ELAP)-certified analytical laboratory. All environmental analytical laboratories would have successfully completed the Naval Facilities Engineering Service Center (NFESC) Laboratory Evaluation Program. Any deviations from these requirements will require approval by the QAO.

A laboratory has not been procured at this time for this project. However, once selected, the laboratory must be capable of meeting all the requirements listed in this SAP, including turnaround time (to be determined), QLs, QC criteria, and data deliverables.

7.1.2 Laboratory Sample Custody and Documentation

The integrity and traceability of samples from the time they are collected through the time data are reported are essential in any sampling and analysis program. The handling of the samples and transferring of custody must be well-documented given the evidentiary nature of the analytical data.

The sample custodian will sign the COC from the courier or FEDEX®, inventory each shipment, and note on the original COC record any discrepancy in the sample custody, temperature of the cooler, or broken samples. The laboratory will note discrepancies on the sample receipt form. The laboratory project manager will immediately notify the Project Chemist. The Project Chemist, in consultation with the project team, will provide instructions in writing as to the fate of the sample(s) in question on a case-by-case basis.

The laboratory will have a system for tracking samples that is consistent with Section 5.8 of the *Quality Systems Manual for Environmental Laboratories* (DoD, 2006). The laboratory will archive the samples and maintain their custody up to 90 calendar days after sample collection, at which time the samples will be disposed of by the laboratory.

7.1.3 Laboratory Quality Control Requirements

The analytical laboratory will have written Standard Operating Procedures (SOPs) defining the instrument operation and maintenance, tuning, calibration, method detection limit (MDL) determination, QC acceptance criteria, blank requirements, and stepwise procedures for each analytical method. At a minimum, SOPs will be written for the following procedures and methods including sample receipt/control/disposal, sample preparation/extraction, sample analysis, result calculation, database management, health and safety, and corrective action. The SOPs, and all revisions, will be available to the analysts in the laboratory. The SOPs must meet the requirements of the analytical methods and, the IR CDQM (NFESC, 1999). In addition, Tables B-2 and B-6 of and the QSM (DOD, 2006), specifically Table B-2, which defines the frequency, acceptance criteria, and corrective action for the following QC checks for each project-specific method. The laboratory must also maintain written records of all activities that have an impact on the quality of the laboratory results.

Explosives (EPA Method 8330):

- Demonstrate acceptable analyst capability
- MDL study
- Retention time window width calculated for each analyte and surrogate
- Minimum five-point initial calibration
- Second source calibration verification
- Retention time window position establishment for each analyte and surrogate
- Retention time window verification for each analyte and surrogate
- Calibration verification (initial and continuing calibration)
- Method blank
- LCS
- MS/MSD
- Surrogate spike

Radioactive isotopes (EPA Methods 901.1M, DOE Sr-01/Sr-02):

- Demonstrate acceptable analyst capability
- Initial calibration
- Second source calibration verification
- Calibration verification (initial and continuing calibration)
- Method blank
- LCS
- Background checks, efficiency checks, self-absorption curves as applicable

Organics by GC (EPA Methods 8081A, 8082):

- Demonstrate acceptable analyst capability
- MDL study
- Retention time window width calculated for each analyte and surrogate
- Breakdown check (8081A only)
- Minimum five-point initial calibration
- Second source calibration verification
- Retention time window position establishment for each analyte and surrogate
- Retention time window verification for each analyte and surrogate
- Calibration verification (initial and continuing calibration)
- Method blank
- LCS
- MS/MSD
- Surrogate spike
- Confirmation of positive results by second column (8081A only)

Organics by GC/MS (EPA Methods 8260B and 8270C):

- Demonstrate acceptable analyst capability
- MDL study
- Tuning
- Minimum five-point initial calibration
- Second source calibration verification
- Retention time window position establishment for each analyte and surrogate
- Retention time window verification for each analyte and surrogate
- Evaluation of relative retention times
- Calibration verification (initial and continuing calibration)
- Internal standards verification
- Method blank
- LCS
- MS/MSD
- Surrogate spike

Metals (EPA Method 6010B/7000):

- Initial calibration for all analytes (minimum one high standard and calibration blank for inductively coupled plasma [ICP] and minimum 5 standards and calibration blank for cold vapor atomic absorption)
- Second source calibration verification

- Continuing calibration verifications
- Low-level calibration check standard (ICP only)
- Method blank
- Calibration blank
- Interference check solutions (ICP only)
- LCS
- Dilution test
- Post-digestion spike addition (ICP only)
- Method of standard additions or internal standard calibration
- MS/MSD

The laboratory must also maintain written records of all activities that have an impact on the quality of the laboratory results.

Any portion of the method that is subcontracted by the laboratory to another laboratory or sent to another facility of the same network of laboratories must have the prior approval of the Project Chemist.

7.1.4 Laboratory Quality Control Checks

The following subsections describe in detail the laboratory QC checks required by this project.

7.1.4.1 Calibration

All instruments will be calibrated and the calibration acceptance criteria met before samples are analyzed. Calibration standards will be prepared with National Institute for Standards and Testing (NIST)-traceable standards and analyzed per method requirements. Initial calibration (ICAL) acceptance criteria documented in the laboratory SOPs will meet those of applicable guidance documents. The ICAL will meet the following requirements:

- The lowest concentration of the calibration standard is less than or equal to the RL based on the final volume of extract or sample.
- For each target analyte, at least one of the calibration standards will be at or below the regulatory limit (action level), as defined by the DQOs.
- Before samples are analyzed, ICAL will be verified with a second source standard prepared at the mid-point of the calibration curve. ICAL verification will meet the acceptance criteria, which are expressed in the laboratory SOPs.
- Daily calibration verification will be conducted at the method-prescribed frequencies and will meet the acceptance criteria of applicable guidance documents. Daily calibration verification will not be used for quantitation of target analytes.

- Calibration data (calibration tables, chromatograms, instrument printouts, and laboratory logbooks) will be clearly labeled to identify the source and preparation of the calibration standard and therefore be traceable to the standard preparation records.

7.1.4.2 Instrument Blanks

An instrument blank is used to monitor the cleanliness of the instrument system during sample analysis. Instrument blanks are solvent or acid solutions of the standard used to calibrate the instrument. During metals analyses, one instrument blank is usually analyzed for every ten samples. For gas chromatograph/mass spectrometer (GC/MS) analysis, instrument blanks are analyzed on an as-needed basis for troubleshooting and chromatography column carryover determination.

7.1.4.3 Method Blanks

Method blanks are prepared in the same manner as the samples, using the same reagents and glassware used for samples. The purpose of the method blank is to ensure that the equipment and reagents used in preparing the samples are free of contaminants that could interfere with the analysis. The method blank must be prepared and analyzed for each batch of 20 project samples or less per matrix (aqueous and solid) type.

The method blank must not exhibit analytes at concentrations greater than half the required reporting limits (RLs). If contaminants are found that either contribute to the apparent concentration of a particular target analyte or interfere with the analysis, the analysis must be stopped, the source of contamination identified and corrected, and the analysis repeated. Contamination in the method blank above half the RLs will require that the entire associated batch of extracts or digestates be reprepared and reanalyzed. Hence, it is very important to make sure that no such contamination is present.

Some methods of inorganic analysis do not have a distinctive preparation step. For these tests, an instrument blank, which contains all reagents used with samples, is considered to be the method blank.

7.1.4.4 Laboratory Control Samples

Laboratory control samples are matrix-equivalent QC check samples (analyte-free water, laboratory sand, or sodium sulfate) spiked with a known quantity of specific analytes carried through the entire sample preparation and analysis process. The spiking solution used for laboratory control samples (LCS)/laboratory control sample duplicate (LCSD) preparation is of a source different from the stock that was used to prepare calibration standards.

The LCS is prepared and run at a frequency of one per 20 project samples per matrix with the associated samples, using the same reagents and volumes. If insufficient quantity of sample is available for the MS/MSD, the LCS will be prepared and analyzed in duplicates.

7.1.4.5 Laboratory Duplicates

For laboratory sample duplicate analyses, a sample is prepared and analyzed twice. Laboratory sample duplicates are prepared and analyzed with each batch of samples for most inorganic analyses.

7.1.4.6 Matrix Spikes

MSs are QC check samples that measure matrix-specific method performance. MSs are only applicable to the off-site laboratory. A MS sample is prepared by adding a known quantity of target analytes to a sample prior to sample digestion or extraction. In general, for organic compound and metal analyses, an MS/MSD pair is prepared and analyzed with each preparation batch or for every 20 samples. For inorganic compound analysis, a single MS and a laboratory sample duplicate are often prepared and analyzed with each batch. The MS results allow verifying the presence of matrix effects.

7.1.4.7 Surrogate Standards

Organic compound analyses include the addition, quantitation, and recovery calculation of surrogate standards. Compounds selected to serve as surrogate standards must meet all of the following requirements:

- Are not the target analytes
- Do not interfere with the determination of target analytes
- Are not naturally occurring, yet are chemically similar to the target analytes
- Are compounds exhibiting similar response to target analytes

Surrogate standards are added to every analytical and QC check sample at the beginning of the sample preparation. The surrogate standard recovery is used to monitor matrix effects and losses during sample preparation. Surrogate standard control criteria are applied to all analytical and QC check samples, and if surrogate criteria are not met, re-extraction and reanalysis may be performed.

7.1.4.8 Post-digestion Spikes and the Method of Standard Addition

A post-digestion spike is used during metal analysis to assess analytical interferences that may be caused by general matrix effects or high concentrations of analytes present in the sample. A digested sample is spiked with the analyte of interest at a known concentration, and the spike recovery is used to estimate the presence and the magnitude of interferences.

If a post-digestion spike recovery fails to meet acceptance criteria, the Method of Standard Addition (MSA) will be used to quantify the sample result. The MSA technique compensates for a sample constituent that enhances or depresses the analyte signal. To perform the MSA, known amounts of a standard at different concentrations are added to aliquots of digested sample, and each spiked sample and the original unspiked sample are analyzed. The absorbance is then plotted against the concentration, and the resulting line is extrapolated to zero absorbance. The point of interception with the concentration axis is the indigenous concentration of the analyte in the sample.

7.1.4.9 Preventative Maintenance

All instruments must be maintained in accordance with the manufacturers' recommended procedures. The laboratory must define in its QA plan the frequency and type of maintenance for each instrument. The laboratory must also record all maintenance activities in an instrument logbook. The laboratory must maintain the instruments in working condition required by the methods specified for the analyses. Sufficient redundancy in equipment must be available in the laboratory to handle downtime situations. Method substitution because of instrumental failure will not be permitted without approval from the Project Chemist.

In addition to preventive maintenance, the laboratory must keep a sufficient supply of replacement parts on hand for those parts known to require frequent changes due to wear and tear or contamination. Whenever preventive or corrective maintenance is applied to an instrument, the laboratory must demonstrate the instrument's return to operating conditions and must recalibrate the instrument prior to resumption of sample analyses.

7.2 DATA QUALITY INDICATORS

In order to meet project DQOs, the QLs listed in Table B.7-1 (soil) and B.7-2 (water) were established below action levels, and the QC criteria presented in Table B.7-3 are in accordance with the *Quality Systems Manual for Environmental Laboratories* (DoD, 2006).

Analytical DQOs will be assessed through application of precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters discussed in this section.

7.2.1 Precision

Precision is the measure of the reproducibility of a set of replicate results or the agreement among repeat observations made under the same conditions. Analytical precision is the measurement of the variability associated with duplicate or replicate analyses. Field duplicate, laboratory duplicate, MSD, and LCSD (if analyzed) samples will be used to assess field and analytical precision. The precision measurement will be determined using the relative percent difference (RPD) between the duplicate sample results as follows:

RPD = 100 x 2 x (result - duplicate result)/(result + duplicate result)

The RPD limits for laboratory duplicate, MSD, and LCSD are presented in Table B.7-3, and the field duplicate limits are listed in Table B.7-4. Associated samples that do not meet the criteria will be evaluated by the validator as described in Section 8.4.

7.2.2 Accuracy

Accuracy is defined as the nearness of a result or the mean of a set of results to the true or accepted value. Analytical accuracy is measured by comparing the percent recovery (%R) of analytes spiked into a sample against a control limit. Spiked samples include MS, MSD, and LCS that are analyzed for every batch of up to 20 samples serve as a measure of analytical accuracy and surrogate standards which are added to all samples, blanks, MS, MSD, and LCS analyzed for organic contaminants to evaluate the method's accuracy and help to determine matrix interferences. %R is calculated as follows:

%R = 100 x (spiked sample result - unspiked sample result)/amount of spike added

The laboratory will review the QC samples and surrogate standard recoveries for each analysis to ensure that the %R lie within the control limits listed in Table B.7-3. Otherwise, data will be flagged as discussed in Section 8.4.

7.2.3 Representativeness

Unlike precision and accuracy, which can be expressed in quantitative terms, representativeness is a qualitative parameter. Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Field personnel will be responsible for ensuring that samples are representative of field conditions by collecting and handling samples according to the procedures in this SAP. Errors in sample collection, packaging, preservation, or COC procedures may result in samples being judged non-representative and may form a basis for rejecting the data.

7.2.4 Completeness

Completeness is the percentage of measurements made that is judged to be valid. The completeness goal is to generate a sufficient amount of valid data to meet project needs. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with a rejected ("R") flag. The requirement of completeness is 95 percent for samples and is determined using the following equation:

% completeness = 100 x (number of valid analyte results/number of possible results)

7.2.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during interlaboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data.

Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

7.3 FIELD QUALITY OBJECTIVES

Field QC samples will be collected and analyzed during the project to assess the consistency and performance of the sampling program. Field QC samples are necessary for establishing data comparability, determining the total measurement error (the overall precision of the measurement system from sample collection to analysis) and for QA during sample handling and shipment. Field QC samples may include field duplicates, equipment rinsates, source blanks, trip blanks, and temperature blanks. Measurement performance criteria for field QC samples in listed in Table B.7-4, and field QC sample frequency is listed in Table B.7-5.

Field QC samples associated with waste sampling will not be collected.

7.3.1 Field Duplicates

Field duplicates consist of two distinct samples (an original and a duplicate) of the same matrix collected at the same time and location to the extent possible and using the same sampling techniques. The purpose of field duplicates is to measure the consistency of field sampling. Field duplicates will be collected at a frequency of one for every ten confirmation samples taken and will be analyzed for the same analytes as the original sample. Field duplicate sample will not be collected from import fill material and the stockpile. Field duplicates are uniquely identified so that the identity of the field duplicates is "blind" to the analytical laboratory. Exact locations of field duplicate samples and their identifications will be recorded in the field logbook. Additional field duplicates may be collected if disposal trench boundaries are greater than anticipated and additional confirmation samples will also be collected. The sampling personnel will choose additional field duplicate locations.

7.3.2 Equipment Rinsate Samples

Equipment rinsate is a sample of analyte-free water collected from a final rinse of sampling equipment after the decontamination procedure has been performed. Rinsate samples will be collected directly from the sampling equipment, placed in appropriate pre-cleaned containers supplied by the analytical laboratory, and analyzed for the same analytes as the field samples under the same analytical conditions. Equipment rinsate samples, collected at a frequency of one per each day of sampling, will help determine the effectiveness of the decontamination procedure and potential for cross-contamination during sampling events. Equipment rinsates will not be collected for this project since only disposal sampling equipment will be used to collect confirmation samples.

7.3.3 Source Blank Samples

A source blank consists of analyte-free, reagent-grade water provided by the laboratory to be used for the collection of equipment rinsate samples as described in Section 7.32. In order to assure that the source blank is free of contamination, one of two courses of action will be followed before the source blank water is used. First, the laboratory will be asked to provide a certificate of analysis that the water provided for the equipment rinsate samples does not contain analytes above the project RLs. If the laboratory cannot provide a certificate of analysis, then a sample of the laboratory water will be collected at the beginning of the project and analyzed for the same parameters as the equipment rinsate samples to verify that the results are not above the project QLs. Source blank samples will only be collected if equipment rinsate samples are to be collected for the project.

7.3.4 Trip Blanks

Trip blanks are hydrochloric acid-preserved, analyte-free, deionized water prepared by the laboratory in 40-mL VOA vials that will be carried to the field, stored with water samples collected for VOC analysis, and returned to the laboratory for VOC analysis. Since the only water VOC samples will be in conjunction with wastewater, trip blanks will not be required for this project.

7.3.5 Temperature Blanks

A temperature blank is a container of tap water that is shipped in each cooler containing field samples and ice. Laboratory personnel will use the temperature blank to measure the temperature of the cooler upon arrival at the laboratory.

TABLE B.7-1

REFERENCE LIMITS FOR SOIL SAMPLES (UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Confirmation Soil Samples	Project Action Limits for Import Fill Material [a]	Project Action Limit for Soil Waste Samples [b]	Project Quantitation Limit	Analytical Method MDLs [c]	Analytical Method QLs [c]	Units
Radionuclides [d]/ EPA Method 901.1M	Americium-241	86954-36-1	NE	NE	NE	*	*	*	pCi/g
	Cobalt-60	10198-40-0	NE	NE	NE	*	*	*	pCi/g
	Cesium-137	10045-97-3	NE	NE	NE	*	*	*	pCi/g
	Europium-152	14683-23-9	NE	NE	NE	*	*	*	pCi/g
	Europium-154	15585-10-1	NE	NE	NE	*	*	*	pCi/g
	Radium-226	13982-63-3	[e]	[e]	NE	*	*	*	pCi/g
	Postassium-40	13966-00-2	NE	NE	NE	*	*	*	pCi/g
	Thorium-232	7440-29-1	NE	NE	NE	*	*	*	pCi/g
Uranium-238/DOE HASL-300	Uranium-238	7440-61-1	NE	NE	NE	*	*	*	pCi/g
Strontium-90/DOE Sr-01/Sr-02	Strontium-90	10098-97-2	NE	NE	NE	*	*	*	pCi/g
Explosives/8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	NE	NE	NE	3.75	0.08	3.75	mg/kg
	Hexahydro-1,3,5-trinitro-1,3,5-trazine (RDX)	121-82-4	NE	NE	NE	2.5	0.08	2.5	mg/kg
	1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	NE	NE	NE	0.75	0.075	0.75	mg/kg
	1,3-Dinitrobenzene (1,3-DNB)	99-65-0	NE	NE	NE	0.50	0.075	0.50	mg/kg
	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	NE	NE	NE	6.25	0.25	6.25	mg/kg
	Nitrobenzene (NB)	98-95-3	NE	NE	NE	0.50	0.075	0.50	mg/kg
	2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	NE	NE	NE	0.50	0.075	0.50	mg/kg
	4-Amino-2,6-dinitrotoluene (4-Am-DNT)	1946-51-0	NE	NE	NE	1.25	0.10	1.25	mg/kg
	2-Amino-4,6-dinitrotoluene (24-Am-DNT)	355-72-78-2	NE	NE	NE	0.75	0.075	0.75	mg/kg
	2,4-Dinitrotoluene (2,4-DNT)	121-14-2	NE	NE	NE	0.50	0.08	0.50	mg/kg
	2,6-Dinitrotoluene (2,6-DNT)	606-20-2	NE	NE	NE	0.75	0.075	0.75	mg/kg
	2-Nitrotoluene	88-72-2	NE	NE	NE	1.0	0.08	1.0	mg/kg
	3-Nitrotoluene	99-08-1	NE	NE	NE	1.0	0.08	1.0	mg/kg
	4-Nitrotoluene	99-99-0	NE	NE	NE	1.0	0.08	1.0	mg/kg
VOCs/EPA Method 8260B	1,1,1-Trichloroethane	71-55-6	N/A	1,200,000	NE	5	2	5	µg/kg
	1,1,2,2-Tetrachloroethane	79-34-5	N/A	930	NE	5	2	5	µg/kg
	1,1,2-Trichloroethane	79-00-5	N/A	1,600	NE	5	2	5	µg/kg
	1,1-Dichloroethane	75-34-3	N/A	6,000	NE	5	2	5	µg/kg
	1,1-Dichloroethene	75-35-4	N/A	410,000	NE	5	2	5	µg/kg
	1,2-Dichloroethane	107-06-2	N/A	600	NE	5	2	5	µg/kg
	1,2-Dichloropropane	78-87-5	N/A	740	NE	5	2	5	µg/kg
	2-Hexanone	591-78-6	N/A	NE	NE	10	5	10	µg/kg
	Acetone	67-64-1	N/A	54,000,000	NE	10	5	10	µg/kg
	Benzene	71-43-2	N/A	1,400	NE	5	2	5	µg/kg
	Bromodichloromethane	75-27-4	N/A	1,800	NE	5	2	5	µg/kg
	Bromoform	75-25-2	N/A	220,000	NE	5	2	5	µg/kg
	Bromomethane	74-83-9	N/A	13,000	NE	10	2	10	µg/kg

TABLE B.7-1

REFERENCE LIMITS FOR SOIL SAMPLES (UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Confirmation Soil Samples	Project Action Limits for Import Fill Material [a]	Project Action Limit for Soil Waste Samples [b]	Project Quantitation Limit	Analytical Method MDLs [c]	Analytical Method QLs [c]	Units
	Carbon tetrachloride	56-23-5	N/A	550	NE	5	2	5	µg/kg
	Chlorobenzene	108-90-7	N/A	530,000	NE	5	2	5	µg/kg
	Chloroethane	75-00-3	N/A	6,500	NE	5	2	5	µg/kg
	Chloroform	67-66-3	N/A	2,000	NE	5	2	5	µg/kg
	Chloromethane	74-87-3	N/A	160,000	NE	10	2	10	µg/kg
	cis-1,2-Dichloroethene	156-59-2	N/A	150,000	NE	5	2	5	µg/kg
	cis-1,3-Dichloropropene	10061-01-5	N/A	1,800 [f]	NE	5	2	5	µg/kg
	Dibromochloromethane	124-48-1	N/A	2,600	NE	5	2	5	µg/kg
	Ethylbenzene	100-41-4	N/A	400,000	NE	5	2	5	µg/kg
	2-Butanone	78-93-3	N/A	110,000,000	NE	10	2	10	µg/kg
	Methyl tert-butyl ether	1634-04-4	N/A	70,000	NE	5	2	5	µg/kg
	Methylene chloride	75-09-2	N/A	21,000	NE	10	2	10	µg/kg
	Methyl isobutyl ketone	108-10-1	N/A	47,000,000	NE	10	5	10	µg/kg
	Styrene	100-42-5	N/A	1,700,000	NE	5	2	5	µg/kg
	Tetrachloroethene	127-18-4	N/A	1,300	NE	5	2	5	µg/kg
	Toluene	108-88-3	N/A	520,000	NE	5	2	5	µg/kg
	trans-1,2-Dichloroethene	156-60-5	N/A	230,000	NE	5	2	5	µg/kg
	trans-1,3-Dichloropropene	10061-02-6	N/A	1,800 [f]	NE	5	2	5	µg/kg
	Trichloroethene	79-01-6	N/A	6,500	2,040,000	5	2	5	µg/kg
	Vinyl chloride	75-01-4	N/A	750	NE	5	2	5	µg/kg
	Xylenes (Total)	1330-20-7	N/A	420,000	NE	10	2	10	µg/kg
SVOCs/EPA Method 8270C	1,2,4-Trichlorobenzene	120-82-1	N/A	220,000	NE	330	167	330	µg/kg
	1,2-Dichlorobenzene	95-50-1	N/A	600,000	NE	330	167	330	µg/kg
	1,3-Dichlorobenzene	541-73-1	N/A	600,000	NE	330	167	330	µg/kg
	1,4-Dichlorobenzene	106-46-7	N/A	7,900	NE	330	167	330	µg/kg
	2,4,5-Trichlorophenol	95-95-4	N/A	62,000,000	NE	330	167	330	µg/kg
	2,4,6-Trichlorophenol	88-06-2	N/A	25,000	NE	330	184	330	µg/kg
	2,4-Dichlorophenol	120-83-2	N/A	1,800,000	NE	330	167	330	µg/kg
	2,4-Dimethylphenol	105-67-9	N/A	12,000,000	NE	330	167	330	µg/kg
	2,4-Dinitrophenol	51-28-5	N/A	1,200,000	NE	660	167	660	µg/kg
	2,4-Dinitrotoluene	121-14-2	N/A	1,200,000	NE	330	167	330	µg/kg
	2,6-Dinitrotoluene	606-20-2	N/A	620,000	NE	330	167	330	µg/kg
	2-Chloronaphthalene	91-58-7	N/A	23,000,000	NE	330	167	330	µg/kg
	2-Chlorophenol	95-57-8	N/A	240,000	NE	330	167	330	µg/kg
	2-Methylphenol	95-48-7	N/A	31,000,000	NE	330	167	330	µg/kg
	2-Nitroaniline	88-74-4	N/A	1,800,000	NE	330	167	330	µg/kg
	2-Nitrophenol	88-75-5	N/A	NE	NE	330	167	330	µg/kg
	3,3-Dichlorobenzidine	91-94-1	N/A	3,800	NE	330	167	330	µg/kg

TABLE B.7-1

REFERENCE LIMITS FOR SOIL SAMPLES
(UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Confirmation Soil Samples	Project Action Limits for Import Fill Material [a]	Project Action Limit for Soil Waste Samples [b]	Project Quantitation Limit	Analytical Method MDLs [c]	Analytical Method QLs [c]	Units
	3-Nitroaniline	99-09-2	N/A	82,000	NE	330	167	330	µg/kg
	4,6-Dinitro-2-methylphenol	534-52-1	N/A	62,000	NE	660	167	660	µg/kg
	4-Bromophenyl-phenylether	101-55-3	N/A	NE	NE	330	167	330	µg/kg
	4-Chloro-3-methylphenol	59-50-7	N/A	NE	NE	330	167	330	µg/kg
	4-Chloroaniline	106-47-8	N/A	2,500,000	NE	330	167	330	µg/kg
	4-Chlorophenyl-phenylether	7005-72-3	N/A	NE	NE	330	170	330	µg/kg
	4-Methylphenol	106-44-5	N/A	3,100,000	NE	330	167	330	µg/kg
	4-Nitroaniline	100-01-6	N/A	82,000	NE	330	167	330	µg/kg
	4-Nitrophenol	100-02-7	N/A	NE	NE	660	167	660	µg/kg
	bis(2-Chloroethoxy)methane	111-91-1	N/A	NE	NE	330	167	330	µg/kg
	bis(2-Chloroethyl)ether	111-44-4	N/A	580	NE	330	167	330	µg/kg
	bis(2-Chloroisopropyl)ether	108-60-1	N/A	7,400	NE	330	167	330	µg/kg
	bis(2-Ethylhexyl)phthalate	117-81-7	N/A	120,000	NE	330	167	330	µg/kg
	Butylbenzylphthalate	85-68-7	N/A	100,000,000	NE	330	167	330	µg/kg
	Di-n-butylphthalate	84-74-2	N/A	62,000,000	NE	330	167	330	µg/kg
	Di-n-octylphthalate	117-84-0	N/A	25,000,000	NE	330	167	330	µg/kg
	Dibenzofuran	132-64-9	N/A	1,600,000	NE	330	167	330	µg/kg
	Diethylphthalate	84-66-2	N/A	100,000,000	NE	330	167	330	µg/kg
	Dimethylphthalate	131-11-3	N/A	100,000,000	NE	330	167	330	µg/kg
	Hexachlorobenzene	118-74-1	N/A	1,100	NE	330	167	330	µg/kg
	Hexachlorobutadiene	87-68-3	N/A	22,000	NE	330	190	330	µg/kg
	Hexachlorocyclopentadiene	77-47-4	N/A	3,700,000	NE	330	167	330	µg/kg
	Hexachloroethane	67-72-1	N/A	120,000	NE	330	167	330	µg/kg
	n-Nitrosodinpropylamine	621-64-7	N/A	330	NE	330	167	330	µg/kg
	n-Nitrosodiphenylamine	86-30-6	N/A	350,000	NE	330	167	330	µg/kg
	Nitrobenzene	98-95-3	N/A	100,000	NE	330	167	330	µg/kg
	Pentachlorophenol	87-86-5	N/A	9,000	17,000	660	175	660	µg/kg
	Phenol	108-95-2	N/A	100,000,000	NE	330	167	330	µg/kg
	Pyridine	110-86-1	N/A	620,000	NE	330	167	330	µg/kg
PAHs/EPA Method 8270C	Acenaphthene	83-32-9	N/A	130[g]	NE	330	167	330	µg/kg
	Acenaphthylene	208-96-8	N/A	NE	NE	330	167	330	µg/kg
	Anthracene	120-12-7	N/A	390[g]	NE	330	167	330	µg/kg
	Benzo[a]anthracene	56-55-3	N/A	1,000[g]	NE	330	167	330	µg/kg
	Benzo[a]pyrene	50-32-8	N/A	1,300[g]	NE	330	167	330	µg/kg
	Benzo[b]fluoranthene	205-99-2	N/A	760[g]	NE	330	167	330	µg/kg
	Benzo[g,h,i]perylene	191-24-2	N/A	950[g]	NE	330	167	330	µg/kg
	Benzo[k]fluoranthene	207-08-9	N/A	1,100[g]	NE	330	167	330	µg/kg
	Chrysene	218-01-9	N/A	1,300[g]	NE	330	167	330	µg/kg

TABLE B.7-1

REFERENCE LIMITS FOR SOIL SAMPLES
(UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Confirmation Soil Samples	Project Action Limits for Import Fill Material [a]	Project Action Limit for Soil Waste Samples [b]	Project Quantitation Limit	Analytical Method MDLs [c]	Analytical Method QLs [c]	Units
	Dibenz[a,h]anthracene	53-70-3	N/A	230 [g]	NE	330	167	330	µg/kg
	Fluoranthene	206-44-0	N/A	2,000 [g]	NE	330	167	330	µg/kg
	Fluorene	86-73-7	N/A	100 [g]	NE	330	167	330	µg/kg
	Indeno[1,2,3-cd]pyrene	193-39-5	N/A	930 [g]	NE	330	167	330	µg/kg
	Naphthalene	91-20-3	N/A	35 [g]	NE	330	167	330	µg/kg
	Phenanthrene	85-01-8	N/A	1,600 [g]	NE	330	167	330	µg/kg
	Pyrene	129-00-0	N/A	2,500 [g]	NE	330	167	330	µg/kg
Pesticides/EPA Method 8081A	4,4-DDD	72-54-8	N/A	10,000	1,000 [h]	4	1.2	4	µg/kg
	4,4-DDE	72-55-9	N/A	7,000	1,000 [h]	4	1.2	4	µg/kg
	4,4-DDT	50-29-3	N/A	7,000	1,000 [h]	4	1.2	4	µg/kg
	alpha-BHC	319-84-6	N/A	360	NE	2	0.6	2	µg/kg
	Aldrin	309-00-2	N/A	100	1,400	2	0.6	2	µg/kg
	beta-BHC	319-85-7	N/A	1,300	NE	2	0.6	2	µg/kg
	delta-BHC	319-86-8	N/A	NE	NE	2	0.6	2	µg/kg
	Chlordane (technical)	57-74-9	N/A	6,500	2,500	2	0.6	2	µg/kg
	Dieldrin	60-57-1	N/A	110	8,000	4	1.2	4	µg/kg
	Endosulfan sulfate	1031-07-8	N/A	3,700,000 [i]	NE	4	1.5	4	µg/kg
	Endosulfan I	959-98-8	N/A	3,700,000 [i]	NE	2	0.6	2	µg/kg
	Endosulfan II	33213-65-9	N/A	3,700,000 [i]	NE	4	1.2	4	µg/kg
	Endrin	72-20-8	N/A	180,000	200	4	1.2	4	µg/kg
	Endrin Aldehyde	7421-93-4	N/A	NE	NE	4	1.2	4	µg/kg
	Endrin Ketone	53494-70-5	N/A	NE	NE	4	1.2	4	µg/kg
	Lindane	58-89-9	N/A	1,700	4,000	2	0.6	2	µg/kg
	Heptachlor	76-44-8	N/A	380	4,700 [j]	2	0.6	2	µg/kg
	Heptachlor epoxide	1024-57-3	N/A	190	4,700 [j]	2	0.6	2	µg/kg
	Methoxychlor	72-43-5	N/A	3,100,000	100,000	20	4	20	µg/kg
	Toxaphene	8001-35-2	N/A	1,600	5,000	50	10	50	µg/kg
PCBs/EPA Method 8082	Aroclor 1016	12674-11-2	N/A	740 [k]	50,000 [k]	50	20	50	µg/kg
	Aroclor 1221	11104-28-2	N/A	740 [k]	50,000 [k]	50	20	50	µg/kg
	Aroclor 1232	11141-16-5	N/A	740 [k]	50,000 [k]	50	20	50	µg/kg
	Aroclor 1242	53469-21-9	N/A	740 [k]	50,000 [k]	50	20	50	µg/kg
	Aroclor 1248	12672-29-6	N/A	740 [k]	50,000 [k]	50	20	50	µg/kg
	Aroclor 1254	11097-69-1	N/A	740 [k]	50,000 [k]	50	20	50	µg/kg
	Aroclor 1260	11096-82-5	N/A	740 [k]	50,000 [k]	50	20	50	µg/kg
TPH/EPA Method 8015B	TPH-gasoline (C_6-C_{10})	8006-61-9	N/A	NE	NE	1	0.5	1	mg/kg
	TPH-diesel range (C_{10}-C_{24})	-3527	N/A	NE	NE	10	5	10	mg/kg
	TPH-motor oil range (C_{24}-C_{36})	-3528	N/A	NE	NE	10	5	10	mg/kg

TABLE B.7-1

REFERENCE LIMITS FOR SOIL SAMPLES (UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Confirmation Soil Samples	Project Action Limits for Import Fill Material [a]	Project Action Limit for Soil Waste Samples [b]	Project Quantitation Limit	Analytical Method MDLs [c]	Analytical Method QLs [c]	Units
Metals/EPA Methods 6010B/6020/7000	Antimony	7440-36-0	N/A	1.0[f]	500	0.5	0.1	0.5	mg/kg
	Arsenic	7440-38-2	N/A	23.0[f]	500	0.5	0.1	0.5	mg/kg
	Barium	7440-39-3	N/A	198[f]	10,000	0.5	0.1	0.5	mg/kg
	Beryllium	7440-41-7	N/A	0.77[f]	75	0.5	0.1	0.5	mg/kg
	Cadmium	7440-43-9	N/A	0.82[f]	100	0.5	0.1	0.5	mg/kg
	Chromium	7440-47-3	N/A	81.7[f]	2,500	0.5	0.1	0.5	mg/kg
	Cobalt	7440-48-4	N/A	14[f]	8,000	0.5	0.1	0.5	mg/kg
	Copper	7440-50-8	N/A	89.4[f]	41,000	0.5	0.2	0.5	mg/kg
	Lead	7439-92-1	N/A	26,900[f]	1,000	0.5	0.1	0.5	mg/kg
	Mercury	7439-97-6	N/A	310	20	0.1	0.033	0.1	mg/kg
	Molybdenum	7439-98-7	N/A	5,100	3,500	0.5	0.1	0.5	mg/kg
	Nickel	7440-02-0	N/A	88.5[f]	2,000	0.5	0.1	0.5	mg/kg
	Selenium	7782-49-2	N/A	5.7[f]	100	0.5	0.1	0.5	mg/kg
	Silver	7440-22-4	N/A	0.61[f]	500	0.5	0.1	0.5	mg/kg
	Thallium	7440-28-9	N/A	5.3[f]	700	0.5	0.1	0.5	mg/kg
	Vanadium	7440-62-2	N/A	62.3[f]	2,400	0.5	0.1	0.5	mg/kg
	Zinc	7440-66-6	N/A	316[f]	5,000	0.5	1	0.5	mg/kg

Notes:

[a] Action limits for import fill samples are based on EPA Region IX industrial Preliminary Remediation Goals.
[b] Action limits for waste samples are based on Total Threshold Limit Concentration (TTLC) values.
[c] Values listed are for validated analytical methods.
[d] The isotopes listed represent a standard list of radionuclides to be reported by the laboratory. However, laboratory will be instructed to report any detected isotopes in addition to the ones listed during each sample analysis.
[e] Action limit is defined as 3 sigma above background value. Above background is defined as any detection above the calculated background value. During previous investigations, background values have been established by TtEC, which is 0.365 pCi/g, at the sites.
[f] Value listed is for total 1,3-dichloropropene
[g] Value listed is the established background value.
[h] Value listed is for the sum of 4,4-DDD, 4,4-DDE, and 4,4-DDT.
[i] Value listed is for total endosulfan.
[j] Value listed is for the sum of heptachlor and heptachlor epoxide.
[k] Value listed is for total PCBs.

BHC – benzene hexachloride
CAS – Chemical Abstract Service
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethene
DDT – dichlorodiphenyltrichloroethane
DOE – Department of Energy
EPA – U.S. Environmental Protection Agency
MDL – method detection limit
mg/kg – microgram per kilogram
mg/kg – milligram per kilogram
N/A – not applicable

NE – none established
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
pCi/g – pico curie per gram
QL – quantitation limit
SVOC – semivolatile organic compound
TPH – total petroleum hydrocarbons
TtEC – Tetra Tech EC Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Policy Plans
VOC – volatile organic compound

TABLE B.7-2

REFERENCE LIMITS FOR WATER SAMPLES
(UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Wastewater Samples [b]	Project Quantitation Limit	Analytical Method MDLs	Analytical Method QLs	Units
Radionuclides [a]/ EPA Method 901.1	Americium-241	86954-36-1	NE	*	*	*	pCi/L
	Cobalt-60	10198-40-0	NE	*	*	*	pCi/L
	Cesium-137	10045-97-3	NE	*	*	*	pCi/L
	Europium-152	14683-23-9	NE	*	*	*	pCi/L
	Europium-154	15585-10-1	NE	*	*	*	pCi/L
	Radium-226	13982-63-3	5	*	*	*	pCi/L
	Postassium-40	13966-00-2	NE	*	*	*	pCi/L
	Thorium-232	7440-29-1	NE	*	*	*	pCi/L
Uranium-238/DOE HASL-300	Uranium-238	7440-61-1	NE	*	*	*	pCi/L
Strontium-90/EPA Method 905.0	Strontium-90	10098-97-2	8	*	*	*	pCi/L
VOCs/EPA Method 8260B	1,1,1-Trichloroethane	71-55-6	NE	1	0.2	1	µg/L
	1,1,2,2-Tetrachloroethane	79-34-5	NE	1	0.2	1	µg/L
	1,1,2-Trichloroethane	79-00-5	NE	1	0.2	1	µg/L
	1,1-Dichloroethane	75-34-3	NE	1	0.2	1	µg/L
	1,1-Dichloroethene	75-35-4	NE/700	1	0.2	1	µg/L
	1,2-Dichloroethane	107-06-2	NE/500	1	0.2	1	µg/L
	1,2-Dichloropropane	78-87-5	NE	1	0.2	1	µg/L
	2-Hexanone	591-78-6	NE	10	5	10	µg/L
	Acetone	67-64-1	NE	10	5	10	µg/L
	Benzene	71-43-2	NE/500	1	0.2	1	µg/L
	Bromodichloromethane	75-27-4	NE	1	0.2	1	µg/L
	Bromoform	75-25-2	NE	1	0.3	1	µg/L
	Bromomethane	74-83-9	NE	1	0.2	1	µg/L
	Carbon tetrachloride	56-23-5	NE/500	1	0.2	1	µg/L
	Chlorobenzene	108-90-7	NE/100,000	1	0.2	1	µg/L
	Chloroethane	75-00-3	NE	1	0.2	1	µg/L
	Chloroform	67-66-3	NE/6,000	1	0.2	1	µg/L
	Chloromethane	74-87-3	NE	1	0.2	1	µg/L
	cis-1,2-Dichloroethene	156-59-2	NE	1	0.2	1	µg/L
	cis-1,3-Dichloropropene	10061-01-5	NE	1	0.2	1	µg/L
	Dibromochloromethane	124-48-1	NE	1	0.2	1	µg/L
	Ethylbenzene	100-41-4	NE	1	0.2	1	µg/L
	2-Butanone	78-93-3	NE/200,000	10	5	10	µg/L
	Methyl tert-butyl ether	1634-04-4	NE	1	0.2	1	µg/L

TABLE B.7-2

REFERENCE LIMITS FOR WATER SAMPLES
(UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Wastewater Samples [b]	Project Quantitation Limit	Analytical Method MDLs	Analytical Method QLs	Units
	Methylene chloride	75-09-2	NE	1	0.5	1	µg/L
	Methyl isobutyl ketone	108-10-1	NE	10	5	10	µg/L
	Styrene	100-42-5	NE	1	0.2	1	µg/L
	Tetrachloroethene	127-18-4	NE/700	1	0.2	1	µg/L
	Toluene	108-88-3	NE	1	0.2	1	µg/L
	trans-1,2-Dichloroethene	156-60-5	NE	1	0.2	1	µg/L
	trans-1,3-Dichloropropene	10061-02-6	NE	1	0.2	1	µg/L
	Trichloroethene	79-01-6	204,000/500	1	0.2	1	µg/L
	Vinyl chloride	75-01-4	NE/200	1	0.2	1	µg/L
	Xylenes (Total)	1330-20-7	NE	1	0.2	1	µg/L
SVOCs/EPA Method8270C	1,2,4-Trichlorobenzene	120-82-1	NE	10	5	10	µg/L
	1,2-Dichlorobenzene	95-50-1	NE	10	5	10	µg/L
	1,3-Dichlorobenzene	541-73-1	NE	10	5	10	µg/L
	1,4-Dichlorobenzene	106-46-7	NE/7,500	10	5	10	µg/L
	2,4,5-Trichlorophenol	95-95-4	NE/400,000	10	5	10	µg/L
	2,4,6-Trichlorophenol	88-06-2	NE/2,000	10	5	10	µg/L
	2,4-Dichlorophenol	120-83-2	NE	10	5	10	µg/L
	2,4-Dimethylphenol	105-67-9	NE	10	5	10	µg/L
	2,4-Dinitrophenol	51-28-5	NE	20	5	20	µg/L
	2,4-Dinitrotoluene	121-14-2	NE/130	10	5	10	µg/L
	2,6-Dinitrotoluene	606-20-2	NE	10	5	10	µg/L
	2-Chloronaphthalene	91-58-7	NE	10	5	10	µg/L
	2-Chlorophenol	95-57-8	NE	10	5	10	µg/L
	2-Methylphenol	95-48-7	NE/200,000 [c]	10	5	10	µg/L
	2-Nitroaniline	88-74-4	NE	10	5	10	µg/L
	2-Nitrophenol	88-75-5	NE	10	5	10	µg/L
	3,3-Dichlorobenzidine	91-94-1	NE	10	5	10	µg/L
	3-Nitroaniline	99-09-2	NE	10	5	10	µg/L
	4,6-Dinitro-2-methylphenol	534-52-1	NE	20	5	20	µg/L
	4-Bromophenyl-phenylether	101-55-3	NE	10	5	10	µg/L
	4-Chloro-3-methylphenol	59-50-7	NE	10	5	10	µg/L
	4-Chloroaniline	106-47-8	NE	10	5	10	µg/L
	4-Chlorophenyl-phenylether	7005-72-3	NE	10	5	10	µg/L
	4-Methylphenol	106-44-5	NE/200,000 [c]	10	5	10	ug/L

TABLE B.7-2

REFERENCE LIMITS FOR WATER SAMPLES
(UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Wastewater Samples [b]	Project Quantitation Limit	Analytical Method MDLs	Analytical Method QLs	Units
	4-Nitroaniline	100-01-6	NE	10	5	10	µg/L
	4-Nitrophenol	100-02-7	NE	20	5	20	µg/L
	bis(2-Chloroethoxy)methane	111-91-1	NE	10	5	10	µg/L
	bis(2-Chloroethyl)ether	111-44-4	NE	10	5	10	µg/L
	bis(2-Chloroisopropyl)ether	108-60-1	NE	10	5	10	µg/L
	bis(2-Ethylhexyl)phthalate	117-81-7	NE	10	5	10	µg/L
	Butylbenzylphthalate	85-68-7	NE	10	5	10	µg/L
	Di-n-butylphthalate	84-74-2	NE	10	5	10	µg/L
	Di-n-octylphthalate	117-84-0	NE	10	5	10	µg/L
	Dibenzofuran	132-64-9	NE	10	5	10	µg/L
	Diethylphthalate	84-66-2	NE	10	5	10	µg/L
	Dimethyl phthalate	131-11-3	NE	10	5	10	µg/L
	Hexachlorobenzene	118-74-1	NE/130	10	5	10	µg/L
	Hexachlorobutadiene	87-68-3	NE/500	10	5	10	µg/L
	Hexachlorocyclopentadiene	77-47-4	NE	10	5	10	µg/L
	Hexachloroethane	67-72-1	NE/3,000	10	5	10	µg/L
	n-Nitrosodinpropylamine	621-64-7	NE	10	5	10	µg/L
	n-Nitrosodiphenylamine	86-30-6	NE	10	5	10	µg/L
	Nitrobenzene	98-95-3	NE/2,000	10	5	10	µg/L
	Pentachlorophenol	87-86-5	1,700/100,000	20	5	20	µg/L
	Phenol	108-95-2	NE	10	5	10	µg/L
	Pyridine	110-86-2	NE/5,000	10	5	10	µg/L
	Acenaphthene	83-32-9	NE	10	5	10	µg/L
	Acenaphthylene	208-96-8	NE	10	5	10	µg/L
	Anthracene	120-12-7	NE	10	5	10	µg/L
	Benzo[a]anthracene	56-55-3	NE	10	5	10	µg/L
	Benzo[a]pyrene	50-32-8	NE	10	5	10	µg/L
	Benzo[b]fluoranthene	205-99-2	NE	10	5	10	µg/L
	Benzo[g,h,i]perylene	191-24-2	NE	10	5	10	µg/L
	Benzo[k]fluoranthene	207-08-9	NE	10	5	10	µg/L
	Chrysene	218-01-9	NE	10	5	10	µg/L
	Dibenz[a,h]anthracene	53-70-3	NE	10	5	10	µg/L
	Fluoranthene	206-44-0	NE	10	5	10	µg/L
	Fluorene	86-73-7	NE	10	5	10	µg/L

TABLE B.7-2

REFERENCE LIMITS FOR WATER SAMPLES
(UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Wastewater Samples [b]	Project Quantitation Limit	Analytical Method MDLs	Analytical Method QLs	Units
	Indeno[1,2,3-cd]pyrene	193-39-5	NE	10	5	10	μg/L
	Naphthalene	91-20-3	NE	10	5	10	μg/L
Pesticides/EPA Method 8081A	4,4-DDD	72-54-8	NE	0.2	0.02	0.2	μg/L
	4,4-DDE	72-55-9	NE	0.2	0.02	0.2	μg/L
	4,4-DDT	50-29-3	100 [d]/NE	0.2	0.02	0.2	μg/L
	alpha-BHC	319-84-6	100 [d] /NE	0.2	0..02	0.2	μg/L
	Aldrin	309-00-2	100 [d] /NE	0.1	0.02	0.1	μg/L
	beta-BHC	319-85-7	NE	0.1	0.02	0.1	μg/L
	delta-BHC	319-86-8	140/NE	0.1	0.02	0.1	μg/L
	Chlordane (technical)	57-74-9	NE	0.1	0.02	0.1	μg/L
	Dieldrin	60-57-1	NE	0.2	0.02	0.2	μg/L
	Endosulfan sulfate	1031-07-8	250/30	0.2	0.02	0.2	μg/L
	Endosulfan I	959-98-8	800/NE	0.1	0.02	0.1	μg/L
	Endosulfan II	33213-65-9	NE	0.2	0.02	0.2	μg/L
	Endrin	72-20-8	NE	0.2	0.02	0.2	μg/L
	Endrin Aldehyde	7421-93-4	NE	0.2	0.02	0.2	μg/L
	Endrin Ketone	53494-70-5	20/20	0.2	0.02	0.2	μg/L
	Lindane	58-89-9	NE	0.1	0.02	0.1	μg/L
	Heptachlor	76-44-8	NE	0.1	0.02	0.1	μg/L
	Heptachlor epoxide	1024-57-3	400/400	0.1	0.02	0.1	μg/L
	Methoxychlor	72-43-5	470 [e] /8 [e]	1	0.2	1	μg/L
	Toxaphene	8001-35-2	470 [e] /8 [e]	2	1	2	μg/L
PCBs/EPA Method 8082	Aroclor 1016	12674-11-2	10,000/10,000	1	0.5	1	μg/L
	Aroclor 1221	11104-28-2	500/500	1	0.5	1	μg/L
	Aroclor 1232	11141-16-5	5,000/NE	1	0.5	1	μg/L
	Aroclor 1242	53469-21-9	5,000/NE	1	0.5	1	μg/L
	Aroclor 1248	12672-29-6	5,000/NE	1	0.5	1	μg/L
	Aroclor 1254	11097-69-1	5,000/NE	1	0.5	1	μg/L
	Aroclor 1260	11096-82-5	5,000/NE	1	0.5	1	μg/L
TPH/EPA Method 8015B	TPH-gasoline (C_6-C_{10})	8006-61-9	5,000/NE	1	0.02	1	mg/L
	TPH-diesel range (C_{10}-C_{24})	-3527	5,000/NE	1	0.02	1	mg/L
	TPH-motor oil range (C_{24}-C_{36})	-3528	NE	0.5	0.1	0.5	mg/L

TABLE B.7-2

REFERENCE LIMITS FOR WATER SAMPLES
(UFP-QAPP Worksheet #15)

Analytical Group/Method	Analyte	CAS Number	Project Action Limit for Wastewater Samples [b]	Project Quantitation Limit	Analytical Method MDLs	Analytical Method QLs	Units
Metals/EPA Methods 6010B/6020/7000	Antimony	7440-36-0	NE	1	0.1	1	mg/L
	Arsenic	7440-38-2	NE	1	0.5	1	µg/L
	Barium	7440-39-3	NE	1	0.5	1	µg/L
	Beryllium	7440-41-7	15,000/NE	1	0.5	1	µg/L
	Cadmium	7440-43-9	5,000/5,000	1	0.5	1	µg/L
	Chromium	7440-47-3	100,000/100,000	1	0.5	1	µg/L
	Cobalt	7440-48-4	750/NE	1	0.5	1	µg/L
	Copper	7440-50-8	1,000/1,000	1	0.5	1	µg/L
	Lead	7439-92-1	5,000/5,000	1	0.5	1	µg/L
	Mercury	7439-97-6	80,000/NE	0.5	0.1	0.5	µg/L
	Molybdenum	7439-98-7	25,000/NE	2	1	2	µg/L
	Nickel	7440-02-0	5,000/5,000	1	0.5	1	µg/L
	Selenium	7782-49-2	200/200	1	0.5	1	µg/L
	Silver	7440-22-4	350,000/NE	1	0.5	1	µg/L
	Thallium	7440-28-9	20,000/NE	1	0.5	1	µg/L
	Vanadium	7440-62-2	1,000/1,000	1	0.5	1	µg/L
	Zinc	7440-66-6	5,000/5,000	10	5	10	µg/L

Notes:

*Reporting limits for radiological analyses are calculated with every analysis. They are selected based on background, sample size, and count time.

[a] The isotopes listed represent a standard list of radionuclides to be reported by the laboratory. However, laboratory will be instructed to report any detected isotopes in addition to the ones listed during each sample analysis.
[b] Water analysis for this project is for characterizing wastewater only. Levels listed represent STLC/TCLP values.
[c] Value listed is for the sum of 2-methylphenol and 4-methylphenol.
[d] Value listed is for the sum of 4,4- DDD, 4,4- DDE, and 4,4- DDT.
[e] Value listed is for the sum of heptachlor and heptachlor epoxide.

µg/L – microgram per liter
BHC – benzene hexachloride
CAS – Chemical Abstract Service
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethene
DDT – dichlorodiphenyltrichloroethane
DOE – Department of Energy
EPA – U.S. Environmental Protection Agency
HASL – Health and Safety Laboratory
MDL – method detection limit
NE – none established
PCB – polychlorinated biphenyl
pCi/L – picocurie per liter
QL – quantitation limit
STLC – Soluble Threshold Limit Concentration
SVOC – semivolatile organic compound
TCLP – Toxicity Characteristic Leaching Procedure
TPH – total petroleum hydrocarbons
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans
VOC – volatile organic compound

TABLE B.7-3

QUALITY CONTROL ACCEPTANCE CRITERIA

Method	Analyte	CAS Number	Accuracy Soil (%R) [a]	Precision Soil (RPD) [b]	Accuracy Water (%R) [a]	Precision Water (RPD) [b]
EPA Method 901.1 M (Soil) and EPA Method 901.1 (Water) or equivalent	Cesium-137	10045-97-3	75-125	≤ 30	75-125	≤ 30
	Radium-226	13982-63-3	75-125	≤ 30	75-125	≤ 30
DOE Sr-01/Sr-02 Method (Soil) and EPA Method 905.0 (Water) or equivalent	Strontium-90	10098-97-2	75-125	≤ 30	75-125	≤ 30
Explosives/8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	75-125	≤ 30	N/A	N/A
	Hexahydro-1,3,5-trinitro-1,3,5-trazine (RDX)	121-82-4	70-135	≤ 30	N/A	N/A
	1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	75-125	≤ 30	N/A	N/A
	1,3-Dinitrobenzene (1,3-DNB)	99-65-0	80-120	≤ 30	N/A	N/A
	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	10-150	≤ 30	N/A	N/A
	Nitrobenzene (NB)	98-95-3	75-125	≤ 30	N/A	N/A
	2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	55-140	≤ 30	N/A	N/A
	4-Amino-2,6-dinitrotoluene (4-Am-DNT)	1946-51-0	80-125	≤ 30	N/A	N/A
	~~2-Amino-4,6-dinitrotoluene (24-Am-DNT)~~	~~355-72-78-2~~	~~80-125~~	~~≤ 30~~	~~N/A~~	~~N/A~~
	2,4-Dinitrotoluene (2,4-DNT)	121-14-2	80-125	≤ 30	N/A	N/A
	2,6-Dinitrotoluene (2,6-DNT)	606-20-2	80-120	≤ 30	N/A	N/A
	2-Nitrotoluene (2-NT)	88-72-2	80-125	≤ 30	N/A	N/A
	3-Nitrotoluene (3-NT)	99-08-1	75-120	≤ 30	N/A	N/A
	4-Nitrotoluene (4-NT)	99-99-0	75-125	≤ 30	N/A	N/A
	Surrogate:					
	1,2-Dinitrobenzene (1,2-DNB)	528-29-0	70-130	N/A	N/A	N/A
EPA Method 8260B	1,1-Dichloroethene	75-35-4	65-135	≤ 30	70-130	≤ 30
	Benzene	71-43-2	75-125	≤ 30	80-120	≤ 30
	Chlorobenzene	108-90-7	75-125	≤ 30	80-120	≤ 30
	Trichloroethene	79-01-6	75-125	≤ 30	70-125	≤ 30
	Toluene	108-88-3	70-125	≤ 30	75-120	≤ 30
	Surrogates:					
	1,2-Dichloroethane-d4	17060-07-0	*	N/A	70-120	N/A
	4-Bromofluorobenzene	460-00-4	85-120	N/A	75-120	N/A
	Dibromofluoromethane	1868-53-7	*		85-115	
	Toluene-d8	2037-26-5	85-115	N/A	85-120	N/A

TABLE B.7-3

QUALITY CONTROL ACCEPTANCE CRITERIA

Method	Analyte	CAS Number	Accuracy Soil (%R) [a]	Precision Soil (RPD) [b]	Accuracy Water (%R) [a]	Precision Water (RPD) [b]
EPA Method 8270C	1,2,4-Trichlorobenzene	120-82-1	45-110	≤ 30	35-105	≤ 30
	1,4-Dichlorobenzene	106-46-7	35-105	≤ 30	30-100	≤ 30
	2,4-Dinitrotoluene	121-14-2	50-115	≤ 30	50-120	≤ 30
	Acenaphthene [c]	83-32-9	45-110	≤ 30	45-110	≤ 30
	2-Chlorophenol	95-57-8	45-105	≤ 30	35-105	≤ 30
	n-Nitrosodi-n-propylamine	621-64-7	40-115	≤ 30	35-130	≤ 30
	4-Chloro-3-methyl phenol	59-50-7	45-115	≤ 30	45-110	≤ 30
	4-Nitrophenol	100-02-7	15-140	≤ 30	0-125	≤ 30
	Pentachlorophenol	87-86-5	25-120	≤ 30	40-115	≤ 30
	Phenol	108-95-2	40-100	≤ 30	0-115	≤ 30
	Surrogates:					
	2,4,6-Tribromophenol	118-79-6	35-125	N/A	40-125	N/A
	2-Fluorbiphenyl	321-60-8	45-105	N/A	50-110	N/A
	2-Fluorophenol	367-12-4	35-105	N/A	20-110	N/A
	Nitrobenzene-d_5	4165-60-0	35-100	N/A	40-110	N/A
	Phenol- d_5	4165-62-2	40-100	N/A	10-115	N/A
	Phenol- d_6	13127-88-3	40-100	N/A	10-115	N/A
EPA Method 8081A	4,4-DDT	50-29-3	45-140	≤ 30	45-140	≤ 30
	Aldrin	309-00-2	45-140	≤ 30	25-140	≤ 30
	Dieldrin	60-57-1	65-125	≤ 30	60-130	≤ 30
	Endrin	72-20-8	60-135	≤ 30	55-135	≤ 30
	gamma-BHC (Lindane)	58-89-9	60-125	≤ 30	25-135	≤ 30
	Heptachlor	76-44-8	50-140	≤ 30	40-130	≤ 30
	Surrogates:					
	Decachlorobiphenyl	2051-24-3	55-130	N/A	30-125	N/A
	Tetrachloro-m-xylene (TCMX)	877-09-8	70-125	N/A	25-140	N/A
EPA Method 8082	Aroclor 1016	12674-11-2	40-140	≤30	25-145	≤30
	Aroclor 1260	11096-82-5	60-130	≤30	30-145	≤30
	Surrogate:					
	Decachlorobiphenyl (DCBP)	2051-24-3	60-135	N/A	40-135	N/A
	Tetrachloro-m-xylene (TCMX)	877-09-8	*	N/A	*	N/A

TABLE B.7-3

QUALITY CONTROL ACCEPTANCE CRITERIA

Method	Analyte	CAS Number	Accuracy Soil (%R) [a]	Precision Soil (RPD) [b]	Accuracy Water (%R) [a]	Precision Water (RPD) [b]
EPA Method 8015	TPH-gasoline	8006-61-9	*	*	*	*
	Surrogate:					
	4-Bromofluorobenzene	460-00-4	*	N/A	*	N/A
	TPH-diesel/motor oil	-3527	*	*	*	*
	Surrogate (choose one):					
	Octacosane/hexacosane/ bromofluorobenzene	TBD	*	N/A	*	N/A
EPA Method 1664	TRPH	TBD	*	*	*	*
EPA Methods 6010B/6020/7000	Antimony	7440-36-0	80-120	≤ 20	80-120	≤ 20
	Arsenic	7440-38-2	80-120	≤ 20	80-120	≤ 20
	Barium	7440-39-3	80-120	≤ 20	80-120	≤ 20
	Beryllium	7440-41-7	80-120	≤ 20	80-120	≤ 20
	Cadmium	7440-43-9	80-120	≤ 20	80-120	≤ 20
	Chromium	7440-47-3	80-120	≤ 20	80-120	≤ 20
	Cobalt	7440-48-4	80-120	≤ 20	80-120	≤ 20
	Copper	7440-50-8	80-120	≤ 20	80-120	≤ 20
	Lead	7439-92-1	80-120	≤ 20	80-120	≤ 20
	Mercury	7439-97-6	80-120	≤ 20	80-120	≤ 20
	Manganese	7439-98-7	80-120	≤ 20	80-120	≤ 20
	Molybdenum	7440-02-0	80-120	≤ 20	80-120	≤ 20
	Nickel	7782-49-2	80-120	≤ 20	80-120	≤ 20
	Selenium	7440-22-4	80-120	≤ 20	80-120	≤ 20
	Silver	7440-28-9	75-120	≤ 20	80-120	≤ 20
	Thallium	7440-62-2	80-120	≤ 20	80-120	≤ 20
	Vanadium	7440-66-6	80-120	≤ 20	80-120	≤ 20
	Zinc	7440-36-0	80-120	≤ 20	80-120	≤ 20

TABLE B.7-3

QUALITY CONTROL ACCEPTANCE CRITERIA

Notes:

* Limit is not defined in the DoD. Therefore, according to the DoD, 2006, laboratory in-house limit will be used. Limit will be added to this table once laboratory for this project has been procured.

[a] Percent recovery (%R) limits listed are for LCS/LCSD and MS/MSD. (LCSD is required if sufficient volume is not available for a MSD.)

[b] Relative percent difference (RPD) limits listed are for LCS/LCSD and MS/MSD. (LCSD is required if sufficient volume is not available for a MSD.)

%R – percent recovery
CAS – Chemical Abstract Service
DoD – Department of Defense
DOE – Department of Energy
EPA – U.S. Environmental Protection Agency
LCS – laboratory control sample
LCSD – laboratory control sample duplicate
MS/MSD – matrix spike/matrix spike duplicate
N/A – not applicable
RPD – relative percent difference
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

TABLE B.7-4

MEASUREMENT PERFORMANCE CRITERIA – FIELD QC SAMPLES (UFP-QAPP Worksheet #12)

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field duplicate	All	10%	Precision	RPD <25% for water and <50% for soil	S &A
Method Blank	Gamma Spectroscopy and Strontium-90	Per analytical batch	Accuracy	Less than the minimum detectable activity.	A
Laboratory Control Sample	Gamma Spectroscopy and Strontium-90	Per analytical batch	Precision and accuracy	Percent recovery limits: 75-125 percent	A
Duplicate	Gamma Spectroscopy and Strontium-90	Per analytical batch	Precision and accuracy	Percent (RPD) limits: ≤30 percent	A
Matrix Spike	Gamma Spectroscopy and Strontium-90	Per analytical batch	Precision and accuracy	Percent RPD (%RPD) limits: ≤30 percent	A

Notes:

QC – quality control
RPD – relative percent difference
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

TABLE B.7-5

FIELD QUALITY CONTROL SAMPLE SUMMARY
(UFP-QAPP Worksheet #20)

Matrix	Analytical Group	Analytical and Preparation SAP Reference	# of Primary Sampling Locations	# of Field Duplicates	# of MS/MSDs	# of Field Blanks	# of Equipment Rinsates	# of Trip Blanks	Total # of Samples to Laboratory
Confirmation Samples [a]									
Soil	Gamma Spectroscopy	SAP Section 5.1	TBD	TBD	TBD	N/A	N/A	N/A	TBD
Soil	Explosives	SAP Section 5.1	TBD	TBD	TBD	N/A	N/A	N/A	TBD
Import Samples [b]									
Soil	VOCs	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	SVOCs	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	PAHs	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	Pesticides	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	PCBs	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	TPH-purgeable	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	TPH-extractable	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	Metals	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	Gamma Spectroscopy	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Soil	^{90}Sr	SAP Section 5.2	4	N/A	N/A	N/A	N/A	N/A	4
Stockpile Samples [c]									
Soil	VOCs	SAP Section 5.3	10	N/A	1	N/A	N/A	N/A	11
Soil	SVOCs	SAP Section 5.3	10	N/A	1	N/A	N/A	N/A	11
Soil	PAHs	SAP Section 5.3	10	N/A	1	N/A	N/A	N/A	11
Soil	Pesticides	SAP Section 5.3	10	N/A	1	N/A	N/A	N/A	11
Soil	PCBs	SAP Section 5.3	10	N/A	1	N/A	N/A	N/A	11
Soil	TPH-purgeable	SAP Section 5.3	10	N/A	1	N/A	N/A	N/A	11
Soil	TPH-extractable	SAP Section 5.3	10	N/A	1	N/A	N/A	N/A	11
Soil	Metals	SAP Section 5.3	10	N/A	1	N/A	N/A	N/A	11
Soil	Gamma Spectroscopy	SAP Section 5.3	100	N/A	1	N/A	N/A	N/A	11
Soil	^{90}Sr	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1

TABLE B.7-5

FIELD QUALITY CONTROL SAMPLE SUMMARY
(UFP-QAPP Worksheet #20)

Matrix	Analytical Group	Analytical and Preparation SAP Reference	# of Primary Sampling Locations	# of Field Duplicates	# of MS/MSDs	# of Field Blanks	# of Equipment Rinsates	# of Trip Blanks	Total # of Samples to Laboratory
Wastewater Samples									
Water	VOCs	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1
Water	SVOCs	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1
Water	PAHs	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1
Water	Pesticides	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1
Water	PCBs	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1
Water	Metals	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1
Water	TPH-purgeable	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1
Water	TPH-extractable	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1
Water	Cyanide	SAP Section 5.3	1	N/A	N/A	N/A	N/A	N/A	1

Notes:

[a] The number of confirmation samples may change if the size of the excavation is larger than anticipated.
[b] Import sample primary locations may increase if initial import source does not pass action levels in Table B.7-1. Field duplicates are associated with confirmation samples and will not be collected for the import samples.
[c] Stockpile sample primary locations may increase if greater volume of soil is required to be excavated than initially estimated. Field QC (except for MS/MSD) is not required for waste characterization samples.

MS/MSD – matrix spike/matrix spike duplicate
N/A – not applicable
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
SAP – Sampling and Analysis Plan
^{90}Sr – strontium-90
SVOC – semivolatile organic compound
TbD – to be determined
TPH-extractable – total extractable petroleum hydrocarbons
TPH-purgeable – total purgeable petroleum hydrocarbons
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

8.0 DATA MANAGEMENT

This section discusses the data management procedures for samples collected for this project, tracing the path of the field and laboratory data from generation, review, and verification to storage and final use. The quality of the data collection process will be assessed through reviews of all documentation and measurements performed and verified to confirm that the information recorded is accurate and complete. Project documentation that will be generated is presented in Table B.4-1.

8.1 DATA GENERATION

Two types of data will be generated – field and laboratory data. These types are described in the following sections.

8.1.1 Field Data

Field sampling data, including field logbooks and field forms, will be maintained. The logbooks will be numbered sequentially on the cover by the Project Quality Control Manager (PQCM) and that number will be entered into a logsheet maintained by the PQCM for the project. Field logbooks and forms will be reviewed by the PQCM and verified as described in Table B.8-1. A copy of all field forms containing information pertaining to sample collection (such as calibration forms) will be forwarded to the Project Chemist.

A copy of the COCs will be faxed/e-mailed to the Project Chemist on a daily basis for review and communication with the laboratory. The COCs will be reviewed daily by the Project Chemist for completeness. The manila copy of the COC form will be mailed to the Project Chemist. The Project Chemist will maintain field documents and forward them to the main project file in San Diego, California, at the completion of the project.

8.1.2 Laboratory Data

The laboratory will report data to TtEC by submitting data packages as described in Section 4.2. For this project, 90 percent of the data will be submitted in an EPA Level III-equivalent data package and 10 percent submitted in an EPA Level IV-equivalent data package as described in Section 4.2. (For waste characterization samples, 100 percent of the data will be submitted in an EPA Level III-equivalent data package.) All data reported by the laboratory will be verified as described in Table B.8-1.

As described in Section 7.1.2, the laboratory will verify sample receipt and document it on sample receipt form. In addition, samples will be assigned a unique number and that will be recorded on the laboratory internal COC record.

Prior to reporting it, all data reported by the analyst must be reviewed by a peer analyst qualified to perform the method and a supervisor. In addition, the laboratory QA manager must review 10 percent of the data reported for each section annually. The laboratory QA manager review may be conducted after the data have been reported to TtEC.

All data will be reported to TtEC on or before the designated turnaround time by fax/e-mail. The Project Chemist will review the data upon receipt prior to releasing it to project personnel to verify that the sampling procedures and analytical results were obtained following the protocols in this SAP and are of sufficient quality to satisfy DQOs.

On or before 21 days from sample receipt, the laboratory will submit hardcopy data with associated QC information as described in Section 4.2 along with an electronic format of the data to TtEC. The format to be used for the electronic data deliverable will be compatible with NEDD and is described in the statement of work.

8.1.3 Electronic

Field data from the COCs (date and time collected, sample identification, etc.) will be entered into the TtEC database by the Project Chemist. Survey data will be recorded by a field surveyor and also entered into the database. All sample locations, except for waste characterization samples, will be surveyed in accordance with *Environmental Work Instruction (EWI) EVR.6, Environmental Data Management and Required Electronic Delivery Standards* (Southwest Division, Naval Facilities Engineering Command, 2005). Horizontal control information will be captured in the State Plane Coordinate System (North American Datum [NAD] 83) in feet, and vertical control standards will be in mean sea level (North American Vertical Datum [NAVD] 88) in feet. All manual entries into the database will be 100 percent verified by the Project Chemist by checking the manual entry against the hard-copy information.

The EDD from the laboratory, which will be compatible with NEDD requirements, will be uploaded into the TtEC database. The data will be checked for required values and project-specific requirements by the database. Any discrepancies in the EDD will either be corrected by TtEC or the laboratory will be notified to make corrections. Ten percent of the data will be checked by the Project Chemist against the hard-copy data package. If errors are found in the electronic data, the Project Chemist will contact the laboratory for correction.

The Data Manager will conduct a weekly backup of the database and maintain the backup file for 3 months.

Electronic data will be submitted to NEDD-Naval Installation Restoration Information Solution website in NEDD format in accordance with the EWI EVR6, Environmental Data Management and Required Electronic Delivery Standards (NFECSW, 2005).

8.2 DATA VALIDATION

The following documents will be used as guidance for validating all data, except waste characterization samples: Contract Laboratory Program *National Functional Guidelines for Organic Data Review, EPA 540/R-99-008* (EPA, 1999), Contract Laboratory Program *National Functional Guidelines for Inorganic Data Review, EPA 540-R-04-004* (EPA, 2004); *Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical, Data Validation* (Southwest Division Naval Facilities Engineering Command, 2001), and the QC criteria specified in this SAP.

Data validation will be performed by an independent data validation company. For this project, 90 percent of the data will require EPA Level III-equivalent data validation and 10 percent EPA Level IV equivalent data validation. Data may be qualified as protocol or advisory. Protocol violations are when the laboratory deviates from the referenced analytical methods or the project-specific QLs, QC limits, or QC criteria.

Field QC samples will be discussed in the validation reports as follows:

- **Field Duplicates** – Field duplicate identifications will be provided on the COC form for each SDG by TtEC. An additional section showing RPD values will be included to demonstrate field duplicate precision. If the results cannot be calculated, this will be noted in the report.
- **Field Blanks** – Identifications for field blanks including trip blanks, equipment rinsates, and source blanks will be provided on the COC forms by TtEC. Any analyte detected in field blanks will be discussed in this section of the report.

Data validation reports will be submitted to TtEC as described in Section 4.3. The validator reports will be filed with the respective analytical data package.

8.3 DATA QUALITY ASSESSMENT

After data are validated, the Project Chemist will review and assess field and laboratory quality control samples data. The PARCC will be determined as described in Section 7.2. Data validation reports will be reviewed and assessed for meeting DQOs. The Project Chemist will review the data validation reports for any deviations and qualify data, if necessary. The following data qualifiers will be used:

J - Result is estimated
U - Analyte is not detected at or above the stated QL
R - Data are rejected
UJ - Analyte is not detected, but there is an uncertainty about the QL

Data qualifying are used to indicate uncertainties associated with the data. The assigned qualifiers will be entered into the validation code field in the database. In addition, data will be assessed through the evaluation of the PARCC parameters.

The Project Chemist will prepare a data quality assessment, which will summarize the findings of the data review and discuss usability of the data.

Data will be presented in tabular format to be included in the project summary report. The electronic data in NEDD format will be submitted to the DON as described in *Environmental Work Instruction (EWI) EVR.6, Environmental Data Management and Required Electronic Delivery Standards* (NFECSW, 2005). These data will also be placed in the project file located in the TtEC San Diego office.

TABLE B.8-1

VERIFICATION PROCESS
(UFP-QAPP Worksheet #34)

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Field logbook	Field logbooks will be reviewed weekly and verified to confirm that the information is complete in accordance with requirements in Section 4.1.1. The inspection will be documented in daily QC reports.	I	PQCM, TtEC
COC forms	COC forms will be reviewed daily upon their completion and verified for completeness.	I	PQCM, TtEC
Sample receipt	For samples shipped via FedEx®, the Project Chemist will verify receipt of samples by the laboratory the day following shipment.	I	Project Chemist, TtEC
Sample logins	Sample logins will be reviewed against the COC and verified that the requirements in this SAP have been met. Prior to release, data will be verified as follows. 100 percent of the data comply with the method – and project specific requirements and that any deviations or failure to met criteria are documented for the project file. 100 percent of manual entries are free of transcription error and manual calculations are accurate; computer calculations are spot-checked to verify program validity; data reported are compliance with method, and project specific QC requirements; raw data and supporting materials are complete; spectra assignments are confirmed; description of deviations from method or project requirements are documented; significant figures and rounding have been appropriately used; reported values include dilution factors; and results are reasonable. The reported information is complete; the information in the report narrative is complete and accurate; results are reasonable. Analytical methods are performed in compliance with approved SOPs. This review may be conducted after release of data since they are done only on 10 percent of the data.	I E	Project Chemist, TtEC Laboratory Project Manager, TBD
Laboratory data prior to release	Laboratory data will be reviewed and verified for completeness against analyses requested on the COC forms.	E	Laboratory Project Manager, TBD
Laboratory data due at turnaround time listed on COC	Laboratory data will be verified that the analyses reported are consistent with the analyses requested on the COC forms.	I	Project Chemist, TtEC
Laboratory data packages	All laboratory data packages will be verified by the laboratory performing the work for completeness and technical accuracy prior to submittal. Data packages will then be reviewed by the Project Chemist for accuracy against faxed/e-mailed data and for completeness in accordance with the data package requirements described in Section 4.5. Subsequently, data packages will be evaluated externally by undergoing data validation Section 8.2.	E I E	Laboratory, TBD Project Chemist, TtEC Third-party data validators

TABLE B.8-1

VERIFICATION PROCESS
(UFP-QAPP Worksheet #34)

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Field and electronic data	One hundred percent of manual entries will be reviewed against the hardcopy information and 10 percent of electronic uploads will be checked against the hardcopy.	I	Project Chemist, TtEC

Notes:

COC – chain of custody
PQCM – Project Quality Control Manager
QC – quality control
TBD – to be determined
TtEC – Tetra Tech EC, Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

TABLE B.8-2

VALIDATION STEPS (IIA AND IIB) PROCESS
(UFP-QAPP Worksheet #35)

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Field logbook	Field logbooks will be reviewed weekly for accuracy associated with each sampling event. The inspection will be documented in daily QC reports.	PQCM, TtEC
IIa	COC forms	COC forms will be reviewed daily to ensure that project information, sample analyses requested, number of field QC samples collected, and percent level III or IV validation chosen is accurate and in accordance with the requirements in this SAP.	Project Chemist, TtEC
IIa	Sample receipt	The sample cooler will be checked for compliance with temperature and packaging requirements listed in Section 6.5 of this SAP.	Laboratory sample custodian, TBD
IIa	Sample logins	Sample login will be reviewed for accuracy against the COC form.	Project Chemist, TtEC Laboratory Project Manager, TBD
IIa	Laboratory data prior to release	Laboratory data will be reviewed to ensure that the data is accurate and meets the requirements in this SAP. Prior to release, data will be validated as follows:	Laboratory Project Manager, TBD
		100 percent of the data comply with the method- and project-specific requirements and that any deviations or failure to meet criteria are documented for the project file.	Laboratory Analyst, TBD
		100 percent of manual entries are free of transcription errors and manual calculations are accurate; computer calculations are spot-checked to verify program validity; data reported are compliant with method- and project-specific QC requirements; raw data and supporting materials are complete; spectral assignments are confirmed; descriptions of deviations from method or project requirements are documented; significant figures and rounding have been appropriately used; reported values include dilution factors; and results are reasonable.	Laboratory Peer Analyst, TBD
		Data reported are compliant with method- and project-specific QC requirements; the reported information is complete; the information in the report narrative is complete and accurate; and results are reasonable.	Laboratory Supervisor, TBD
		Data reported are compliant with method- and project-specific QC; analytical methods are performed in compliance with approved SOPs. This review may be conducted after release of data since reviews are done only on 10 percent of the data.	Laboratory Quality Assurance Manager, TBD

TABLE B.8-2

VALIDATION STEPS (IIA AND IIB) PROCESS
(UFP-QAPP Worksheet #35)

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
	Laboratory data due at turnaround time listed on COC	Laboratory data will be reviewed to ensure that the data reported met the analyte list and limits listed in Table A.7-1 and A.7-2.	Project Chemist, TtEC
IIa	Laboratory data packages	All laboratory data packages will be validated by the laboratory performing the work for technical accuracy prior to submittal.	Laboratory Project Manager, TBD
		Data packages will then be reviewed for accuracy against the laboratory data that was faxed/e-mailed at the turnaround time listed on the COC.	Project Chemist, TtEC
		Data packages will be evaluated externally by undergoing data validation as described in Section 8.2.	Third-party data validator, TBD
IIb	Data validation reports	Data validation reports will be reviewed in conjunction with the project DQOs and data quality indicators (listed in Section 7.2).	Project Chemist, TtEC

Notes:

COC – chain of custody
DQO – Data quality objective
PQCM – Project Quality Control Manager
QC – quality control
SAP – Sampling and Analysis Plan
SOP – Standard Operating Procedure
TBD – to be determined
TtEC – Tetra Tech EC, Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

9.0 QUALITY ASSURANCE OVERSIGHT

QA oversight for this project will include surveillance of field activities and of the laboratories performing analysis.

9.1 FIELD SURVEILLANCE

NAVFAC SW QAOs and TtEC Quality Control Program Manager may schedule surveillance of field activities at any time to evaluate the execution of sample collection, identification, and control in the field. The TtEC QCM will conduct surveillance of field activities at a minimum of once for a project lasting less than 6 months and once every six months for project lasting longer than 6 months. The surveillance will also include observations of COC procedures, field documentation, instrument calibrations, and field measurements.

Field documents and COC records will be reviewed to ensure that all entries are printed or written in indelible black or blue ink, dated, and signed. Sampling operations will be reviewed and compared to this SAP and other applicable SOPs. Use of proper sample containers, proper handling of samples, and adequate documentation of the sampling operation will be verified.

Field measurements will be reviewed by random spot-checking to determine that the instrument is within calibration, the calibration is done at the appropriate frequency, and that the sensitivity range of the instrument is appropriate for the project.

9.1.1 Corrective Action

Findings identified during the field surveillance will be recorded on a surveillance checklist. A surveillance report will be prepared and provided to the Project Manager. The Project Manager shall assign an individual to identify and implement corrective actions.

The TtEC QCM will monitor corrective action documentation, verify implementation of the corrective action, track and analyze the corrective action, and close out corrective action documentation upon completion of the corrective action.

9.2 LABORATORY ASSESSMENT

The laboratory to be used for this project will have a State of California DHS ELAP-certified analytical laboratory. All environmental analytical laboratories would have successfully completed the NFESC Laboratory Evaluation Program. TtEC will only conduct a laboratory assessment if warranted during the project. The scope of the laboratory assessment by TtEC will be determined based on quality issues encountered.

Planned project assessments and assessment findings and corrective action responses are included in Tables B.9-1 and B.9-2, respectively.

TABLE A.9-1

PLANNED PROJECT ASSESSMENTS
(UFP-QAPP Worksheet #31)

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
Operational Readiness Review	Prior to mobilization of the project and prior to initiating major phases of work	Internal	TtEC	Project Manager, TtEC	Project Manager, TtEC	Project Manager, TtEC	Project QC Manager, TtEC
Field Sampling Surveillance	Once at the beginning of field sampling activities	Internal	TtEC	Project Chemist, TtEC	Project Manager, TtEC	Project Manager, TtEC	Project QC Manager and Project Chemist, TtEC
Data Review Surveillance	Once for project duration less than six months	Internal	TtEC	Program Chemist, TtEC	Project Chemist, TtEC	Program Chemist, TtEC	QC Program Manager, TtEC
Management Review	Once	Internal	TtEC	QC Program Manager, TtEC	Project Manager, TtEC	Project Manager, TtEC	Project QC Manager, TtEC

Notes:

QC – quality control
TtEC – Tetra Tech EC, Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

TABLE B.9-2

ASSESSMENT FINDINGS AND CORRECTIVE ACTION RESPONSES
(UFP-QAPP Worksheet #32)

Assessm ent Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Field Sampling Surveillance	Surveillance Report	Project Manager, TtEC	7 days after completion of the inspection	Corrective Action Report	Project Manager and QC Program Manager, TtEC	5 days after notification
Data Review Surveillance	Surveillance Report	Project Manager, TtEC	7 days after completion of the inspection	Corrective Action Report	Project Manager and QC Program Manager, TtEC	14 days after notification
Management Review	Surveillance Report	Project Manager, TtEc	7 days after completion of the inspection	Corrective Action Report	QC Program Manager, TtEC	14 days after notification

Notes:

QC – quality control
TtEC – Tetra Tech EC, Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

TABLE B.9-3

QA MANAGEMENT REPORT
(UFP-QAPP Worksheet #33)

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Field Sampling Surveillance Report	One at startup of sampling	TBD	Project Chemist, TtEC	Project Manager, Program Chemist, QC Program Manager, TtEC
Data Review Surveillance Report	One after all data generated and reviewed	TBD	Program Chemist, TtEC	Project Manager, Program Chemist, QC Program Manager, TtEC
Management Review Report	One after management review is completed	TBD	QC Program Manager, TtEC	Project Manager, Program Manager, TtEC

Notes:

QC – quality control
TBD – to be determined
TtEC – Tetra Tech EC, Inc.
UFP-QAPP – Uniform Federal Policy for Quality Assurance Project Plans

10.0 SAP REVISION OR AMENDMENT

Significant change in work scope affecting the original project DQOs will require the SAP to be amended. Any changes to the SAP will be documented prior to sampling and analysis activities. Minor changes will be documented by completing a FCR form. The FCR must be approved prior to field implementation. Major changes to work scope affecting the original DQOs or meeting criteria described in *Environmental Work Instruction (EWI) #2, 3EVR.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs)* (NAVFAC SW, 2006) will require preparation of a SAP addendum. The SAP addendum must be approved by NAVFAC SW QAO prior to conducting sampling and analysis.

11.0 REFERENCES

Department of Defense (DoD). 2006. *Quality Systems Manual for Environmental Laboratories.* January.

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______________. 1986. *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846.* Third Edition and final updates.

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______________. 1999. *National Functional Guidelines for Organic Data Review, EPA 540/R-99/008.* Contract Laboratory Program. October.

______________. 2004. *National Functional Guidelines for Inorganic Data Review, EPA 540/R-04/004.* Contract Laboratory Program. October.

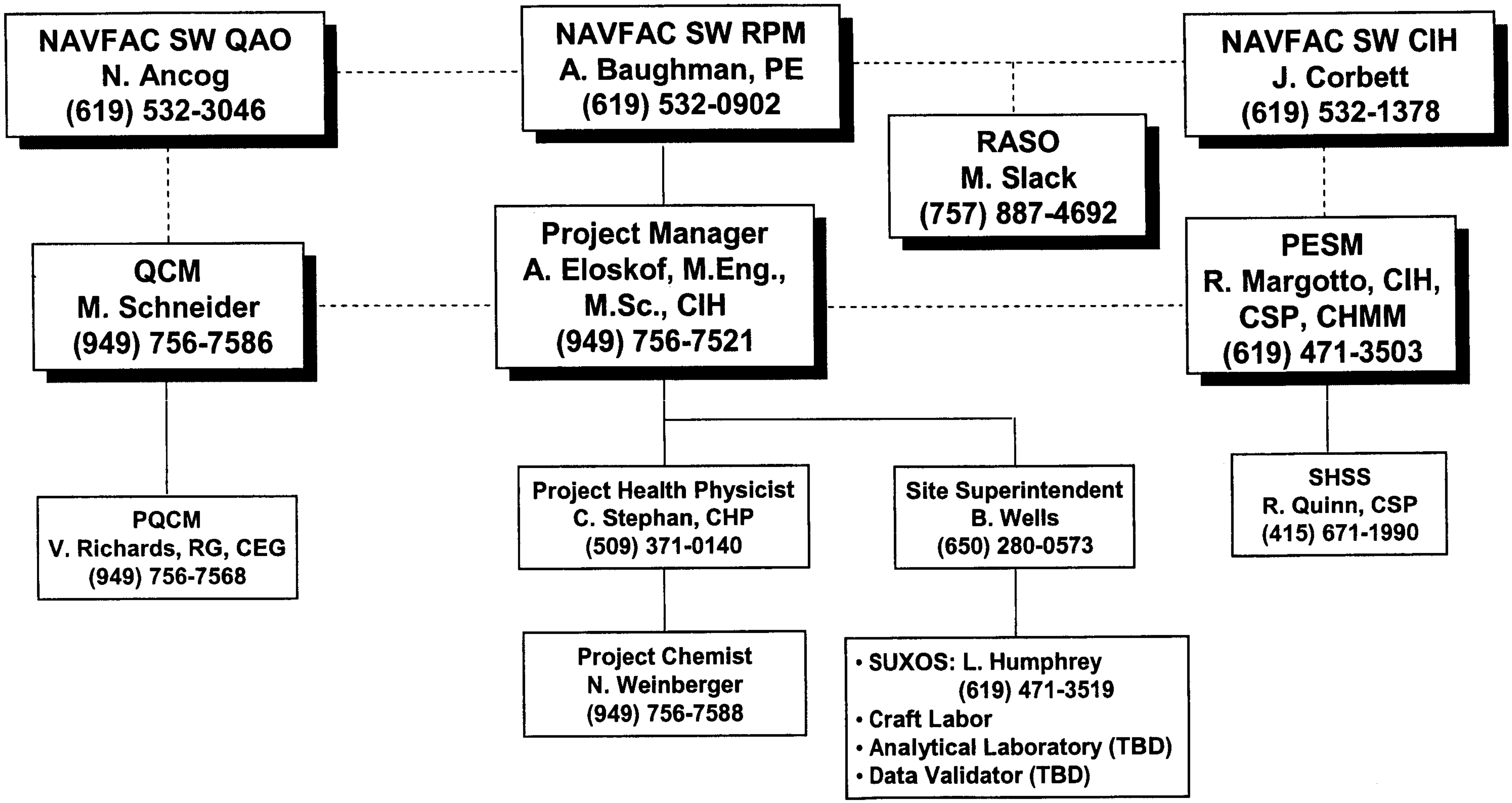
______________. 2005. *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP.*

______________. 2006. *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-T, QAMS.*

FIGURES

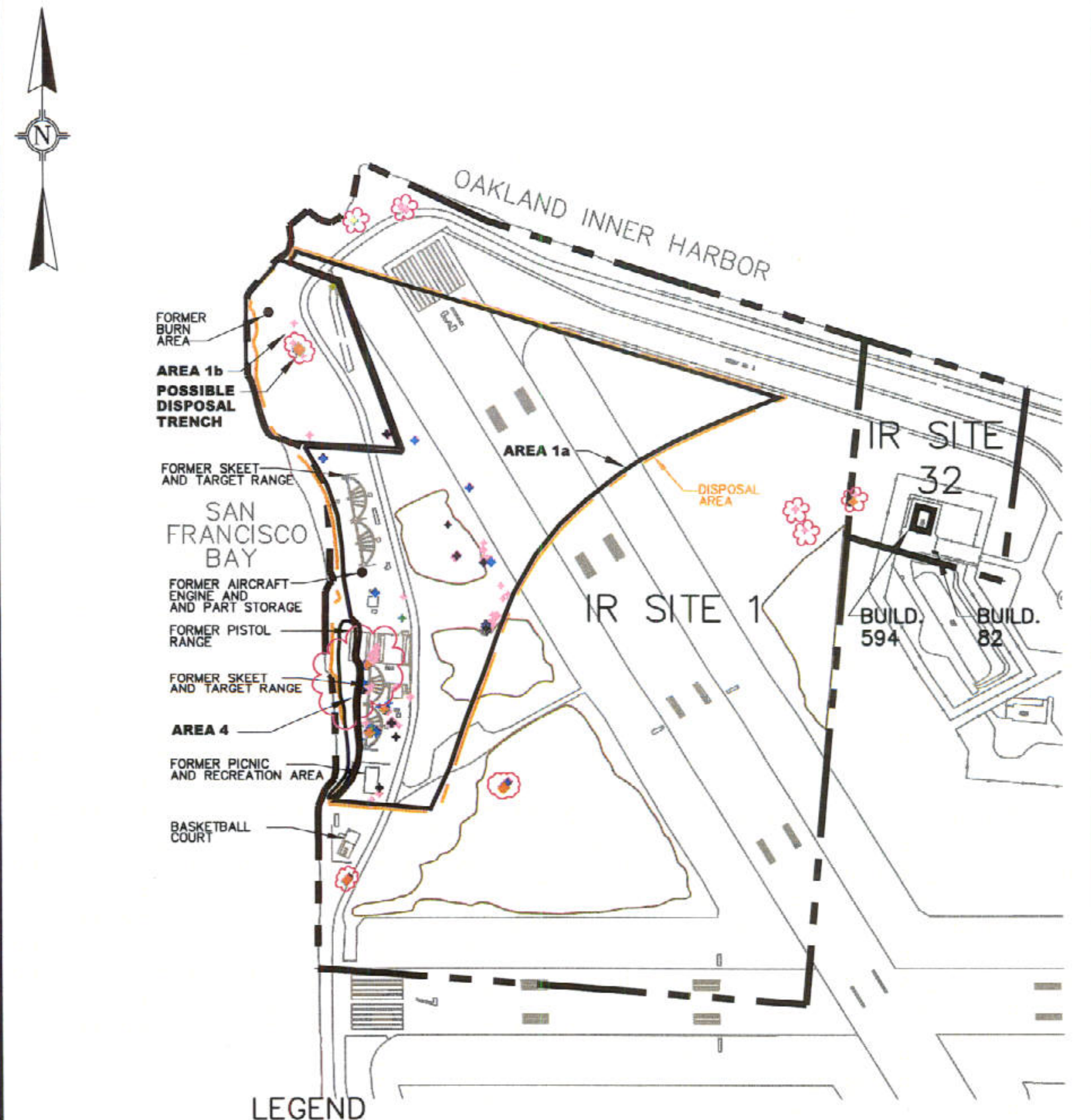
Figure B.2-1

Project Organization Chart



Legend
------- = In regular contact and coordination
——— = Directly reports to above

RACIV070232 Fig B.2-1



LEGEND

IR SITES 1 AND 32 BOUNDARY

DISPOSAL AREA BOUNDARY

SEASONAL WETLAND BOUNDARY

NET CPM VALUES

- 4K–10K
- 10K–15K
- 15K–20K
- 20K–25K
- 25K–30K
- 30K–35K
- 35K–40K
- 40K–45K
- 45K–50K
- >50K

POTENTIAL EXCAVATION AREA

500 250 0 500

SCALE IN FEET

SOURCE:
OU-3 REMEDIAL INVESTIGATION REPORT, FINAL BY TETRA TECH EM INC., PUBLISHED IN RANCHO CORDOVA IN 1999.

Figure B.5–1

IR SITE 1

POTENTIAL EXCAVATION AREAS

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 070232B51.DWG

DCN: ECSD-RACIV-07-0232

CTO: #0015

APPROVED BY: AE

CHECKED BY: JA

REVISION: 0

DRAWN BY: MD

DATE: 01/31/07

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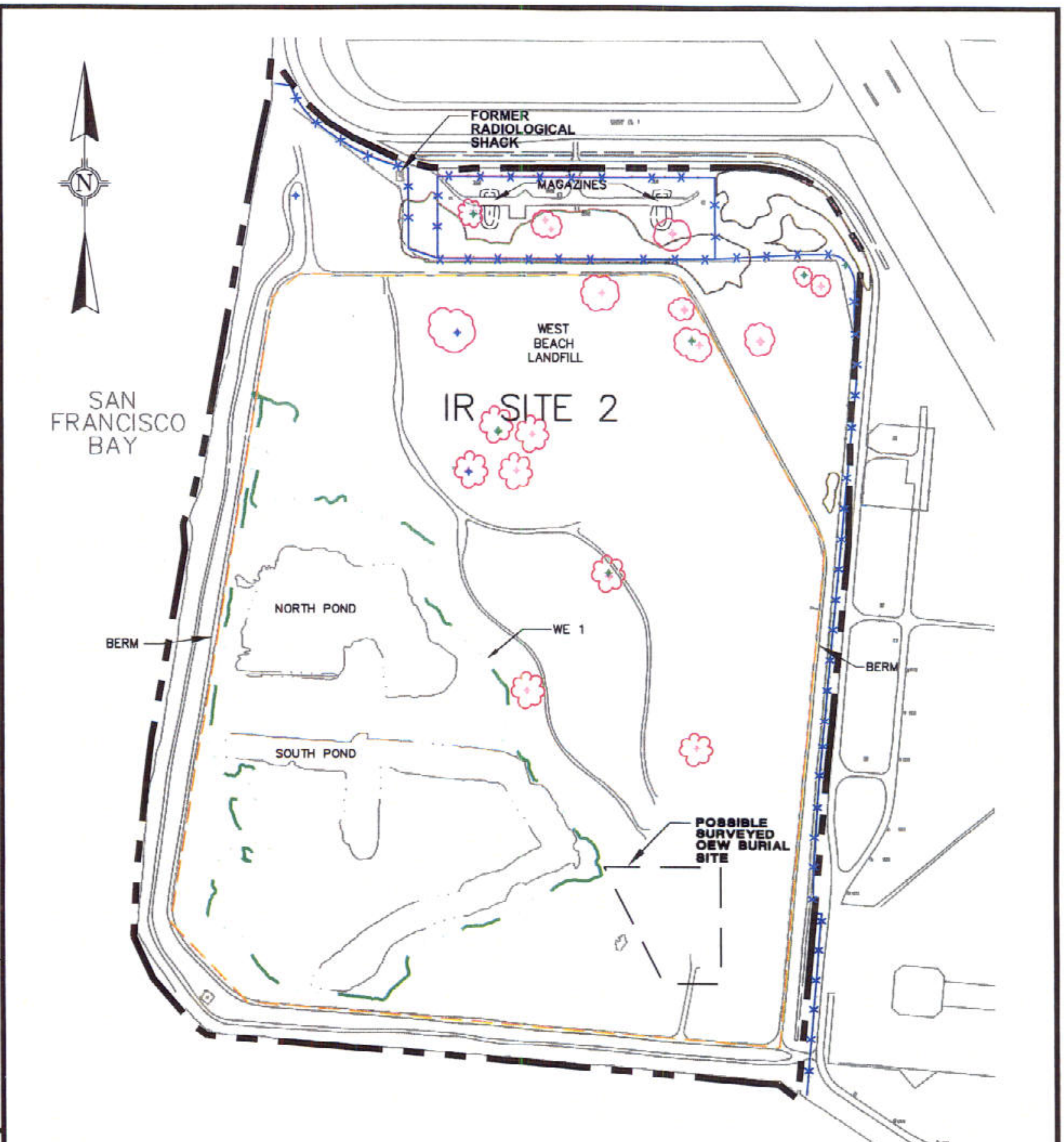
PLOT/UPDATE: DEC 15 2006 14:45:14



LEGEND

IR SITE 2 BOUNDARY
FENCE LINE
PERMANENT WETLAND BOUNDARY
BERM
WE WETLAND
OEW ORDINANCE AND EXPLOSIVE WASTE
POTENTIAL EXCAVATION AREA

NET CPM VALUES
4K–10K
10K–15K
15K–20K

500 250 0 500
SCALE IN FEET

Figure B.5–2
IR SITE 2
POTENTIAL EXCAVATION AREA

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 070232B52.DWG
DCN: ECSD-RAC-07-0232
CTO: #0015
APPROVED BY: AE
CHECKED BY: JA
REVISION: 0
DRAWN BY: MD
DATE: 01/31/07

P:\3210-RAC IV\CTO-0015\DWG\070232\070232B52.DWG
PLOT/UPDATE: DEC 15 2006 14:48:07

ATTACHMENT 1

FIELD FORMS

EQUIPMENT/INSTRUMENT CALIBRATION AND MAINTENANCE FORM

INSTRUMENT (NAME / MODEL NO. / SERIAL NO.): ______________________________

MANUFACTURER: ______________________________ DATE PURCHASED or LEASED: ____________________

CALIBRATION LOGSHEET

CALIBRATION DATE	INITIAL SETTINGS	STANDARD(S) USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS

MAINTENANCE LOGSHEET

MAINTENANCE DATE	REASON FOR MAINTENANCE	MAINTENANCE PERFORMED	SIGNATURE	COMMENTS

ATTACHMENT 2

EXAMPLE OF SAMPLE LABEL, CHAIN OF CUSTODY, AND CUSTODY SEAL

TETRA TECH
1230 Columbia Street, Suite 600
San Diego, CA 92101 (619) 234-8696

NUMBER 21700

CHAIN-OF-CUSTODY RECORD

PROJECT NAME	PURCHASE ORDER NO.	ANALYSES REQUIRED	LABORATORY NAME
PROJECT LOCATION	PROJECT NO.		
SAMPLER NAME	AIRBILL NUMBER		LABORATORY ID (FOR LABORATORY)
PROJECT CONTACT	PROJECT CONTACT PHONE NUMBER		

SAMPLE ID	DATE COLLECTED	TIME COLLECTED	NO. OF CONTAINER	LEVEL 3	LEVEL 4	TYPE	TAT										COMMENTS

Project Information Section
Do not submit to Laboratory

LOCATION	DEPTH START	DEPTH END	QC

RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)	LABORATORY INSTRUCTIONS/COMMENTS
COMPANY	TIME	COMPANY	
RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)	COMPOSITE DESCRIPTION
COMPANY	TIME	COMPANY	
RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)	SAMPLE CONDITION UPON RECEIPT (FOR LABORATORY) TEMPERATURE: ____ SAMPLE CONDITION: ☐ INTACT ☐ BROKEN
COMPANY	TIME	COMPANY	COOLER SEAL: ☐ INTACT ☐ BROKEN

SAMPLING COMMENT:

White - Laboratory; Pink - Laboratory; C[illegible] Project File; Manila - Data Management

SAMPLE LABEL (EXAMPLE)

SAMPLE NO.:____
PROJECT:____
DATE:_____/_____/_____ TIME:_______________HRS__________
MEDIUM: WATER_____ SOIL_____ SEDIMENT____________
OTHER________________________________(Specify)
TYPE: GRAB_____ COMPOSITE_____ OTHER______________
PRESERVATION:___________________________________
ANALYSIS:____
SAMPLED BY:____
REMARKS:____

CUSTODY SEAL (EXAMPLE)

CUSTODY SEAL

Person Collecting Sample:__________________________ Sample No.:______
(Signature)
Date Collected:______________ Time___________

APPENDIX C

SITE-SPECIFIC CONTRACTOR QUALITY CONTROL PLAN

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0015

APPENDIX C

FINAL

SITE-SPECIFIC CONTRACTOR QUALITY CONTROL PLAN

March 2, 2007

INSTALLATION RESTORATION SITES 1, 2, AND 32
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-07-0748

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, CA 92705-8536

Mary Schneider
Quality Control Program Manager

Abram S. Eloskof, M.Eng., M.Sc., CIH
Project Manager

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ABBREVIATIONS AND ACRONYMS

AHA	Activity Hazard Analysis
BRAC	Base Realignment and Closure
Cal-EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMT	Construction Management Technician
CQC	Contractor Quality Control
CQCR	Contractor Quality Control Report
CTO	Contract Task Order
DFW	definable feature of work
DON	Department of Navy
DTSC	Department of Toxic Substances
EPA	U.S. Environmental Protection Agency
FCR	Field Change Request
IPT-West	Integrated Project Team West
IR	Installation Restoration
MPPEH	material potentially presenting an explosive hazard
NAS	Naval Air Station
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NCR	Nonconformance Report
OSHA	Occupational Safety and Health Administration
PESM	Program Environmental Health and Safety Manager
PHP	Project Health Physicist
PjM	Project Manager
PMO	Program Management Office
PQCM	Project Quality Control Manager
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
QCM	Quality Control Program Manager
QP	Quality Program

ABBREVIATIONS AND ACRONYMS
(Continued)

RASO	Radiological Affairs Support Office
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SEC	Site Emergency Coordinator
SHSP	Site Health and Safety Plan
SHSS	Site Health and Safety Specialist
SOP	Standard Operating Procedure
SSA	Significant Subsurface Anomalies
SUXOS	Senior UXO Supervisor
TCRA	time-critical removal action
TtEC	Tetra Tech EC, Inc.
UFGS	Unified Facilities Guide Specification
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
Water Board	Regional Water Quality Control Board

REVISION PAGE

Section No.	Page No.	Modification	Approval Signature	Date

1.0 INTRODUCTION

The Site-specific Contractor Quality Control (CQC) Plan identifies the specific procedures and methods to be implemented for the time-critical removal action (TCRA) at Installation Restoration (IR) Sites 1, 2, and 32, located within Alameda Point, Alameda, California. This Site-specific Project CQC Plan for Contract Task Order (CTO) No. 0015 is an addendum to the Program Construction Quality Management Plan (Tetra Tech EC, Inc. [TtEC], 2006a).

This CQC Plan will provide an effective quality control (QC) system that will ensure the quality of work performed by TtEC and its subcontractor personnel. The purpose of this CQC Plan is to establish the specific procedures and methods for field inspections to be performed.

1.1 BACKGROUND

IR Sites 1 and 32 are located in the northwest corner of Alameda Point, while IR Site 2 is located in the southwest corner (Figure C.1-1). IR Site 1 operated between 1943 and 1956 as the former Naval Air Station (NAS) Alameda's main site for waste disposal. IR Site 2 was used as a disposal area for Alameda Point from approximately 1952 through 1978. An open space area in the eastern portion of IR Site 32 was used for equipment, vehicle, and aircraft storage.

The primary objective of the removal action at IR Sites 1, 2, and 32, as part of the Installation Restoration Program at Alameda Point, is to segregate material potentially presenting an explosive hazard (MPPEH) and radioactive point sources from non-hazardous, non-Resource Conservation and Recovery Act (RCRA) hazardous and RCRA hazardous soils and to dispose of the soil off site. The MPPEH and the radioactive point sources will be stored at approved locations; however, TtEC will not be responsible for the off-site transportation or disposal of these materials.

To achieve this objective, the scope of work of this TCRA consists of the following:

- MPPEH removal from soil during excavation of the Former Firing-range Berm, debris pits, disposal trench, and radiological hot spot areas; segregation and transport of material to an approved on-site storage location
- Removal of previously identified radiological anomalies and transport of material to an approved on-site storage location
- Soil sampling
- Transportation and disposal of RCRA, non-RCRA, and non-hazardous waste to an appropriate Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-approved disposal facility.
- Report generation

The TCRA work will be conducted in accordance with information presented in the Action Memorandum (TtEC, 2006b) and the TCRA Work Plan.

2.0 PROJECT ORGANIZATION, RESPONSIBILITY, AND POINTS OF CONTACT

This section describes the organization and authority of project personnel including subcontractors. The organizational structure, functional responsibilities, levels of authority, and lines of communication have been established within the organization to ensure high-quality work. The project organization chart showing the reporting lines for each individual is provided in Figure C.2-1. The responsibilities and authorities of the key personnel are described in the following paragraph.

The Naval Facilities Engineering Command, Southwest (NAVFAC SW) Remedial Project Manager (RPM) for this project is Mr. Andrew Baughman. Mr. Gregory Grace is the on-site Resident Officer in Charge of Construction (ROICC) responsible for the management, oversight of safety, and quality assurance (QA) of field activities.

2.1 REMEDIAL PROJECT MANAGER

The RPM, Mr. Andrew Baughman, has primary responsibility with the Department of Navy (DON) for day-to-day management of the project activities performed under this TCRA Work Plan and for its successful completion. The RPM's duties and authority include the following:

- Performing project management for the DON
- Ensuring that the project scope of work requirements are fulfilled
- Overseeing the project cost and schedule
- Providing formal technical direction to the TtEC project team, as needed

2.2 QUALITY ASSURANCE OFFICER

The Quality Assurance Officer (QAO), Mr. Narciso Ancog, is the DON representative with primary responsibility for ensuring that the contract-required QA measures are in place and effective for the work performed. The QAO's duties and authority include the following:

- Reviewing and approving Sampling and Analysis Plans
- Providing DON oversight of the TtEC QA Program
- Providing quality-related directives through the Contracting Officer
- Acting as point of contact for matters pertaining to generation and maintenance of quality of data
- Authorizing the suspension of project execution if QA requirements are not adequately followed

2.3 RESIDENT OFFICER IN CHARGE OF CONSTRUCTION

The ROICC, Mr. Gregory Grace, has the primary responsibility for providing on-site QA and safety oversight of contractors. The ROICC's duties and authority include the following:

- Verifying that all work has been completed per contract and technical specifications prior to final government acceptance
- Performing ongoing field inspection to verify that all work is in compliance with both contract and technical specifications
- Notifying the contractor of any work that is not in compliance
- Notifying the contractor of any work that is being performed in an unsafe manner
- Interacting with the contractor's Project Quality Control Manager (PQCM) on quality-related issues
- Reviewing and signing waste manifests as the generator's representative
- Reviewing Contractor Daily Reports for completeness and accuracy
- Attending preparatory phase, initial phase, pre-final, and final acceptance inspections
- Attending weekly QC meetings

2.4 PROJECT MANAGER

The Project Manager (PjM), Abram Eloskof, is responsible for the direction, execution, and successful completion of project tasks in order to achieve overall project goals. The PjM has responsibility for and the authority to direct all segments of the project including technical, construction, and administrative activities. Authorities and responsibilities include the following:

- Coordinating work activities of subcontractors and TtEC personnel and ensuring that all personnel adhere to the administrative and technical requirements of the project
- Monitoring and reporting the progress of work and ensuring that the project deliverables are completed on time and within project budget
- Monitoring the budget and schedule and notifying the client and the Program Manager of any changes that may require administration actions
- Ensuring adherence to the quality requirements of the contract, project scope of work, and the QC plans
- Ensuring that all work meets the requirements of the technical specifications and complies with applicable codes and regulations
- Ensuring that all work activities are conducted in a safe manner in accordance with the Site Health and Safety Plan (SHSP), Safety – Safety and Health Manual (EM-385-1-1; United States Army Corps of Engineers [USACE], 2003), and all applicable Occupational Safety and Health Administration (OSHA) regulations

- Serving as the primary contact between the DON and TtEC for actions and information related to the work and making sure to include appropriate TtEC lead and experts in decision-making
- Coordinating satisfactory resolution and completion of evaluation and acceptance for Nonconformance Reports (NCRs)

2.5 QUALITY CONTROL PROGRAM MANAGER

The Quality Control Program Manager (QCM), Ms. Mary Schneider, is responsible for the oversight of program QC, including field activities, and chemical/radiological data acquisition. The duties of the QCM include the following:

- Coordinating quality-related matters across all projects and resolving quality concerns
- Providing quality-related direction and training to the PQCM and others performing quality-related functions
- Having the authority to suspend project activities if quality standards are not maintained
- Interfacing with the DON including the Southwest Division Quality Assurance Officer on quality-related issues
- Performing reviews of audit and surveillance reports
- Implementing the DON technical directives relating to quality

2.6 SITE SUPERINTENDENT

The Site Superintendent reports to the PjM and is responsible for coordinating, directing, implementing, and supervising site construction activities. Specific duties of the Site Superintendent include the following:

- Implementing field activities in accordance with the TCRA Work Plan
- Directing support personnel and subcontractors
- Administering site access and communication
- Maintaining worksite, facilities, vehicles, and equipment
- Coordinating work activities of subcontractors and TtEC personnel and ensuring that all personnel adhere to the administrative and technical requirements of the project
- Coordinating and maintaining logistics of all components of on-site tasks, including all personnel and equipment
- Preparing status reports and estimating future scheduling needs
- Preparing daily Contractor Production Reports
- Monitoring and reporting the progress of field activities and ensuring that project deliverables are completed on time and within budget

- Ensuring that all work activities in the field are conducted in a safe manner in accordance with the SHSP

2.7 PROJECT QUALITY CONTROL MANAGER

The PQCM, Mr. Vince Richards, is responsible for overall management of project QC and reports to the QCM. Appointment letters and resumes of the assigned PQCM and his alternate, Bill Ogle, are provided in Attachments 1 and 2, respectively. The PQCM has the authority to stop work on site-related issues affecting the quality of the work performed and for directing the correction of all nonconforming work. The PQCM, will be on site at all times during field activities. The duties of the PQCM are the following:

- Provide and maintain an effective QC system for all site activities.
- Monitor QC activities to ensure conformance with authorized policies, procedures, contract specifications, required standards, sound practices, and methods of quality construction.
- Prepare the daily Contractor Quality Control Reports (CQCRs).
- Perform and coordinate the three phases of inspection (preparatory, initial, and follow-up) and making sure they are implemented for all definable features of work (DFWs).
- Be responsible for issuance and enforcement of NCRs.
- Ensure that all on-site and off-site inspections, testing, and sampling are performed in accordance with the plans, specifications, and applicable codes.
- Ensure that all required tests and inspections are performed and results documented.
- Conduct required QC meetings, including the coordination and mutual understanding meeting, site survey visit, and other scheduled meetings.
- Provide inspection and conduct or supervise testing and sampling.
- Coordinate and maintain submittal register, photograph log sheet, request for information, and NCR log.
- Review and maintain records of approved submittals, Design Change Notices for construction activities, and Field Change Requests (FCRs).
- Inspect material delivery handling and storage in accordance with technical specifications.
- Review and approve submittals and shop drawings and/or forward submittals as information only or for approval.
- Maintain testing and rework logs.
- Issue compliance notice on material, equipment, work-in-place, and workmanship.
- Issue and maintain NCR.
- Review project plans and procedures for quality issues.

- Identify the need for corrective action and initiating, recommending, and coordinating solutions for project quality problems.
- Perform submittal reviews and approvals/certifications.
- Direct the removal of work, material, and equipment that is not in compliance with plans and specifications.
- Recommend removal of any individual from the project who consistently fails to perform their duties properly.
- Immediately stop any segment of work that does not comply with the specifications and drawings.

2.8 PROJECT HEALTH PHYSICIST

The Project Health Physicist (PHP), Cliff Stephan, is responsible for implementing, directing, and supervising all radiological project-related activities. The PHP is responsible for the following:

- Assisting in the development of the SHSP and approving the plan
- Assisting in identifying project radiological analysis needs and provide technical support in subcontractor selection
- Providing health physics guidance on an as-needed basis
- Providing radiological control/protection technician services, if required
- Directing and assisting Radiological Control Technicians and project personnel in proper completion of radiological records
- Conducting required radiological safety training
- Reviewing and approving project field procedures that involve the handling of radioactive materials or access to radiological areas
- Ensuring timely and thorough review of records prior to approval
- Approving records with verifiable signature and date once records meet the quality standards
- Conducting radiation incident investigations
- Conducting radiological project inspections
- Conducting data assessment

2.9 SENIOR UXO SUPERVISOR

The Senior Unexploded Ordnance (UXO) Supervisor (SUXOS), Mr. Lance Humprey, will be responsible for implementing, directing, and supervising inspection and certification activities for any MPPEH encountered. The duties of the SUXOS include:

- Ensuring all fieldwork activities are performed in accordance with the TtEC Corporate engineering procedures, TCRA Work Plan, and applicable professional standards
- Conducting ordnance safety briefings
- Providing oversight of fieldwork activities performed by subcontractors
- Having overall responsibility and accountability for all MPPEH-handling activities
- Ensuring that MPPEH-related fieldwork activities are performed in accordance with the TtEC corporate procedures and applicable professional standards
- Acting as the Site Emergency Coordinator (SEC), a specific MPPEH-related function, if required
- Conducting other inspection/audit activities as directed by the PQCM
- Completing reports and other documentation as directed by the PQCM
- Monitoring MPPEH QC activities to ensure conformance with authorized policies, procedures, contract specifications, and sound practices
- Ensuring all required tests and inspections are performed and results are reported
- Attending required meetings, including the pre-construction conference, site survey visit, and other scheduled meetings, as required

2.10 SUBCONTRACTORS AND VENDORS

Qualified subcontractors may be selected to provide various construction services for this project. The subcontractor is required to provide labor, material, and equipment necessary to conduct construction activities as directed by the PjM. Subcontractors and vendors will be required to conform with TtEC's QA/QC Plan and the requirements of all approved procedures, technical specifications, and contract provisions.

The subcontractor's QC inspectors are responsible for field inspection of their construction and operating activities. TtEC personnel will monitor, oversee, and make on-site observations and inspections of work in progress to determine if the subcontractor's work is proceeding in accordance with the QA/QC Plan.

Subcontractor personnel are responsible for maintaining a daily log of the project activities they perform and for providing information needed to complete the Daily QC Report. All inspection records, including inspection reports, deficiency reports, and re-inspections of corrective actions will be documented.

2.11 POINTS OF CONTACTS

The following is a list of the key project, DON, and regulatory contacts:

Agency	Contact	Project Title
NAVFAC SW 1455 Frazee Road, Suite 900 San Diego, CA 92108-4310	Mr. Andrew Baughman (619) 532-0902 andrew.baughman@navy.mil	RPM
Bases Realignment and Closure (BRAC) Program Management Office (PMO) 1455 Frazee Road, Suite 900 San Diego, CA 92108-4310	Mr. Thomas Macchiarella (619) 532-0940 thomas.macchiarella@navy.mil	BRAC Environmental Coordinator
BRAC PMO CSO – San Francisco Bay Area 410 Palm Ave., Building 1, Suite 161 San Francisco, CA 94130-1806	Mr. Doug DeLong (415) 743-4713 (510) 772-8832 (cellular) douglas.delong@navy.mil	BRAC Environmental Compliance Manager
NAVFAC SW 1455 Frazee Road, Suite 900 San Diego, CA 92108-4310	Ms. Joyce Howell-Payne (619) 532-0923 joyce.howell-payne@navy.mil	Contract Specialist
NAVFAC SW 1220 Pacific Coast Highway San Diego, CA 92132	Mr. Narciso Ancog (619) 619-532-3046 narciso.ancog@navy.mil	QA Officer
NAVFAC SW 2450 Saratoga Street, Building 110, Suite 200 Alameda Point, Alameda, CA 94501-7545	Mr. Gregory Grace (510) 749-5940 gregory.grace@navy.mil	ROICC
NAVFAC SW 2450 Saratoga Street, Building 110, Suite 200 Alameda Point, Alameda, CA 94501-7545	Mr. Robert Perricone (510) 749-5942 robert.perricone@navy.mil	ROICC/Construction Management Technician
Radiological Affairs Support Office (RASO) Building 1971 NWS P.O. Box Drawer 260 Yorktown, VA 23691-0260	Mr. Matthew Slack (757) 887-4692 matthew.slack@navy.mil	RASO
U.S. Environmental Protection Agency (EPA) 75 Hawthorne Street (SFD-8-2) San Francisco, CA 94105-3901	Ms. Anna-Marie Cook (415) 972-3029 cook.anna-marie@epa.gov	EPA-RPM
Cal/EPA DTSC Office of Military Facilities 700 Heinz Avenue, Building F, Suite 200 Berkeley, CA 94710	Mr. Tom Lanphar (510) 540-3776 tlanphar@dtsc.ca.gov	Cal/EPA DTSC RPM
Water Board, San Francisco Region 1515 Clay Street, Suite 1400 Oakland, CA 94612	Mr. Erich Simon (510) 662-2355 ersimon@waterboards.ca.gov	Water Board RPM
United States Fish and Wildlife Service (USFWS) P.O. Box 159 Alameda, CA 94501-0559	Ms. Rachel Hurt (510) 377-8375 rachel_hurt@fws.gov	USFWS

Agency	Contact	Project Title
TtEC 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705-5718	Mr. Abram Eloskof (949) 756-7521 (714) 620-5530 (cellular) abram.eloskof@tteci.com	PjM
TtEC 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705-5718	Ms. Mary Schneider (949) 756-7586 mary.schneider@tteci.com	QC Program Manager
TtEC 1230 Columbia St., Suite 750 San Diego, CA 92101-8536	Mr. Lance Humphrey (619) 471-3519 (619) 988-5974 (cellular) lance.humphrey@tteci.com	UXO Supervisor
TtEC 1230 Columbia St., Suite 750 San Diego, CA 92101-8536	Mr. Roger Margotto (619) 471-3503 (714) 810-3742 (pager) roger.margotto@tteci.com	PESM
TtEC 3200 George Washington Way, Suite G Richland, WA 99352-3429	Mr. Cliff Stephan (509) 371-0140 (509) 430-4655 (cellular) cliff.stephan@tteci.com	PHP
TtEC 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705-5718	Mr. Nathan Mudry (949) 756-7509 (949) 230-7847 (cellular) nathan.mudry@tteci.com	Project Biologist
TtEC 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705-5718	Mr. Bob Wells (650) 280-0573 (cellular) bob.wells@tteci.com	Site Superintendent
TtEC 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705-5718	Mr. Vincent Richards (949) 756-7568 (949) 283-0589 (cellular) vincent.richards@tteci.com	PQCM
TtEC 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705-5718	Mr. Richard Quinn (415) 671-1990 (650) 450-1969 (cellular) richard.quinn@tteci.com	SHSS
TtEC 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705-5718	Mr. Nicholas Weinberger (949) 756-7588 nicholas.weinberger@tteci.com	Project Chemist

3.0 DEFINABLE FEATURES OF WORK

A DFW is defined as an activity or task that is separate and distinct from other activities and requires separate control activities. The DFW establishes the control measures required to verify both the quality of work performed and compliance with specified requirements, which include inspecting materials and workmanship before, during, and after each DFW. The following DFWs have been identified for the project and the required phases of controls are presented in Table C.3-1.

Pre-mobilization

- Preparatory Activities
- Environmental resources survey

Protection of Wildlife and Sensitive Habitat

- Biological monitoring
- Sensitive habitat protection

Mobilization and Construction Setup

- Mobilization/construction setup including installation of temporary fencing (if required), the site trailer, and mobilization of equipment and materials required for the removal action

Removal Action Earthwork of MPPEH Areas

- Vegetation clearance
- Field survey to establish site control
- Geophysical survey for Significant Subsurface Anomalies (SSA)
- Implementation of erosion control measures
- Screening and soil stockpile pad installation
- Excavation and screening for MPPEH and radiological anomalies
- Collection and on-site storage of MPEHH and radioactive point sources
- Post-excavation sampling
- Import backfill material and backfill excavations

Removal Action Earthwork of Radioactive Point Sources

- Excavation of previously identified hot spots except in proposed cap area within IR Site 1
- Collection and on-site storage of radioactive point sources

Off-Site Removal of Non-MPPEH or Radioactive Materials

- Waste characterization sampling
- Transportation and disposal of non-RCRA hazardous soil and non-hazardous soil and debris

Site Restoration

- Hydroseeding

Final Cleanup and Demobilization

- Demobilization

4.0 SUBMITTALS

This section describes the review and approval process of submittals. In addition, TtEC will institute and maintain a submittal register (Table C.4-1) to track submittals from issuance to approval. A list of required submittals will be developed at the initiation of project activities and revised as necessary. Submittals will be scheduled, reviewed, certified, and managed in accordance with the procedures defined in this section.

Standard Unified Facilities Guide Specification (UFGS) submittal titles are as follow:

- SD-01 Pre-construction Submittals
- SD–02 Shop Drawings
- SD-03 Product Data
- SD-04 Samples
- SD-05 Design Data
- SD-06 Test Reports
- SD-07 Certificate
- SD-08 Manufacturer's Instructions
- SD-09 Manufacturer's Field Reports
- SD-10 Operation and Maintenance Data
- SD-11 Closeout Submittals

The submittal descriptions are described in Section 1.1.2 of the UFGS 01330 (Naval Facilities Engineering Command [NAVFAC], 2006). The title list does not infer that they are all applicable to the DON's scope of work for this project.

4.1 REVIEW OF SUBMITTALS

Submittals will be reviewed to ensure completeness, accuracy, and contract compliance. Submittal of a certification will be inspected and approved by the PQCM for conformance to the project specifications or certification criteria. All items will be checked and approved by the PQCM or designated representative. Any submittals requiring modifications or changes will be returned to the originating organization for correction and then resubmitted for review and approval by the PQCM, or designee, prior to acceptance. Approved submittals will be stamped, signed, or initialed, and dated. During the preparatory phase of the QC inspections, the PQCM or designee will ensure that all materials and equipment have been tested and approved. No field activities will be performed without the required approval of applicable submittals.

4.2 SUBMITTAL PROCESS

Required submittals will be submitted to the DON and project personnel as determined by the distribution schedule. Each submittal will have a unique document control number. All possible attempts will be made to schedule submittals to allow for sufficient review and approval time. However, certain submittals will require accelerated processing to maintain the schedule.

A transmittal form will accompany each submittal. Each transmittal will be identified with:

- The contract and CTO number
- Name and address of the submitting organization
- Date of submittal
- Description of item being submitted, including reference to specification section (if applicable)
- Approval of submitting organization indicating conformance to the requirements

The PQCM will update the submittal log regularly.

4.3 REVIEW AND PROCESSING OF SUBMITTALS THAT DO NOT REQUIRE DON APPROVAL

Material submitted for review by the PQCM will indicate that it either conforms to established requirements or does not conform to established requirements. The PQCM will advise submitter of the results of the review. The submittal log will be updated to indicate status.

Conforming submittals will be transmitted to project and DON personnel as determined by the distribution schedule. All items sent to the DON will use a transmittal form that will indicate each item transmitted, the date reviewed by the PQCM, and its review status.

Nonconforming submittals will be returned to the submitter for correction, resolution of comments, and re-submittal.

4.4 REVIEW AND PROCESSING OF SUBMITTALS THAT REQUIRE DON APPROVAL

Material submitted for review by the PQCM will be signed to indicate that it conforms to requirements.

Submittals reviewed by the PQCM will then be transmitted to the DON in accordance with the project distribution schedule for review and approval. All items sent to the DON will use a transmittal form that will indicate each item transmitted, the date reviewed by the PQCM, and its review status. Upon completion of review, the ROICC will either return the transmittal form to the PQCM for further action, or accept the submittal as complete.

The PQCM will advise the submitter of the results of the review in writing and include any comments. The submittal log will be updated to indicate status.

Nonconforming submittals may be returned to the submitter for correction, resolution of comments, and re-submittal, if required.

4.5 REVISED SUBMITTALS

Revised submittals will be logged, reviewed, and processed in a manner identical with the initial submittal.

5.0 TESTING
(OTHER THAN CHEMICAL SAMPLING AND ANALYSIS)

The PQCM will verify the performance of all tests specified or required by the TCRA Work Plan to ensure that control measures are adequate to provide a product conforming to contract specifications. General requirements for testing procedures to be implemented for this project are included in the TCRA Work Plan. The type, number, and frequency of required tests are specified in the Testing Plan and Log (Table C.5-1). These tests include both operational and acceptance testing as appropriate.

5.1 DOCUMENTATION

All test results, both passing and failing, will be documented in the Daily Quality Control Report for the day the results are obtained. Paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. The actual test reports may be submitted later to the ROICC. An informational copy of tests performed by off-site facilities will be provided directly to the ROICC or designee.

5.2 LABORATORY SERVICES

An independent testing laboratory will provide laboratory services, as needed. The laboratory will be selected and qualified in accordance with recognized industry and applicable project requirements.

5.3 TESTING PLAN LOG

The Testing Plan Log (Table C.5-1) specifies all tests required by the project specifications and drawings. Testing will be conducted to verify that control measures are adequate to provide a product conforming to contract specifications. General requirements for testing procedures to be implemented for this project are included in the project specifications.

6.0 INSPECTION PLAN

This section discusses the DFWs for all field activities, including that of subcontractors and suppliers, the inspection process, and the required meetings to ensure compliance with the contract. The DFWs establish the measures required to verify both the quality of work performed and compliance with specified requirements, and include inspecting materials and workmanship before, during, and after each DFW. The DFWs for this project are identified in Section 3.0 and listed in Table C.3-1.

Project CQC includes implementing the following three control phases for all aspects of the work specified:

- Preparatory phase
- Initial phase
- Follow-up phase

6.1 COORDINATION AND MUTUAL UNDERSTANDING MEETING

Prior to start of site work, a coordination and mutual understanding meeting will be held to discuss the QC Program requirements. DON attendance will include the RPM, ROICC, the ROICC's Construction Management Technician (CMT) and the BRAC Environmental Compliance Manager. The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used, administration of on-site and off-site work, coordination of the field activities, production, and the PQCM duties with the ROICC. At a minimum, the TtEC personnel required to attend the meeting shall include the PjM, Site Superintendent, PQCM, SHSS, and the PHP. Minutes of the meeting shall be prepared by the PQCM and signed by the PjM and the DON's RPM and/or ROICC or designated representative. This meeting may be held in conjunction with the pre-construction meeting.

6.2 QC MEETINGS

After the start of field activities, the PQCM will conduct QC meetings at a frequency of once per week or as required by the ROICC. The meetings will be held at the project site and will be attended by the ROICC, ROICC CMT, Site Superintendent, SHSS, and the PQCM. The PQCM will notify the ROICC at least 48 hours in advance of each meeting. The following shall be accomplished at each meeting:

- Review the minutes of the previous meeting
- Review the schedule
  - Work or testing accomplished since last meeting

  - Rework items identified since last meeting
  - Rework items completed since last meeting
- Review the status of submittals
  - Submittals reviewed and approved since last meeting
  - Submittals required in the near future
- Review the work to be accomplished in the following 2 weeks and documentation required and schedule the three phases of control and testing
  - Establish completion date for rework items
  - Required preparatory phase inspections
  - Required initial phase inspections
  - Required follow-up phase inspections
  - Required testing
  - Status of off-site work or testing
  - Required documentation
- Resolve QC and production problems.
- Address items that may require revisions to the Project CQC Plan

6.3 PREPARATORY PHASE INSPECTION

The PQCM will conduct preparatory phase inspections prior to starting the DFWs listed in Table C.5-1. These inspections shall include the following:

- Review of the TCRA Work Plan, Standard Operating Procedures (SOPs), and drawings
- Ensuring that all required procurement for supplies and services are approved
- Ensuring that provisions have been made to provide required control inspection
- Ensuring that all personnel have the required trainings/certifications needed to perform the work
- An examination of the work area to ensure that all required preliminary work has been completed and is in compliance with the approved TCRA Work Plan requirements
- A physical examination of the required materials and equipment to ensure that they are properly delivered to the site, conform to specifications, and are properly stored
- A review of the appropriate Activity Hazard Analysis (AHA) to ensure that safety requirements are met
- A discussion of procedures for performing the work, including potential repetitive deficiencies

- Documentation of workmanship standards for the particular phase of work
- Ensuring that the Project CQC Plan for the work to be performed has been accepted by the DON

The PjM, DON RPM, and ROICC shall be notified at least 2 working days in advance of each preparatory phase activity. This phase shall include a meeting conducted by the PQCM and attended by the SS and any personnel involved in performing the DFW.

The issues discussed during the preparatory phase meetings will be documented on the Preparatory Inspection Checklist (Attachment 3). The PQCM will direct personnel performing work activities as to the acceptable level of workmanship required.

6.4 INITIAL PHASE INSPECTION

An initial inspection will be performed at the beginning of a DFW and will include the following:

- A check of preliminary work to ensure that it is in compliance with contract requirements
- A review of the Inspection Checklist documenting results of the preparatory meeting
- Verification of full contract compliance, including required control inspections
- Establishment of the required level of workmanship and verification to ensure that work meets minimum acceptable standards
- Resolution of all differences
- A check of safety requirements to include compliance with and upgrading of the SHSP and AHA
- A review of the AHA with project personnel

The PjM, DON RPM, and ROICC shall be notified at least 2 working days in advance of each initial phase activity. The PQCM will document initial inspections for each item using the Initial Inspection Checklist (Attachment 3) and attach it to the Daily CQC Report. The exact location of the initial phase inspection will be indicated for future reference and comparison with follow-up inspections.

An initial phase inspection will be conducted each time a new crew arrives on site or any time acceptable specified quality standards are not being met.

6.5 FOLLOW-UP PHASE INSPECTION

During the completion of a particular work feature, follow-up inspections will be conducted to ensure continued compliance with contract requirements. The frequency of the follow-up inspections will depend on the extent of the work being performed on each particular feature.

Each follow-up inspection will be documented on the Follow-up Inspection Checklist (Attachment 3), which will be attached to the Daily CQC Report. A final follow-up check will be conducted on any completed work phase prior to the commencement of a subsequent phase. Any deficiencies will be corrected prior to starting additional phases of work or will be identified on a list of items that do not conform to the specified requirements or are incomplete.

6.6 ADDITIONAL PREPARATORY AND INITIAL PHASES

The PQCM may conduct additional preparatory and initial inspections on the same DFWs under the following circumstances:

1. If the quality of ongoing work is unacceptable as determined by the PQCM, PjM, DON RPM, or ROICC
2. If there are substantial changes in the staff, on-site supervision, or work crew
3. If work on a DFW is resumed after a substantial period of inactivity
4. If other problems develop

6.7 COMPLETION INSPECTION

Completion inspections will be performed as summarized in this section.

6.7.1 Construction Quality Control Completion Inspections

The PQCM will conduct a detailed inspection prior to the pre-final inspection, when all of the work or an increment of work is deemed to be substantially complete. The work will be inspected for conformance to plans, specifications, quality, workmanship, and completeness. The PQCM will prepare an itemized list of work not properly completed, inferior workmanship, or work that does not conform to plans and specifications. The list will also include outstanding administrative items, such as record (as-built) drawings. The list will be included in the QC documentation and submitted to the PjM following the inspection and will specify an estimated date for correction of each deficiency. The completion inspection will be documented on the Completion Inspection Checklist (Attachment 3) and attached to the Daily CQC Report.

6.7.2 Pre-final Inspection

The PjM, or designee, will conduct the pre-final inspection. The DON RPM, ROICC, PQCM, and other primary management representative(s), as applicable, will attend. The PjM will schedule the pre-final inspection in response to notification from the PQCM prior to the planned inspection date. The PQCM is required to verify at this time that all specific items previously identified as being unacceptable, along with all remaining project work, will be complete and acceptable by the scheduled date for the pre-final inspection. At this inspection, the ROICC will develop a list of incomplete and/or unacceptable work performed under the contract and will provide this list to TtEC.

6.7.3 Final Acceptance Inspection

The PjM will schedule the final acceptance inspection based on notification from the PQCM of readiness. The DON RPM, Site Superintendent, ROICC, PQCM, and other primary management representative(s), as applicable, will attend. Notification will be provided prior to the planned final acceptance inspection date and must include verification that all specific items previously identified as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection.

6.8 INSPECTION DOCUMENTATION

The PQCM is responsible for the maintenance of the inspection records. Inspection records will be legible and clearly provide all necessary information to verify that the items or activities inspected conform to the specified requirements or, in the case of nonconforming conditions, provide evidence that the conditions were brought into conformance or otherwise accepted by the ROICC. All inspection records will be made available to the DON.

7.0 DOCUMENTATION

Preparation, review, approval, and issuance of documents affecting quality will be controlled to the extent necessary to determine that the documents meet specified requirements. Project documents, which may be controlled, include the following:

- Meeting minutes, conference notes, and confirmation notes
- Submittal Register
- Inspection documentation
- Contractor Production Report
- Daily CQC Report
- Material inspection and shipping logs
- NCRs
- NCR log
- FCRs
- Rework Items List
- Photograph log
- Field logbooks

7.1 DAILY CONTRACTOR QUALITY CONTROL REPORT

The PQCM is responsible for maintenance of current records of QC operation, activities, and tests performed, including the work of subcontractors and suppliers. The records will include factual evidence that required QC activities and tests were performed. The daily CQCR will be completed to document site activities covered by the Site-specific CQC Plan and will include:

- Records of inspection and /or testing performed
- Identification and location of each DFW and its current phase (preparatory, initial, follow-up) of completion
- Results of inspections/testing
- Location and description of deficiencies
- Deficiencies corrected as of the date of the report
- Rework items
- Deviations from plans, difficulties, and resolution
- Test and/or control activities performed with results and references to specifications/plan requirements, including the control phase (preparatory, initial, and follow-up) and deficiencies (along with corrective action)

- Material received, with statement as to its acceptability and storage
- Submittals reviewed with contract reference, by whom, and action taken
- Off-site surveillance activities, including actions taken

The records will indicate a description of both conforming and nonconforming features covered with a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The daily CQCR attached to the Contractor Production Report will be furnished to the ROICC on the first workday following the date covered by the report, except that report need not be submitted for days during which no work is performed. At a minimum, one report will be prepared and submitted for every 7 days of no work and on the last day of a no-work period. All calendar days will be accounted for throughout the life of the contract. The first report following a day of no work will summarize work for that day only. The report will be signed and dated by the PQCM and other appropriate personnel, including subcontractors responsible for completion of activities. The report will include copies of test reports. The report will be provided to the ROICC for review by 10:00 a.m. on the working day following the day the work was performed or as agreed to by the ROICC.

7.2 CONTRACTOR PRODUCTION REPORT

The Contractor Production Report will be prepared for each day the work is performed and will be attached to the daily CQCR prepared for the same day. The Contractor Production Report will be prepared, signed, and dated by the Site Superintendent and will contain the following information:

- Contractor and subcontractor and their area of responsibility
- Location and description of work performed
- Trades working on the project that day and number of personnel
- Operating equipment, with hours worked, idle, or down for repair
- Work performed that day giving location, description, weather conditions, and by whom work was done
- Any delays encountered
- Site visitors/purpose
- Job safety evaluations stating what was checked, results, and instructions or corrective actions
- A list of instructions given/received and conflicts in plans and/or specifications
- Contractor's verification statement

7.3 CONFERENCE NOTES AND CONFIRMATION NOTES

In addition to other required documentation, the PQCM is responsible for taking notes and preparing the reports of all conferences. Conference notes will be typed and the original report furnished to the DON within 5 days after the date of the conference for concurrence and subsequent distribution to all attendees. At a minimum, this report will include the following:

- Date and place the conference was held
- List of attendees, including name, organization, and telephone number
- Comments made during the conference and decisions affecting criteria changes
- Conference notes that augment the written comments

The PjM is also responsible for providing a record of all discussions, verbal directions, telephone conversations, and so forth in which TtEC personnel or their representatives participate on matters relating to this contract and work. These records, entitled "Confirmation Notices," will be numbered sequentially and will fully identify participating personnel, subject discussed, and any conclusions reached. The PjM, or his designee, will forward a reproducible copy of the confirmation notices to the DON RPM and ROICC within 5 working days.

8.0 NONCONFORMANCES

The PQCM documents any work or materials not conforming to the technical specifications, TCRA Work Plan or project/contract requirements on an NCR. The NCR will detail the nonconforming condition, the recommended corrective action(s), and the disposition of the corrective action(s). The NCR will remain open until the nonconforming condition has been satisfactorily resolved and verified by the PQCM. Upon receipt of notification of detected nonconformance, NCRs for each item will be completed.

8.1 IDENTIFICATION OF NONCONFORMING ITEMS

Items identified as nonconforming will be documented in accordance with the TtEC corporate Quality Program (QP)–11 procedure, Control of Nonconforming Conditions. Copies of completed NCRs will be sent to the ROICC.

8.1.1 Condition Requiring Stop Work

If corrective actions are insufficient, resolution cannot be reached, or results of prior work are indeterminate, work may be stopped. A Stop Work Order can only be issued by the PjM and the PQCM in writing. If there is a disagreement between the PQCM and the PjM, the difference will be brought to the attention of the QCM until resolution is achieved.

The conditions of the Stop Work Order will be described in detail on a Rework Items List in addition to the NCR to allow evaluation of the problem(s) and proper corrective action(s). Work will not continue until the Stop Work Order has been rescinded by the individual who authorized it.

8.2 NONCONFORMING ITEMS

The nonconforming items will be controlled to prevent inadvertent use. All items noted as nonconforming will be clearly identified and segregated from acceptable items when practical as described in the QP–11 procedure.

8.3 DISPOSITION

The disposition of NCRs will include the necessary actions required to bring the nonconforming condition to an acceptable condition and may include reworking, replacing, retesting, or reinspecting. Implementation of the disposition may be done in accordance with the original procedural requirements, a specific instruction, or an FCR.

8.3.1 Field Change Requests

Site personnel shall document changes to the approved plans in the field through the FCR form. At a minimum, the following information will be documented in the FCR form:

- Project name
- CTO number
- FCR number
- Documents to which a change is requested (including revision number if applicable)
- Description of the item or condition for which the change is requested
- Reason for the change
- Recommended disposition
- Cost and schedule implication of the change, if any
- Approval of disciplines
- Approval of the PjM, Site Superintendent, PQCM, Project Environmental and Safety Manager, and QCM

8.4 CORRECTIVE ACTIONS

On detection of a nonconforming condition, the PQCM will immediately take corrective action. The procedure for identification, analysis, and implementation of corrective action is described in the QP-12 procedure, Corrective Action.

9.0 QUALITY MANAGEMENT

In addition to the required QC field inspections, the TtEC QP requires a quality management overview of the site QA/QC Program implementation. The PQCM will perform regular internal QC checks on the site implementation of the QA/QC Program. Reports of any deficiencies will be reported to the PjM for corrective action.

Inspections will be performed and checked for the following:

- Conformance with TCRA Work Plan and associated plans
- Thoroughness of performance
- Identification and completeness of documentation generated during performance

10.0 REFERENCES

Naval Facilities Engineering Command (NAVFAC). 2006. *Unified Facilities Guide Specification (UFGS) 01330, Submittal Procedures*. April.

Tetra Tech EC, Inc. (TtEC). 2006a. *Draft Program Construction Quality Management Plan.* DCN: ECSD-RACIV-06-0025. January 13.

__________________. 2006b. *Pre-Draft Action Memorandum, Installation Restoration Sites 1, 2, and 32.* July17. DCN: ECSD-RACIV-06-0256.

United States Army Corps of Engineers (USACE). 2003. *Safety – Safety and Health Requirements*. EM-385-1-1. November 3.

TABLES

TABLE C.3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Pre-mobilization						
Preparatory Activities	• Notify ROICC. • Review project documents and verify that all meetings have been conducted and documented and that all notifications have been made. • Verify that photographs of the site are taken prior to any site work and submitted to ROICC. • Verify that all site personnel, including contractors, have submitted health and safety documentation. • Review traffic access and base security requirements as well as qualification review.		• Verify that all site conditions are properly documented. • Verify that project documents have been reviewed.		• Verify that traffic and security requirements are being followed.	
Environmental Resources Survey	• Review health and safety requirements • Verify that wildlife biologist has a Bachelor of Science in biology or related field and a minimum of two years of field experience in northern California ecology and biology and has received site-specific field training to be able to identify likely local species and to understand northern California wildlife behavior. • Verify that survey is conducted not more than 48 hours prior to the start of field activities. • Review site drawings.		• Verify that survey is conducted not more than 48 hours prior to the start of field activities. • Verify survey area.		• Verify that survey area is within the project activities areas. • Inspect field documentation.	
Protection of Wildlife and Sensitive Habitat						
Biological Monitoring	• Verify that wildlife biologist has a Bachelor of Science in biology or related field and a minimum of two years of field experience in northern California ecology and biology and has received site-specific field training to be able to identify likely local species and to understand northern California wildlife behavior. • Verify that biological monitors have received site-specific field training to be able to identify likely local species and to understand northern California wildlife behavior. • Verify that all personnel, including subcontractors, have been briefed of the biological resources associated with this project. • Verify that biological surveys are conducted prior to vegetation clearance and removal actions. • Review site drawings. • Review AHA(s) for this activity.		• Verify that potential habitat areas to be included in the removal-related activities have been field identified. • Verify that prior to mowing/pruning or removal activities, no sensitive/special-status species, nesting birds and so forth are present within the work area. • Verify minimum 1,000-foot distance setback between field-related construction activities and active California least tern nests. • Verify that appropriate distances are established between all known work areas and nests of any other bird species protected under the Migratory Bird Treaty Act, such as the Borrowing Owl, if observed on site. • Verify that prior to vegetation clearing or removal actions, access roads and under and around all equipment has been checked for wildlife species that could enter the work area after the initial biological survey. • Verify that no federally or state listed species are residing within the project work limits.		• Verify that heavy excavation work is being performed outside of the breeding season for the California least tern. Breeding season is from April through late August. • Verify minimum 1,000-foot distance setback between field-related construction activities and active California least tern nests. • Verify that biological surveys were conducted prior to vegetation clearance and removal actions. • Verify that prior to vegetation clearing or removal actions, access roads and under and around all equipment were checked for wildlife species that could enter the work area after the initial biological survey. • Verify that appropriate distances were established between all known work areas and nests of any other bird species protected under the Migratory Bird Treaty Act, such as the Borrowing Owl, when observed on site. • Verify that no federally or state listed species are residing within the project work limits.	
Sensitive Habitat Protection	• Verify that all personnel, including subcontractors, have been briefed on the potential sensitive habitats associated with this project. • Verify that all areas to be avoided are clearly marked on project maps provided to personnel, including subcontractors. • Review site drawings. • Review AHA(s) for this activity.		• Verify environmental sensitive area surveys are conducted in accordance with the TCRA Work Plan. • Verify that areas such as pickleweed are being monitored during site activities. • Verify BMPs are in place to control erosion and siltation. • Verify temporary access routes are flagged, delineated prior to initiation of site activities. • Verify biological monitor is on site during the start of mobilization activities to guide vehicles during site activities to avoid impacts to sensitive habitat features. • Verify that fueling of equipment is taking place on existing paved areas or identified laydown areas greater than 30 meters from sensitive habitat.		• Verify that sensitive locations at the site were delineated and work crews are aware of restricted areas. • Verify that areas such as pickleweed are being monitored during site activities. • Verify BMPs are in place to control erosion and siltation. • Verify temporary access routes are flagged, delineated. • Verify that fueling of equipment is taking place on existing paved areas or identified laydown areas greater than 30 meters from sensitive habitat. • Verify that staging is located in disturbed habitat or on paved areas. • Verify minimum 1,000-foot distance setback between field-related construction activities and active California least tern nests.	

TABLE C.3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
			• Verify that staging is located in disturbed habitat or on paved areas. • Verify minimum 1,000-foot distance setback between field-related construction activities and active California least tern nests. • Verify that appropriate distances are established between all known work areas and nests of any other bird species protected under the Migratory Bird Treaty Act, such as the Borrowing Owl, if observed on site.		• Verify that appropriate distances are established between all known work areas and nests of any other bird species protected under the Migratory Bird Treaty Act, such as the Borrowing Owl, if observed on site.	
Mobilization/Construction Setup						
Trailer installation, electrical hook-ups, temporary fence installations and mobilization of equipment and materials	• Verify that all pertinent documents are approved. • Verify that construction and excavation permit requirements are met prior to performing any intrusive work. • Review project documents and verify that all meetings have been conducted and documented and that all notifications have been made. • Verify that all site personnel including contractors have submitted health and safety documentation. • Review traffic access and base security requirements. • Verify that electrical work is conducted by a certified electrician. • Review site drawings and fence specification. • Review AHA(s) for this activity.		• Verify that materials and equipment delivered to the site are as identified in the Work Plan and SOW. • Verify that electrical work is conducted in accordance with the SHSP. • Verify that work zones, including decontamination areas, are being constructed and/or delineated in accordance with the TCRA Work Plan and SHSP. • Verify that stormwater management procedures are followed. • Verify that fence is installed as shown in the fence relocation drawing and in accordance with specification. • Verify that base traffic and security requirements are being followed.		• Verify that temporary facilities have been installed as per the TCRA Work Plan. • Verify compliance. • Review AHAs. • Review base security. • Inspect fence installation. • Verify that base traffic and security requirements are being followed.	
Removal Action of MPPEH Area						
Vegetation clearance	• Review work with ROICC and verify work area. • Confirm clear understanding of project plans and SOW. • Verify that safety checks on all heavy equipment, power and hand tools have been completed. • Verify that all equipment operators are certified to operate the equipment. • Review AHA(s) for this activity. • Verify personnel have attended radiological and MPPEH briefings.		• Verify that green waste and debris are being placed in the designated area. • Verify that grubbing activities are conducted per the TCRA Work Plan and SHSP. • Verify equipment operation and maintenance and safety condition.		• Inspect operation and ensure that all debris is removed from work area. • Verify that all debris is properly disposed. • Verify that BMPs are provided for disturbed areas of work.	
Field survey	• Verify that project documents have been reviewed and approved before start of work. • Verify that surveyor is licensed in California. • Verify proper base benchmark has been obtained. • Verify with the ROICC that site locations and off-site easements have been confirmed. • Review submittal requirements from contractors. • Review AHA(s) for this activity. • Verify personnel have attended radiological and MPPEH briefings.		• Verify that surveyor has the correct control point information. • Confirm that survey crew understands survey area and specific locations needing to be surveyed. • Verify that contractor conducts survey in accordance with approved TCRA Work Plan and contractor SOW.		• Verify that contractor has provided a copy of daily survey logbooks and listed control points used. • Verify that deliverables are received as required in SOW. • Verify that survey data and staking points are in accordance with the standard specified.	
Geophysical survey	• Verify that project documents have been reviewed and approved before start of work. • Verify with ROICC that all as-built utility drawings and locations have been identified. • Review TCRA Work Plan for limits of work and identified utilities. • Review AHA(s) for this activity. • Verify personnel have attended radiological and MPPEH briefings.		• Verify that contractor performs work as specified in the TCRA Work Plan. • Verify that utility location staking and marking are recorded.		• Verify that contractor has provided daily logs and listed materials used. • Verify that identified utilities are marked and noted on the drawings for as-built documentation.	

TABLE C.3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Screening and soil stockpile pad installation	• Notify ROICC. • Review specifications and requirements relevant to grading for liner installation. • Review specifications and requirements relevant to installation. • Review liner certification and submittal. • Inspect liner delivery. • Review specifications and requirements relevant to liner installation. • Review AHA(s) for this activity.		• Verify that the surface for the liner development is conducted in accordance with project documents. • Report deployment. • Verify that liner was testing in accordance with procedures.		• Verify that work has been performed in compliance with construction drawings and specifications. • Inspect liner testing data.	
Excavation and screening of MPPEH and low-level radiological material	• Verify that a site plan identifying sensitive areas has been prepared. • Verify that the SWPPP has been reviewed with ROICC. • Verify that material and equipment for erosion control meet requirements of SWMP. • Verify that equipment and products are appropriate for work and are stored on site. • Review work with ROICC and verify work area. • Verify that all workers have required health and safety documentation. • Review TCRA Work Plan. • Verify that materials and equipment delivered to the site are as identified in the TCRA Work Plan. • Verify that safety checks on all heavy equipment have been completed. • Verify that all equipment operators are certified to operate the equipment and completed MPPEH and radiological training. • Verify that dust control and erosion control measures are in place per the TCRA Work Plan. • Review AHA(s) for this activity		• Verify that SWMP BMPs are implemented. • Verify equipment maintenance and safety conditions. • Verify that excavation boundary is properly delineated. • Verify that excavation is conducted per MPPEH and radiological requirements provided in the TCRA Work Plan. • Verify that soil free of MPPEH and radioactive debris are segregated and placed in the proper stockpile area.		• Inspect field control BMPs. • Verify implementation of SWMP. • Verify that work area is protected from water run-on. • Verify that all MPPEH and radiological safety procedures are being followed. • Verify equipment maintenance and safety. • Verify correct excavation depth. • Verify that stockpile areas are maintained.	
Collection and on-site storage of MPPEH	• Verify that the proper storage containers are available. • Review AHA(s) for this activity. • Review the TCRA Work Plan and SOP (MPPEH Management).		• Verify that containers are managed per the TCRA Work Plan. • Verify proper labeling of containers.		• Inspect storage areas. • Verify that DON receives documents that indicated their control of materials.	
Post-excavation sampling	• Notify Alameda/ROICC. • Conduct activities in accordance with approved TCRA Work Plan and SAP. • Verify that appropriate containers and sampling equipment are available. • Review AHA(s) for this activity. • Verify that SAP has been approved by NAVFAC SW QAO. • Verify personnel have attended radiological and MPPEH briefings.		• Confirm that samples are being collected and will be analyzed in accordance with the SAP. • Verify sampling documentation is being done in accordance with SAP requirements. • Verify that appropriate containers and sample preservatives are used. • Verify proper handling and packaging of samples. • Verify equipment decontamination procedures are followed.		• Check that sampling documentation is in accordance with SAP requirements. • Conduct ongoing inspection of proper sampling and equipment decontamination techniques. • Verify laboratory received all collected samples. • Confirm receipt of analytical data.	
Import material and placement	• Verify that final grading complies with drawings. • Review work with ROICC and verify work area. • Verify that all confirmation sampling from excavated areas have been completed and meet the requirements of the TCRA Work Plan and SAP. • Verify import soil test results are acceptable. • Verify safety checks on all heavy equipment have been completed. • Verify that all equipment operators are certified to operate the equipment. • Review AHA(s) for this activity.		• Verify that backfill is placed in proper lifts and receive appropriate compaction efforts. • Verify drawings' optimal grades. • Verify that BMPs are in place. • Verify that proper water addition, if necessary for compaction, is being conducted.		• Inspect operation and verify that import soil materials meet gradation specifications. • Protect work area from water run-on. • Inspect BMPs. • Review as-built condition and document final inspection.	

TABLE C.3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Remedial Action Earthwork of Low-Level Radioactive Sources						
Excavation of "hotspots" identified during characterization survey	• Review work with ROICC and verify work area. • Verify that all workers have required health and safety documentation. • Review TCRA Work Plan. • Verify that materials and equipment delivered to the site are as identified in the TCRA Work Plan. • Verify safety checks on all heavy equipment have been completed. • Verify that all equipment operators are certified to operate the equipment and completed radiological and MPPEH training. • Verify that dust control and erosion control measures are in place per the TCRA Work Plan. • Review AHA(s) for this activity.		• Verify equipment maintenance and safety conditions. • Verify that excavation boundary is properly delineated. • Verify that excavation is conducted per the radiological plan. • Verify that excavated material is delivered to screening area. • Verify that materials free of radioactive debris are segregated and placed within the proper stockpile area.		• Verify all radiological safety procedures are being followed. • Inspect equipment condition. • Verify correct excavation depth. • Verify that stockpile areas are maintained. • Verify that radioactive debris is stored in proper containers and labeled.	
Collection and on-site storage of low-level radiological point sources	• Verify that the proper storage containers are available. • Review AHA(s) for this activity. • Review the TCRA Work Plan.		• Verify that containers are managed per the TCRA Work Plan. • Verify proper labeling of containers.		• Inspect storage areas. • Verify that DON receives documents that indicated their control of materials.	
Import material and placement	• Verify that final grading complies with drawings. • Review work with ROICC and verify work area. • Verify that all confirmation sampling from excavated areas have been completed and meet the requirements of the TCRA Work Plan and SAP. • Verify import soil test results are acceptable. • Verify safety checks on all heavy equipment have been completed. • Verify that all equipment operators are certified to operate the equipment. • Review AHA(s) for this activity.		• Verify that backfill is placed in proper lifts and receive appropriate compaction efforts. • Verify drawings' optimal grades. • Verify that BMPs are in place. • Verify that proper water addition, if necessary for compaction, is being conducted.		• Inspect operation and verify that import soil materials meet gradation specifications. • Protect work area from water run-on. • Inspect BMPs. • Review as-built condition and document final inspection.	
Off-Site Removal of Non-MPPEH or Radioactive Materials						
Waste characterization sampling	• Notify Alameda/ROICC. • Verify that appropriate containers and sampling equipment are available. • Review AHA(s) for this activity. • Review waste characterization requirements.		• Confirm that samples are being collected and will be analyzed in accordance with the SAP and disposal facility requirements. • Verify that appropriate containers and sample preservatives are used. • Verify proper handling and packaging of samples. • Verify equipment decontamination procedures. • Inspect documentation.		• Inspect documentation. • Conduct ongoing inspection of proper sampling and equipment decontamination techniques.	
Transportation and disposal of Non-RCRA soil and non-hazardous soil and debris.	• Review TCRA Work Plan. • Verify that waste profiles have been approved by disposal sites. • Verify that waste manifest has been approved and signed by DON representative. • Verify that all traffic or other (if any) permits from Alameda County have been obtained. • Verify that locations of disposal with the ROICC have been confirmed. • Review submittal load tickets process from contractors. • Review traffic pattern. • Review road closure and traffic plan with ROICC. • Review signage requirements with ROICC. • Review truck decontamination requirements. • Review AHA for this activity.		• Verify that contractor performs work as specified in the TCRA Work Plan and Transportation and Disposal Plan. • Review load ticket record procedures. • Verify that truck decontamination is being conducted in accordance with the TCRA Work Plan.		• Verify that contractor has provided delivery logs. • Verify that disposal loads are in accordance with the standard requirements of the TCRA Work Plan. • Verify that all load tickets are accounted for.	

TABLE C.3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Site Restoration						
Hydroseeding	• Verify that hydroseed complies with specifications. • Review work with ROICC and verify work area. • Review seed mix submittals from contractors. • Verify that samples of the seed mixture are collected. • Verify safety checks on all heavy equipment have been completed. • Verify that contractor has required health and safety documentation. • Verify that all equipment operators are certified to operate the equipment. • Review AHA(s) for this activity.		• Verify that hydroseed placement meets specifications. • Verify that BMPs are in place to protect the work area in accordance with the SWMP.		• Inspect operation.	
Final Cleanup and Demobilization						
Demobilization	• Verify that all project work has been performed in conformance with the TCRA Work Plan. • Perform walk-through with NAVFAC SW and ROICC personnel to confirm that all work has been completed. • Verify that personnel, equipment, and materials are available for demobilization work. • Review site plans for cleanup, waste handling, and extra material storage. • Review AHA(s) for this activity.		• Verify proper work performance. • Verify that decontamination procedures are being performed in accordance with the project documents. • Verify proper project documentation and records filing. • Perform pre-final site inspection to verify proper work performance.		• Verify that all work has been performed in conformance with project documents. • Verify that all documentation of this phase has been performed. • Verify proper submittal of final QC report and documentation storage. • Perform and document final site inspection.	

Notes:

AHA – Activity Hazard Analysis
BMP – Best Management Practice
DON – Department of the Navy
SHSP – Site Health and Safety Plan
MPPEH – material potentially presenting an explosive hazard
NAVFAC SW – Naval Facilities Engineering Command, Southwest
QAO
QC – quality control
RCRA – Resource Conservation and Recovery Act
ROICC – Resident Officer in Charge of Construction
SAP – Sampling and Analysis Plan
SOW – Scope of Work
SWMP – Stormwater Management Plan
TCRA – time-critical removal action

TABLE C.4-1

SUBMITTAL REGISTER

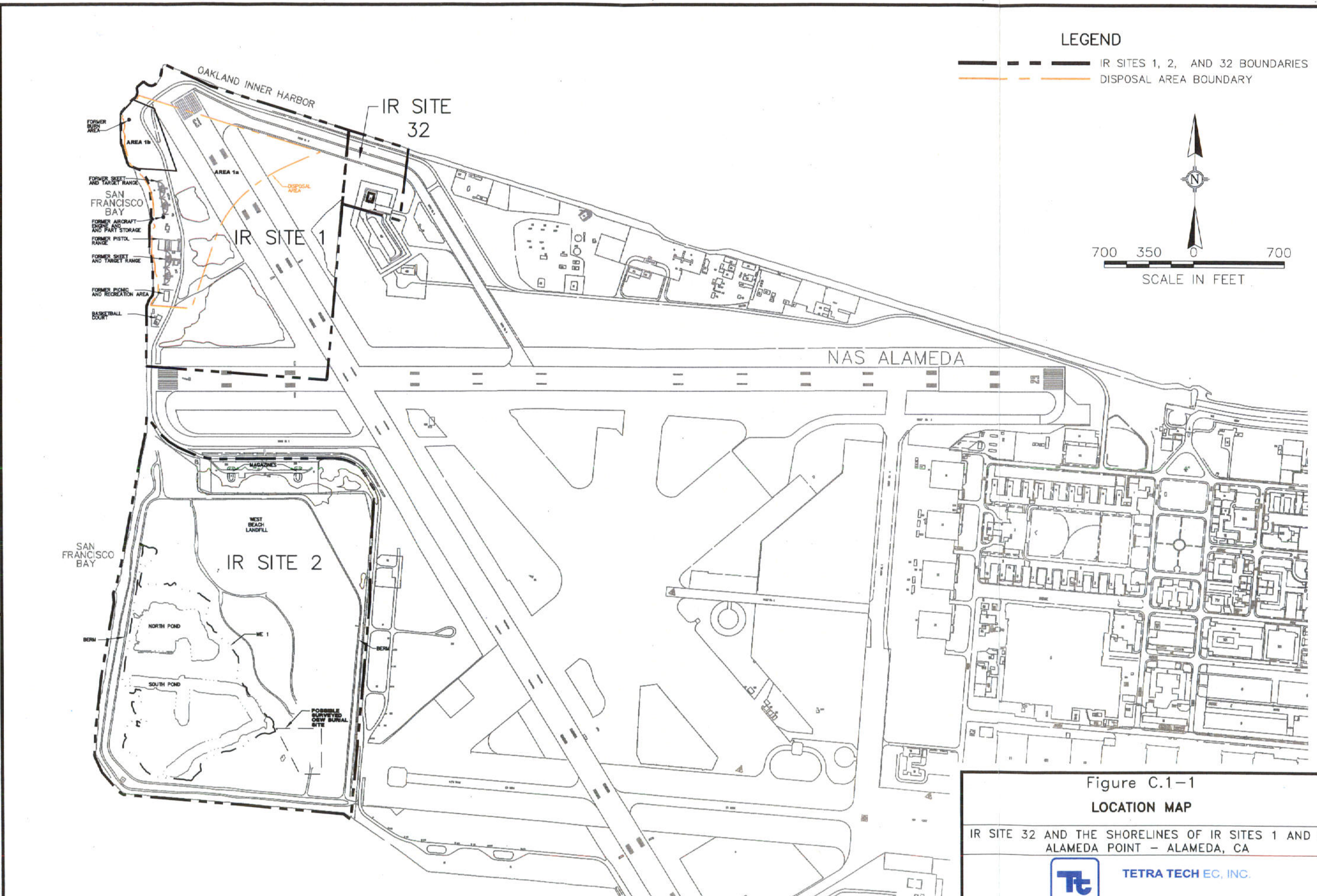
TITLE AND LOCATION: IR Sites 1, 2, and 32 Time-critical Removal Action Alameda Point, Alameda, CA						CONTRACTOR Tetra Tech EC, Inc.						CONTRACT NO. N62473-06-D-2201, CTO 0015				
					CONTRACTOR SCHEDULE DATES				CONTRACTOR ACTION			APPROVING AUTHORITY				
ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	CLASSIFICATION GOVT OR A/E REVWR	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(I)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(r)
			SD 01, PRE CONSTRUCTION SUBMITTAL													
			a. List of Contact Personnel		G											
			b. Construction Schedule		G											
			c. Submittal Register		G											
			d. Remedial Work Plan		G											
			e. Site Health and Safety Plan		G											
			f. Quality Control (QC) Plan		G											
			g. Environmental Condition Report and Site Restoration Plan		G											
			SD-03, Product Data													
			a. Liner material													
			SD-04, SAMPLES													
			a. Select import fill													
			SD-06, TEST REPORTS													
			a. Select import fill													
			SD-07, CERTIFICATES													
			a. Solid waste disposal manifests		G											
			b. Disposal permit/manifests for hazardous waste		G											
			a. Seed mix													
			SD-08, Manufacturers' Installation Instruction													
			a. Geosynthetic liner													
			SD-11, CLOSEOUT SUBMITTALS													
			a. Submittal Register		G											
			b. As-built drawings		G											
			e. As-built Field Summary Report		G											

TABLE C.5-1

TESTING PLAN AND LOG

CONTRACT NUMBER N62473-06-D-2201, CTO No. 0015			PROJECT TITLE AND LOCATION: Time-critical Removal Action for IR Sites 1, 2, and 32 at Alameda Point, Alameda							CONTRACTOR Tetra Tech EC, Inc.		
SPECIFICATION SECTION AND PARAGRAPH NUMBER	ITEM OF WORK	TEST REQUIRED	ACCREDITED/ APPROVED LAB		SAMPLED BY	TESTED BY	LOCATION OF TEST		FREQUENCY	DATE COMPLETED	DATE FORWARDED TO CONTR. OFF.	REMARKS
			YES	NO			ON SITE	OFF SITE				
		Select fill material – Laboratory test ASTM D 422							100 pounds per borrow source			

FIGURES



DRAWING NO: 07023212.DWG

DCN: ECSD-RAC-07-0232

CTO: #0015

APPROVED BY: AE

CHECKED BY: JA

REV: REVISION 0

DRAWN BY: MD

DATE: 01/31/07

P:\3210-RAC IV\CTO-0015\DWG\070232\07023212.DWG
PLOT/UPDATE: DEC 15 2006 14:12:34

Figure C.1-1

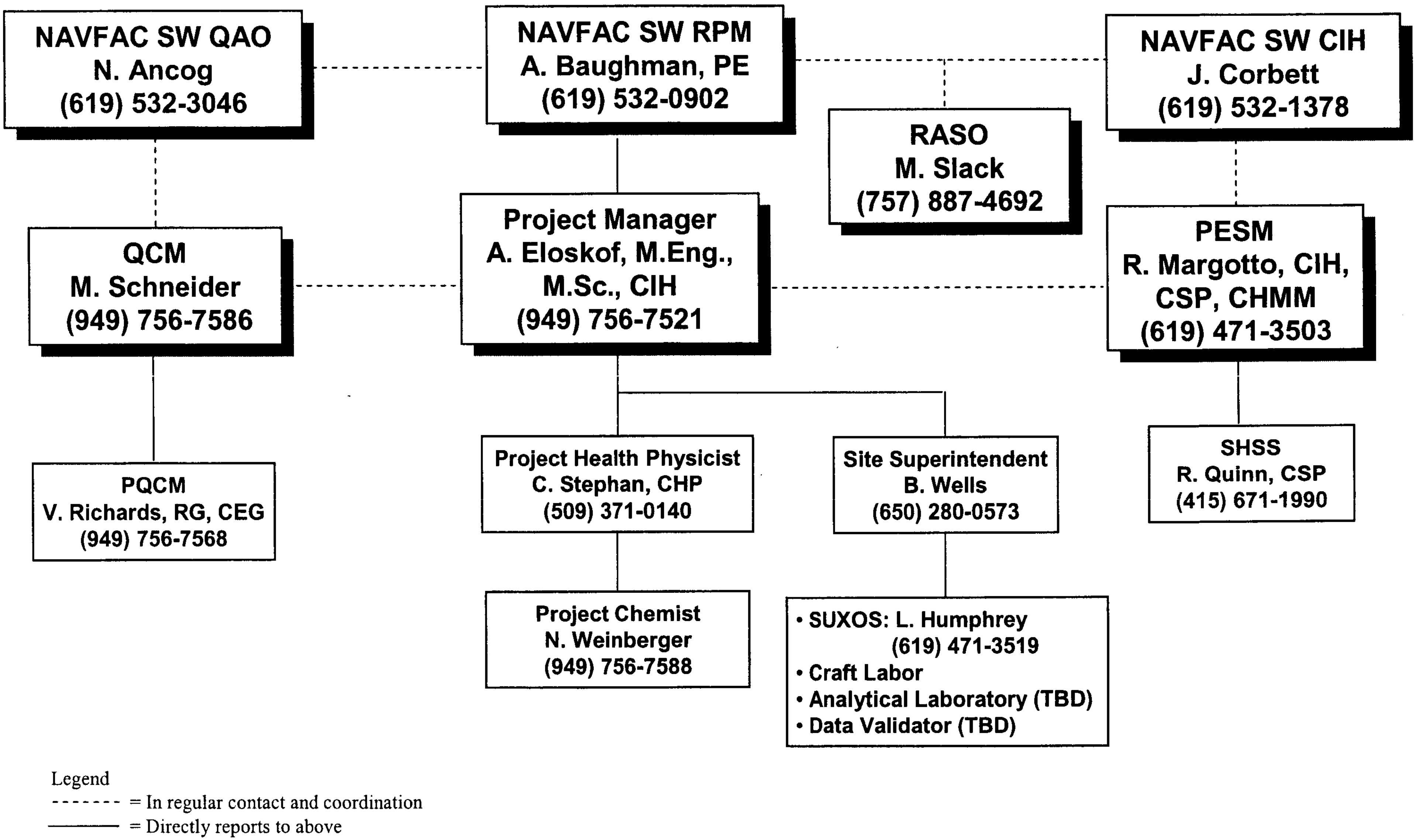
LOCATION MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

Figure C.2-1

Project Organization Chart



RACIV070232 Fig C.2-1

ATTACHMENT 1

DELEGATION OF AUTHORITY LETTERS

TETRA TECH EC, INC.

July 21, 2006

Mr. Vince Richards
Tetra Tech EC, Inc.
1940 E. Deere Street, Suite 200
Santa Ana, CA 92705

Subject: **Project Quality Control Manager**

Reference: Contract No. N62473-06-D-2201,
Environmental Remediation Contract, Contract Task Order (CTO) No. 0015,
Alameda Point, Alameda, California

Dear Mr. Richards:

In accordance with the terms of Tetra Tech EC, Inc. (TtEC) Contract No. N62473-06-D-2201, this letter notifies you of your appointment as the Project Quality Control Manager for CTO No. 0015 at the Alameda Point.

As the designated Project Quality Control Manager, you will be responsible for managing the site-specific quality control requirements in accordance with the approved plans. You will be responsible for conducting quality control meetings, performing the three phases of control, and performing submittal review. You will be required to be present during all field activities to ensure that any testing is conducted in accordance with approved plans. In addition, you will be required to prepare the necessary quality control certification and documentation.

You have the authority and responsibility for suspending work when conditions adverse to quality are identified and for directing the correction of all nonconforming work.

This letter is effective immediately until modified by the Quality Control Program Manager with concurrence of the TtEC Project Manager, the NAVFAC SW Remedial Project Manager, and the Resident Officer in Charge of Construction.

Sincerely,

Tetra Tech EC, Inc.
Mary Schneider
Mary Schneider
Quality Control Program Manager

cc: A. Eloskof, Project Manager

TETRA TECH EC, INC.

July 21, 2006

Mr. Bill Ogle
Tetra Tech EC, Inc.
Cummins Ave. (North of Building 45)
Moffett Field, CA 94035

Subject: **Alternate Project Quality Control Manager**

Reference: Contract No. N62473-06-D-2201,
Environmental Remediation Contract, Contract Task Order (CTO) No. 0015,
Alameda Point, Alameda, California

Dear Mr. Ogle:

In accordance with the terms of Tetra Tech EC, Inc. (TtEC) Contract No. N62473-06-D-2201, this letter notifies you of your appointment as the Alternate Project Quality Control Manager for CTO No. 0015 at the Alameda Point.

As the designated Project Quality Control Manager, you will be responsible for managing the site-specific quality control requirements in accordance with the approved plans. You will be responsible for conducting quality control meetings, performing the three phases of control, and performing submittal review. You will be required to be present during all field activities to ensure that any testing is conducted in accordance with approved plans. In addition, you will be required to prepare the necessary quality control certification and documentation.

You have the authority and responsibility for suspending work when conditions adverse to quality are identified and for directing the correction of all nonconforming work.

This letter is effective immediately until modified by the Quality Control Program Manager with concurrence of the TtEC Project Manager, the NAVFAC SW Remedial Project Manager, and the Resident Officer in Charge of Construction.

Sincerely,

Tetra Tech EC, Inc.
Mary Schneider
Mary Schneider
Quality Control Program Manager

cc: A. Eloskof, Project Manager

SGS

1230 Columbia Street, Suite 500, San Diego, CA 92101
Tel 619.234.8690 Fax 619.234.8591
www.tteci.com

ATTACHMENT 2

RESUMES

EXPERIENCE SUMMARY

Mr. Richards is a Certified Engineering Geologist registered in the State of California with over 25 years of experience in the geotechnical and environmental field. During the past 20 years, his work has been focused on the environmental and solid waste management fields. His duties have included managing remediation projects and specific tasks associated with landfill construction jobs, as well as conducting various geotechnical and groundwater environmental studies for both private and government agencies. Mr. Richards has participated in numerous drilling projects involving a variety of equipment and has experience with many water and soil sampling techniques. Mr. Richards field experience with large type construction projects has enabled him to perform and monitor quality control task associated with a wide variety of activities at these sites. Mr. Richards has also completed the Army Corp of Engineers quality assurance training. He has been responsible for preparing remedial investigation reports, remedial action and closure plans, detailed work plans, quality control and health and safety reports, permitting documents, and final closure reports for hazardous and non-hazardous facilities.

Currently, Mr. Richards serves in Iraq as an Environmental Safety and Quality (ESQ) Engineer on various open delivery orders for the Air Force Center for Environmental Excellence (AFCEE) ID/IQ contract. He is responsible for, conducting quality control and site health and safety duties, and performing other tasks associated with the reconstruction contract.

EDUCATION

BS, Geology, California State University, 1979

REGISTRATIONS/CERTIFICATIONS

Certified Engineering Geologist, CA, Number 1483, Earned 1/1/90, Expires 7/23/07
Professional Geologist, CA, Number 4627, Earned 1/1/89, Expires 7/23/07

TRAINING

OSHA Hazardous Waste 8-hour Refresher Training, 2005
DOT/HM-126F Hazardous Material Training, 2005
Environmental and Safety Supervisor Course, 2000
Project Management Training (PM-200), 2000
Waste Management Training, 2005
Loss Control Management Training, 1998
Project Management Training (PM-100), 1998
OSHA Hazardous Waste 40-hourTraining, 1988
Project Management Training (PM-300), 2002
U.S.A.C.E. Construction Quality Management for Contractors, 2002

CORPORATION PROJECT EXPERIENCE

ESQ Engineer
Air Force Center for Environmental Excellence (AFCEE) Contract, Various U.S. Military Facilities, Iraq
Responsible for conducting quality control and site health and safety duties associated with several reconstruction contracts in Iraq. Sites include the reconstruction of four Border Forts along the Syrian/Iraq border in the Ninawa and Al Anbar provinces and 11 medical clinics at multi-locations within Iraq.

Senior Project Geologist
U.S. Navy, Southwest Remedial Action Contract (SWDIVRAC), Various U.S. Navy Facilities, CA and NY.
Responsible for various open delivery orders including supervising drilling and excavation projects, soil and groundwater sampling, conducting quality control and site health and safety duties for contaminated soil removal and low-level radiation surveys, and performing other various task associated with remediation contracts. Sites include: Alameda Point, Moffett Field, Barstow MCLB, Yermo MCLB, Long Beach, Seal Beach California and Bethpage New York. Drilling experience include sonic, air-rotary, reverse and traditional mud-rotary, hollow-stem auger and direct-push technologies.

Senior Geologist
EPA Superfund Site, Operating Industries Inc. (OII) Landfill, CA
Primarily responsible for supervising and performing work activities associated with the installation of final landfill gas (LFG) collection system. Tasks included performing well and probe drilling and abandonment, installing gas headers and gas controls systems. These duties required constant quality control checks to assure that the proper materials were delivered and used in the system in addition to the proper operation of the system. System included 350 gas/leachate wells, 10 miles of gas headers, air blowers and landfill gas flaring equipment. Responsible for identifying, approving and coordinating the import of one million cubic yards of offsite soil used during capping activities at the site area. These duties required the supervision of the quality control activities that included geotechnical and chemical testing of the soil and placement. Provided additional quality control assistance with the installation of concrete drainage swales, road crossings for underground headers, above layout of gas header system and as-built survey work. Provided geologic logging and design support groundwater and leachate control during early work activities associated with the Final Remedy.

Site Engineer
City of Los Angeles, Lopez Canyon Landfill, Los Angeles, CA
Supervised construction of a low-permeability clay and synthetic liner for a 10-acre expansion at an existing landfill. Performed quality control activities associated with the benificiation of onsite soils with bentonite products to meet permeability requirements, and reviewing test data on quality control test for a synthetic liner.

Site Geologist
Los Angeles County Sanitation District, Puente Hills Landfill, Whittier, CA
Performed oversight activities associated with the construction of a 1000-foot long, 100-foot deep bentonite slurry trench with a clamshell bucket and 50-foot mast crane. Responsibilities included observation of the excavation, verifying bedrock contacts and reviewing quality control test on the slurry mixture.

Project Manager
Operable Unit No. 3, Jet Propulsion Laboratory, Pasadena, CA
Supervised the drilling, construction and sampling of five, 1000-feet deep, groundwater monitoring wells in a residential area. Responsible for the scheduling, coordination of drill and geology crews, quality control for well drilling and site control issues to assure safety of the residents. Supervised the installation of the WestBay sampling system in each well and assure proper operation.

Site Geologist
U.S. Air Force Air Combat Command, Kelly Air Force Base, San Antonio, TX
Supervised the installation of a groundwater monitoring and recovery well system.

Site Assessment Manager
Army Corps of Engineers, Davis-Monthan AFB, Tucson, AZ
Technical engineering lead for the construction of a 25-gpm activated carbon groundwater treatment plant. Facilitated the design of a mobile treatment system constructed on east coast and transported to site. Supervised construction and testing of a reinforced, bermed, concrete pad for the treatment module. Oversight responsibilities for the start-up of the system that included electrical testing, program logic and leak testing of the liquid piping and treatment vessels.

Assessment Manager
Department of the Navy, Concord Naval Weapons Station, Concord, CA
Supervised the stabilization and removal of approximately 1000 cy of heavy metal contaminated soils on base property.

Technical Engineer Lead, 1995 - 1997
Remediation Corporation, Southwest Division Remedial Action Contract (SWDIVRAC) OHM, El Toro Marine Corps. Base, Irvine, CA
Participated in completing open delivery orders in excess of 30 million dollars. Responsible for supervising a variety of remediation projects at the site including free-product recovery, UST removals, in situ remediation, groundwater treatment, groundwater monitoring and soil vapor recovery.

PREVIOUS EXPERIENCE

1991 - 1992
City of Los Angeles, Lopez Canyon Landfill, Los Angeles, CA
Supervised field studies and the regulatory agencies approval process associated with expanding the Lopez Canyon Landfill. Responsible for selecting a low-permeability soil liner and a state-of-the-art sidewall liner system.

1991 - 1992
Bryan A. Stirrat & Associates, Colton Landfill, San Bernardino County, California
Supervised construction of interim drainage facilities for stormwater discharge at the site. Quality control responsibilities included verification of survey control, and installation of designed construction materials including CMP and geosynthetic slope stability materials.

1991 - 1992
Orange County Steel Salvage Company, Anaheim, CA
Prepared the Treatability Study and Remedial Action Plan for chemical fixation of PCB-contaminated auto-shredder fluff.

1991 - 1992
Elixer Industries, Gardena, CA
Conducted a groundwater investigation on a shallow aquifer contaminated with paint manufacturing by-products and enhanced the existing free-product removal system.

Construction Manager, 1987 - 1991
Law Environmental, Azusa Land Reclamation Class III Landfill, Azusa, CA
The site activities involved a 17-acre expansion of an existing landfill. Expansion site required the excavation of approximately 100,000 cubic yards of construction debris, installation of a soil and geosynthetic liner and soil buffer layer. Responsibilities included review of all quality control documents regarding verification of bedrock, soil types, liner thickness, material testing of geosynthetic liner and liner repairs. Acted as direct liaison between the client and regulatory agencies for implementing all regulatory-approved specifications during the construction and coordinating field changes as required.

1987 - 1991
Law Environmental, Regional Water Quality Control Board, Southern California
Participated in investigations required by RWQCB permit conditions for numerous landfill operators at a wide variety of landfill sites. Tasks involved performing Solid Waste Assessment Test (SWAT) projects and preparing a variety of permit applications. Maintained constant interaction with regulatory personnel. Activities included field investigations, water and gas well drilling, soil and water sampling, vadose zone monitoring, and report preparation.

Site Geologist, 1984 - 1987
BKK Landfill Corporation, BKK Class I Landfill, West Covina, CA
Responsible for supervising groundwater and gas well drilling operations, providing survey control, and quality control duties related to documenting field activities. Prepared geotechnical information for preparation and implementation of the first approved Final Closure and Post-Closure Plans for a Class I Landfill in California. As a member of the site engineering team, negotiated on a regular basis with federal and state government regulators to implement state-of-the-art closure design.

Senior Environmental Specialist, 1991 - 1992
Participated in studies and the agency approval process associated with selecting and using low-permeability soil liners for the expansion area of the City of Los Angeles, Lopez Canyon Landfill. Supervised test pad construction and field-testing, utilized heavy earth-moving equipment and a large field permeability test apparatus called a Sealed Double-Ring Infiltrometer. Supervised the testing and agency approval process for an alternative side slope protection system for the liner installation, which involved the air application of a sand and cement mixture on 1:1 cut slopes in the proposed expansion area. Responsibilities also included preparing specifications and QA/QC procedures for the installation of soil, gunite and geosynthetic materials used in the composite liner system.
Supervised the construction of interim drainage facilities at the Colton Landfill, San Bernardino County, California. Responsible for the quality control of construction activities to ensure design specifications. Duties included directing survey work and coordinating engineers with the necessary design changes due to field conditions. Assisted in preparing the Treatability Study for the chemical fixation of PCB-contaminated auto-shredder fluff at the Orange County Steel Salvage Company in Anaheim, California. Also assisted in the Remedial Action Plan (RAP) for projects including the Gardena Valley Landfills 1 and 2 in Gardena, California, and the Orange County Steel Salvage in Orange, California. Conducted groundwater investigations, collected water and product level information, and formulated water contour and contamination plume maps at Elixer Industries in Gardena, California.

Senior Geologist, 1987 - 1991
Conducted SWAT studies including field investigations, water and gas well drilling, soil and water sampling, vadose zone monitoring, and preparation of a Final SWAT Report. Performed studies to identify any environmental hazards created from processes associated with the decomposition of refuse (creation of leachate and gas) for existing, closed, or abandoned solid waste sites. SWAT studies included Cal Mat's Inert Waste Facility in Sun Valley, California; Hewitt Sanitary Landfill (closed site) in North Hollywood, California; Penrose Sanitary Landfill (closed site) in Sun Valley, California; Tuxford Sanitary Landfill (closed site) in Sun Valley, California; Newberry Inert Landfill (closed site) in Sun Valley, California; Nu-Way Inert Landfill in Irwindale, California; Lopez Canyon Sanitary Landfill in Los Angeles, California; and Chandlers Palos Verdes Inert Landfill in Palos Verdes, California.

Participated in preparing a variety of permit applications including Revised Waste Discharge Reports, Solid Waste Facility Permits, and Report of Disposal and Site Information documents for projects including Azusa Land Reclamation Class II Landfill in Azusa, California; Nu-Way Industries in Owl

Rock Inert Landfill in Irwindale, California; and Cal Mat's Irwindale Inert Landfill in Irwindale, California.

Conducted Title 23, Chapter 15 groundwater monitoring and prepared quarterly and annual reports for sites including Azusa Land Reclamation Class III Landfill in Azusa, California; Nu-Way Industries Inert Landfill in Irwindale, California; Chandler Inert Landfill in Palos Verdes, California; and Orange County Steel Salvage.

Served as the former on-site manager for a 30-acre expansion of the Azusa Land Reclamation Class III Landfill in Azusa, California. Responsible for implementing all regulatory-approved specifications during the construction of a HDPE and clay liner and sidewall protection system. Prepared technical specifications on the liner system for regulatory agency approval and managed bid documents for construction work. Also conducted groundwater investigations for organic contamination. Duties included well installation, soil and water sampling, groundwater contouring and defining contamination plumes at several California locations.

Site Geologist, 1984 - 1987
BKK Class I Landfill, West Covina, California
Assisted engineers in developing a water and gas well monitoring system for the site. Supervised drilling operations, survey control, and activity documentation. Prepared geotechnical information for preparation and implementation of the Final Closure and Post-Closure Plans for the BKK Class I Landfill. Managed necessary geotechnical information required for permitting of the BKK Class III Landfill and prepared QA/QC procedures for the installation of low-permeability cover and liner systems that included in situ and test-pad permeability testing.

Geophysical Geologist, 1981 - 1984
Served as a Geologist for offshore investigations at platform and pipeline sites. Prepared detailed geologic hazard maps from seismic interpretation for the Exxon offshore facilities in Santa Barbara Channel and Shell Oil in the San Pedro Basin. Participated as a member of research crews in the Santa Barbara Channel collecting shallow seismic data information on geologic features of the ocean bottom.

Geologist, 1980 - 1981
MX Missile-Siting Project, Nevada and Utah
Conducted geologic field studies in the Nevada and Utah deserts to assist engineers in siting missile facilities. Interpreted aerial photographs, prepared surface soil maps, identified geologic hazards, and presented information in site-specific reports.

Student Engineer, 1978 - 1980
Edison, San Onofre Nuclear Generating Station, Units 2 and 3 (SONGS), Southern California
Staff member of a field geology group remediating soil stabilization problems. Supervised drilling crews, prepared geologic logs and supervised pressure grouting for soil stabilization.

DISCIPLINE CODES

Geologists: 011, Y

SKILL SET

GEOSCIENCES
Borings and Wells - Geotechnical Borings
Borings and Wells - Monitoring Well Installation
Borings and Wells - Recovery Well / Production Well Installation
Borings and Wells - Soil Classification / Logging
Geophysics – Borehole
Geophysics - Other
Hydraulics / Design - Extraction Well Design
Hydraulics / Design -

Injection Well Design
Hydraulics / Design - Interceptor Trenches / French Drains
Hydraulics / Design - Slurry Walls / Cut Off Trenches
Hydrogeology - Pump Test
Hydrogeology - Slug Test
Hydrogeology - Wellhead Protection
Manufacturing Facilities / Property Transfer
Marine Geology - Oceanography
Sampling - Groundwater
Sampling - Sediment
Sampling - Soil
Sampling - Water Level Measurements
Underground Storage Tanks / Refineries
CHEMICAL SCIENCES
Air Sampling and Analysis
Analytical Method Development
Chemical Warfare Agents
Enzyme Linked Immunoassay
Fate and Transport Analysis/Modeling
Feasibility Study
Field/Mobile Laboratory Oversight
Field QA Audits
Field Sampling and Analysis Plan
Field Screening
Gas Chromatography
Gas Chromatography/Mass Spectrometry
Geotechnical Sampling
Groundwater/Surface Water Sampling
Immunoassay
Inorganics
Laboratory QA Audits
Metals
Mixed Waste
Mobile Laboratories
Monitoring Programs (air,biota,soil,water)
National Pollution Discharge Elimination System
Nerve Agents
NORM Waste
Organics
PCBs
Pesticides
Process Monitoring
Proposal Lead
Project Manager
Quality Assurance
Quality Assurance Manager
Quality Assurance Officer
Quality Assurance Plan
Quality Control
Risk Assessment
Radionuclides
Remedial Action
Remedial Investigation/Feasibility Study
Scanning Electron Microscopy
Semivolatiles
Site Characterization
Soil Gas Analysis
Soil/Sediment Sampling
Task Leader
Transmission Electron Microscopy
Treatability Studies
Volatiles
Volatile Headspace Analysis
Waste Characterization
Wet Chemistry
Work Plan
X-Ray Fluorescence

TECHNICAL EXPERTISE

Mr. Richards has extensive experience performing remediation investigations, implementing remediation systems, and managing landfills including providing gas field services, construction support, and closure permitting.

PROFESSIONAL REFERENCES

Dr. Les LaFountain, New Cure Incorporated, 323-727-5576

RELATED COMPANY INFORMATION

Office Location: Santa Ana
Hire Date: 11/12/97
Years with Other Firms: 13
Years with Current Firm: 8
Supervisor: Phillip Bartley
Phone: (949) 756-7568
Fax: (949) 756-7560
E-mail Address: vincent.richards@tteci.com
Other E-mail Address (if any):
Resume Last Revised: 8/31/2005

Mr. George William Ogle
Supervisor, Craft Personnel

EXPERIENCE SUMMARY

Project Superintendent with well developed professional skills in facility construction, operations, repair/maintenance, mobilization, and demobilization, safety procedures, labor management, coordination and scheduling, budget formulation. Logistics, customer relations, and QA/QC sampling programs. Background includes the following highlights:

- Construction and operational management of a $3MM, experimental asphalt recycling facility utilizing indirect firing in the primary dryer and in the oxidizer.
- Operations Manager of a bioremediation/land farming project designed to clean light end hydrocarbons from soil. Seven acre facility.
- Erection and operational management of a $2MM, LTTD operation designed as semi-fixed facility. Later, was responsible for moving the plant to a remote location, re-erecting, and rewiring, for operation as a mobile plant.
- Participation in soil washing and fixation operations.
- Site selection, lease negotiation, and agency permitting of a fixed facility TDU in northern California.
- Permitting responsibility for establishing and operating the first "fixed facility" thermal desorption operation in the San Francisco Bay Area.

EDUCATION

BS, Biology/Geology/Geography, Shepherd College, 1968

TRAINING

40-Hour Hazwoper Training - 1994
Hazardous Site Supervisor Training - 1998
Confined Space - 1998
Basic Electricity - 1998
Bearings and Drives - 1999
First Aid/CPR - 2002
8-Hour Hazwoper update - 2003
Federal Contract Basics (FAR) - 2000
ESS Training - 2001
CQC School - 2001
Waste Management Training – 2003
Caterpillar Medium Wheel Loader Training -1999
CAL/OSHA Excavation/Trenching & Shoring – 1999

CORPORATION PROJECT EXPERIENCE

Site Superintendent, 2001 to Present
Initial responsibilities were confined to the operation and maintenance of two, pump-and-treat water systems (WATS and EATS, one, WATS is a State-of-the-Art system which includes hydrogen peroxide and ozone injection) at Moffett Field, CA. Currently, monitors and assists in overall on-site activity by Tetra tech FW. Responsibilities include site safety, direction of Moffett-based Tetra tech FW personnel, production and maintenance of the WATS system, EATS system (similar to WATS but lower output capabilities and carbon filtered only), two landfills, Navy-owned wells on the facility, and after-task maintenance of various locations throughout the base (WATS has undergone three major upgrades, one to add final step charcoal filtering to the water being treated another to delete the air stripper from the treatment train and enclose the system so that no fugitive contaminants would escape to the atmosphere,

and one to upgrade the ozone generation system), daily agency compliance, and customer relations. Also serves as point-of-contact and site liason for new projects until the field team is operational.

PREVIOUS EXPERIENCE

Site Superintendent, 1996-2001
Environmental Chemical Corporation
Began as a Loader Operator and progressed to Site Superintendent with first-line responsibility for overall plant operations of this IUMM, plus, protect. Responsible for site safety, personnel, production, maintenance (electrical and mechanical), agency compliance, customer relations, and budgetary management.

Plant Manager, 1995-1996
Ecopave, Inc.
Initial responsibilities were associated with the construction, erection, and assembly of an experimental asphalt recycling plant on a Greenfield Site. The plant consisted of two, indirect fired units, one for the drier and one for the oxidizer which was designed to destroy any hydrocarbon vapors produced in the recycling operation. After construction, I was responsible for all aspects of the day-to-day operations, including customer liaison and budgetary maintenance.

Operations Manager, 1993-1995
Remedial Environmental Marketing Company
Initially responsible for specification approval of a new, $2MM, Tarmac, LTTD plant. Was given the sole responsibility of erecting the plant and training personnel for operation. Then, was responsible for all aspects of the operation except sales.

Operations Manager, 1993
Nevada Hydrocarbon Inc., CA
After functioning as a consultant for several months, I accepted a position which was responsible for the site location, permitting, construction, and operation of a fixed facility soil remediation plant in the Sacramento, CA., area. A site was located, leased (along with a service contract to the site owner), and permitted for this operation.

Operations Manager, 1989-1992
Port Costa Materials
Three sites. Initially responsible for the operation of three remote plants, Port Costa, CA., Frazier Park, CA., and Olancha, CA. Developed operational budgets for these locations. Successfully initiated Prop. 65 compliance and safety programs designed to reduce abnormally high incidence of accidents. Negotiated a trade-off with State of California in order to construct a shipping dock on the Carquinez Strait. Maintained a viable operation while developing good community relations with neighboring municipalities, Permitted and operated the first fixed-base Thermal Desorption remediation facility in Northern California.

Production Manager, 1986-1989
Hawaiian Cement Company
Responsible for all aspects of the production of Portland Cement at the HCC, Ewa Beach. HI., facility. Developed and implemented a plan to increase plant operation time from 50% of the year to 100%. Trained personnel, including supervisors to meet budget set. The end result was more than twice the yearly output at a cost increase of approximately 20%. Recommissioned two cement mills, one at a remote location, to satisfy production requirements. Supervised 5 salaried and 28 hourly (union) personnel.

Various managerial positions within the cement industry, 1964-1986
Began as a Physical Tester in the laboratory and progressed, with three different companies, to Regional Plant Manager. Responsibilities included quarrying, milling, pyroprocessing, shipping, QA/QC, safety and health, maintenance, administration, and customer relations. Budgets have been as high as $12MM per year. I've been involved with the construction of a new, $94MM cement plant and was responsible for start-up of that plant.

PROFESSIONAL ACCOMPLISHMENTS

Bill Ogle and Duane Harrison (Moffet Field site) have received a STAR award as a result of their work at the Moffett Naval Air Field under the Navy SW Div RAC contract. Mary Parker, our Moffett project RPM and Rick Weissenborn, the Navy's Lead RPM, were extremely pleased with our preparation and presentation during the EPA 5-year review conducted by EPA's independent reviewer, Des Garner, on January 22, 2004. Specifically, Mary and Rick were very complimentary of the preparation by Bill Ogle and Duane Harrison, who have been working at Moffett since early 2000, and are performing O&M, optimization, and site management on the West-side Aquifers Treatment System (WATS) and the other sites at Moffett Field. They worked very hard to ensure that all the necessary documents were ready for review, and made copies of pertinent sections for Des. Des also stated to us and to the Navy that WATS was "a state of the art system" and that our maintenance, records, and the quality of our operations staff was "quite a contrast" to the other Regional Plume systems he had reviewed.

DISCIPLINE CODES

16 Construction Manager, Y

RELATED COMPANY INFORMATION

Payroll Number: 14943
Employment Status: Full
Preferred First Name: Bill
Office Location: San Diego
Hire Date: 1/22/01
Years with Other Firms: 33
Years with Current Firm: 4
Total Years Experience: 37
Supervisor:
Office Phone: (650) 564-9868
Cell Phone: (650) 450-2982
Fax: (650) 564-9870
E-mail Address: bogle@ttfwi.com
Other E-mail Address (if any):
Resume Last Revised: 12/15/2004

ATTACHMENT 3

FORMS

NONCONFORMANCE REPORT

	Report No.
Client or Project:	Drawing No./Spec. No.
Supplier, Construction QC or Contractor	P.O. No.
Description of Component, Part or System	

I. Description of Nonconformance *(Items involved, specification, code or standard to which items do not comply, submit sketch if applicable)*

Name and Signature of Person Reporting Nonconformance	Title/Company	Date

II. Recommended Disposition *(Submit sketch, if applicable)*

Name and Signature of Person Recommending Disposition	Title/Company	Date

III. Evaluation of Disposition by Foster Wheeler Environmental, Reason for Disposition

IV. Corrective Action ☐ Required ☐ Not Required

V. ☐ Engineering	☐ QA/QC	☐ Construction	☐ Other
Name *(Signature)*	Name *(Signature)*	Name *(Signature)*	Name *(Signature)*
Date	Date	Date	Date
☐ Accepted ☐ Rejected ☐ Accepted with Comments	☐ Accepted ☐ Rejected ☐ Accepted with Comments	☐ Accepted ☐ Rejected ☐ Accepted with Comments	☐ Accepted ☐ Rejected ☐ Accepted with Comments

VI. Verification of Disposition ☐ Required ☐ Not Required

By	Signature	Title	Date

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

REPORT NO

PHASE	CONTRACT NO. 0015	CONTRACT TITLE TCRA for IR Sites 1, 2 and 32, Alameda Point

PREPARATORY

WAS PREPARATORY PHASE WORK PREFORMED TODAY? YES ☐ NO ☐

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL PREPARATORY PHASE CHECKLIST.

Schedule Activity No.	Definable Feature of Work	Index #

INITIAL

WAS INITIAL PHASE WORK PREFORMED TODAY? YES ☐ NO ☐

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL INITIAL PHASE CHECKLIST.

Schedule Activity No.	Definable Feature of Work	Index #

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE? YES ☐ NO ☐

WORK COMPLIES WITH SAFETY REQUIREMENTS? YES ☐ NO ☐

Schedule Activity No.	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)

Schedule Activity No.	Description

REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

Schedule Activity No.	Description

REMARKS (Also Explain Any Follow-Up Phase Checklist Item From Above That Was Answered "NO"), Manuf. Rep On-Site, etc.

Schedule Activity No.	Description

On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

AUTHORIZED QC MANAGER AT SITE DATE

GOVERNMENT QUALITY ASSURANCE REPORT

DATE

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT

Schedule Activity No.	Description

GOVERNMENT QUALITY ASSURANCE MANAGER DATE

CONTRACTOR QUALITY CONTROL REPORT

(CONTINUATION SHEET)
(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

REPORT NO.

PHASE	CONTRACT NO. 0015	CONTRACT TITLE TCRA for IR Sites 1, 2 and 32, Alameda Point

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE? YES ☐ NO ☐

WORK COMPLIES WITH SAFETY REQUIREMENTS? YES ☐ NO ☐

Schedule Activity No.	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REMARKS (Also Explain Any Checklist Item From Above That Was Answered "NO"), Manuf. Rep. On-Site, etc.

Schedule Activity No.	Description

CONTRACTOR PRODUCTION REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

CONTRACT NO N62473-06-D-2201	TITLE AND LOCATION TCRA for IR Sites 1, 2 and 32, Alameda Point	DATE REPORT NO
CONTRACTOR Tetra Tech EC, Inc.	SUPERINTENDENT/ PQCM	

AM WEATHER	PM WEATHER	MAX TEMP (F)	MIN TEMP (F)

WORK PERFORMED TODAY

WORK LOCATION AND DESCRIPTION	EMPLOYER	NUMBER	TRADE	HRS

JOB SAFETY	WAS A JOB SAFETY MEETING HELD THIS DATE? (If YES attach copy of the meeting minutes)	☐ YES	☐ NO	TOTAL WORK HOURS ON JOB SITE, THIS DATE, INCL CON'T SHEETS	
	WERE THERE ANY LOST TIME ACCIDENTS THIS DATE? (If YES attach copy of completed OSHA report)	☐ YES	☐ NO	CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT	
WAS CRANE/MANLIFT/TRENCHING/SCAFFOLD/HV ELEC/HIGH WORK/ HAZMAT WORK DONE? (If YES attach statement or checklist showing inspection performed.)		☐ YES	☐ NO	TOTAL WORK HOURS FROM START OF CONSTRUCTION	
WAS HAZARDOUS MATERIAL/WASTE RELEASED INTO THE ENVIRONMENT? (If YES attach description of incident and proposed action.)		☐ YES	☐ NO		

LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED ☐ SAFETY REQUIREMENTS HAVE BEEN MET.

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB (INDICATE SCHEDULE ACTIVITY NUMBER)

Submittal #	Description of Equipment/Material Received

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INDICATE HOURS USED AND SCHEDULE ACTIVITY NUMBER.

Owner	*Description of Construction Equipment Used Today* (incl Make and Model)	Arrival	Off Rent Date	Actual Demob Date	Hours Idle	Hours Used	Reason for Idle

REMARKS

CONTRACTOR/SUPERINTENDENT DATE

PREPARATORY PHASE CHECKLIST

(CONTINUED ON SECOND PAGE)

CONTRACT NO N62473-06-D-2201	DEFINABLE FEATURE OF WORK	SPEC SECTION SCHEDULE ACT NO.	DATE INDEX #

PERSONNEL PRESENT

GOVERNMENT REP NOTIFIED _____ HOURS IN ADVANCE: YES ☐ NO ☐

NAME	POSITION	COMPANY/GOVERNMENT

SUBMITTALS

REVIEW SUBMITTALS AND/OR SUBMITTAL REGISTER. HAVE ALL SUBMITTALS BEEN APPROVED? YES ☐ NO ☐

IF NO, WHAT ITEMS HAVE NOT BEEN SUBMITTED? ____________

ARE ALL MATERIALS ON HAND? YES ☐ NO ☐

IF NO, WHAT ITEMS ARE MISSING? ____________

CHECK APPROVED SUBMITTALS AGAINST DELIVERED MATERIAL. (THIS SHOULD BE DONE AS MATERIAL ARRIVES.)

COMMENTS: ____________

MATERIAL STORAGE

ARE MATERIALS STORED PROPERLY? YES ☐ NO ☐

IF NO, WHAT ACTION IS TAKEN? ____________

SPECIFICATIONS

REVIEW EACH PARAGRAPH OF SPECIFICATIONS. ____________

DISCUSS PROCEDURE FOR ACCOMPLISHING THE WORK. ____________

CLARIFY ANY DIFFERENCES. ____________

PRELIMINARY WORK & PERMITS

ENSURE PRELIMINARY WORK IS CORRECT AND PERMITS ARE ON FILE.

IF NOT, WHAT ACTION IS TAKEN? ____________

TESTING	IDENTIFY TEST TO BE PERFORMED, FREQUENCY, AND BY WHOM.
	WHEN REQUIRED?
	WHERE REQUIRED?
	REVIEW TESTING PLAN.
	HAS TEST FACILITIES BEEN APPROVED?
SAFETY	ACTIVITY HAZARD ANALYSIS APPROVED? YES ☐ NO ☐ REVIEW APPLICABLE PORTION OF EM 385-1-1.
MEETING COMMENTS	NAVY/ROICC COMMENTS DURING MEETING.
OTHER ITEMS OR REMARKS	OTHER ITEMS OR REMARKS:

PQCM DATE

INITIAL PHASE CHECKLIST

		SPEC SECTION	DATE
CONTRACT NO N62473-06-D-2201	DEFINABLE FEATURE OF WORK	SCHEDULE ACT NO.	INDEX #

PERSONNEL PRESENT

GOVERNMENT REP NOTIFIED _____ HOURS IN ADVANCE: YES ☐ NO ☐

NAME	POSITION	COMPANY/GOVERNMENT

PROCEDURE COMPLIANCE

IDENTIFIY FULL COMPLIANCE WITH PROCEDURES IDENTIFIED AT PREPARATORY. COORDINATE PLANS, SPECIFICATIONS, AND SUBMITTALS.

COMMENTS: ______

PRELIMINARY WORK

ENSURE PRELIMINARY WORK IS COMPLETE AND CORRECT. IF NOT, WHAT ACTION IS TAKEN?

WORKMANSHIP

ESTABLISH LEVEL OF WORKMANSHIP.

WHERE IS WORK LOCATED? ______

IS SAMPLE PANEL REQUIRED? YES ☐ NO ☐

WILL THE INIITAL WORK BE CONSIDERED AS A SAMPLE? YES ☐ NO ☐

(IF YES, MAINTAIN IN PRESENT CONDITION AS LONG AS POSSIBLE AND DESCRIBE LOCATION OF SAMPLE) ______

RESOLUTION

RESOLVE ANY DIFFERENCES.

COMMENTS: ______

CHECK SAFETY

REVIEW JOB CONDITIONS USING EM 385-1-1 AND JOB HAZARD ANALYSIS

COMMENTS: ______

OTHER

OTHER ITEMS OR REMARKS

PQCM ______ DATE ______

COMPLETION INSPECTION CHECKLIST

Date	
Report No.	

Contract No.: N62473-06-D-2201, CTO No. 0015 | Contract Title: TCRA for IR Sites 1, 2 and 32, Alameda Point

Contract Specifications:

Major Definable Features of Work:

A. Open Punchlist Items From Follow-Up Phase Checklist:

	Item	Date of Completion
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

B. New Punchlist Items Noted:

	Item	Date of Completion
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

C. ROICC NOTIFIED? ☐ Yes ☐ No

On behalf of Tetra Tech EC, Inc., I certify this activity is completely in accordance with the Contract Documents, based upon the information available to me.

Project Quality Control Manager

NONCONFORMANCE REPORT LOG

PROJECT TITLE: TCRA at IR Sites 1, 2 and 32

PROJECT LOCATION: Alameda Point, Alameda, California

CONTRACTOR: Tetra Tech EC, Inc.

NCR NO.	HOLD TAG NO.	DESCRITION OF CONDITIONS/ ITEM AFFECTED	LOCATION	DATE					REMARKS
				VALIDATION	DISPOSITION/ APPROVAL	RE-INSPECTION	CLOSURE	HOLD TAG REMOVAL	

PHOTOGRAPH LOG SHEET

Date Submitted

Roll No.

Contract No.: N62473-06-D-2201, CTO No. 0015 | Contract Title: TCRA at IR Sites 1, 2 and 32, Alameda Point

Photographer:

Frame	Date	Time	Location/Grid No.	Description/Work No.	Notes
1.					
2.					
3.					
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34.					

REWORK ITEMS LIST

Contract No. and Title: N62473-06-D-2201, CTO 0015, TCRA at IR Sites 1, 2 and 32, Alameda Point

Contractor: Tetra Tech EC, Inc.

NUMBER	DATE IDENTIFIED	DESCRIPTION	CONTRACT REQUIREMENT (Spec. Section and Par. No., Drawing No. and Detail No., etc.)	ACTION TAKEN BY QC MANAGER	RESOLUTION	DATE COMPLETED

MATERIALS INSPECTION CHECKLIST

Date	
Report No.	

Contract No.: N62473-06-D-2201, CTO No. 0015	Contract Title: TCRA at IR Sites 1, 2 and 32

Contract Specifications:

Material	Qty	Condition	Testing	Comments

Storage Conditions:

Submittals:

MATERIALS INSPECTION CHECKLIST

Date	
Report No.	
Contract No.: N62473-06-D-2201, CTO No. 0015	Contract Title: TCRA at IR Sites 1, 2 and 32
Contract Specifications:	
Material/Equipment Certifications:	
Preparatory Site Conditions:	
Contract Variance:	
Comments:	

Attendees:	
	QC Representative Date
	PQCM Date

TETRA TECH FW, INC.

FIELD CHANGE REQUEST FORM

Contract No.	CTO No.	Field Change Request Form No.
N62473-06-D-2201	0015	FCRF-
Location		Date

RE: Drawing No. ______________________ Title ______________________

Specification Section ______________________ Title ______________________

Other ______________________

Description (items involved, submit sketch, if applicable)

Reason for Change

Recommended Disposition (submit sketch, if applicable)

TETRA TECH FW, INC.

FIELD CHANGE REQUEST FORM

Contract No.	CTO No.	Field Change Request Form No.
N62473-06-D-2201	0015	FCRF-

Additional Details

Will this change result in a contract cost or time change? ☐ Yes ☐ No

Estimate of contract cost or time charge (if any) ____________________

Preparer (signature)	Date	Preparer's Title	Site Superintendent/PQCM (Signature)	Date

Disposition

☐ Approved.

☐ Not approved (give reason). ____________________

TtEC Engineer (signature) (if engineering related)	Date	TtEC Project Manager (signature)	Date
☐ Comments (attached) ☐ No Comments		☐ Comments (attached) ☐ No Comments	
TtEC PESM (signature)	Date	TtEC Scientist (signature) (if science related)	Date
☐ Comments (attached) ☐ No Comments		☐ Comments (attached) ☐ No Comments	
TtEC QC Program Manager (signature)	Date		
☐ Comments (attached) ☐ No Comments			

Distribution: Original to Project File, Copy to Site File, Project Manager, DON RPM, DON ROICC, PQCM, QCM

APPENDIX D

STANDARD OPERATING PROCEDURES

APPENDIX D-1
STANDARD OPERATING PROCEDURE (SOP) 1
RADIATION AND CONTAMINATION SURVEYS

1.0 PURPOSE

The purpose of this procedure is to specify methods and requirements for radiological surveys and documentation of acquired data.

Adherence to this procedure will provide reasonable assurance that the surveys performed have reproducible results. This guidance for control of radiation exposures provided in this procedure is in accordance with the as low as reasonably achievable (ALARA) philosophy.

2.0 SCOPE

This procedure shall be implemented by Tetra Tech EC, Inc. (TtEC) staff and subcontractor personnel when conducting radiation or contamination surveys.

3.0 DEFINITIONS AND ABBREVIATIONS

Activity – The rate of disintegration (transformation) or decay of radioactive material. The units of activity for the purpose of this procedure are disintegrations per minute (dpm) for loose and fixed surface contamination, picocuries per gram (pCi/g) for soil, or microcuries per milliliter (μCi/mL) for airborne contamination.

Contamination – Deposition of radioactive material in any place is not desired. Contamination may be due to the presence of alpha particle, beta particle or gamma-ray-emitting radionuclides.

Controlled Area – Any area to which access is controlled in order to protect individuals from exposure to radiation and radioactive materials and/or to prevent the release of radioactive materials to the uncontrolled areas.

Exposure Rate – The amount of radiation (exposure) delivered at a given point per unit time. Typical units are microroentgen per hour (μR/hr).

Fixed Contamination – Radioactive contamination that is not readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe, or masslin.

Minimum Detectable Activity (MDA) – For purposes of this procedure, MDA for removable radioactive contamination is defined as the smallest amount of sample activity that will yield a net count with a 95 percent confidence level based upon the background count rate of the laboratory counting instrument used.

Minimum Detectable Concentration (MDC) – For purposes of this procedure, MDC is the *a priori* activity level that a specific instrument and technique can be expected to detect 95 percent of the time for portable survey instruments.

Removable Surface Contamination – Radioactive contamination that is readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe, or masslin.

Uncontrolled Area – An uncontrolled area is any area where access is not controlled for radiological purposes.

4.0 PROCEDURE DETAILS

4.1 General

Radiation surveys are performed to identify radiation areas, measure the exposure rate, and assess the intensity and shape of those areas to determine control requirements at the worksite.

Contamination surveys are conducted to detect loose surface contamination and fixed contamination. Loose surface contamination is normally detected indirectly by a swipe sample or wipe performed on the item or surface of interest. Fixed contamination levels are measured directly.

Survey results, locations, and any unusual conditions shall be documented and described on Attachments 1 and 2, Radiation/Contamination Survey Form and Radiation/Contamination Survey Supplement, respectively.

When performing surveys, express readings as the actual observed number. Do not report "<MDA" or "<Bkg". When background corrections are made, results may be expressed as negative numbers as applicable.

4.1.1 Discussion

Radiation and contamination surveys shall be performed on an as-needed basis. The need for performing a survey is identified by, but not limited to the following conditions:

- A condition exists where radiological data are needed.
- An investigation is required due to abnormal conditions or indications.
- An ongoing job requires a survey to update radiological postings.
- As required to support *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM; NUREG-1575) based survey activities.

4.1.2 Planning and Prerequisites

Instruments used to perform radiation and contamination surveys shall be operated in accordance with their operation procedure. Steps to be completed during the planning phase include the following:

- Obtain appropriate survey instruments and prepare the instruments for use.
- Obtain the necessary forms, swipes, and applicable protective clothing that will be used during the survey.

Prior to entering an area to perform a survey, each radiation detection instrument shall be:

- Battery checked.
- Checked for obvious physical damage.
- Quantitatively response-checked daily, prior to use.
- Checked to ensure that the instrument calibration is current.

If any of the above conditions are unsatisfactory, the instrument shall be tagged out of service and not used.

4.2 Procedure Process

4.2.1 Exposure Surveys

Always survey a sufficient number of locations to determine average and maximum general area and contact radiation levels.

A Ludlum Model-19 or equivalent should be used for performing exposure rate surveys for gamma radiation. The instrument should be operated in accordance with the manufacturer-supplied operations manual and any applicable requirements from work-specific documents. Care should be taken to ensure that the instrument has been allowed to stabilize between individual measurements.

When performing general area exposure rate surveys, the Radiological Control Technician (RCT) should:

- Attempt to determine the source of radiation fields.
- Record the highest level as the general area exposure rate.
- Perform contact exposure rate measurements with the detector within 1 inch of the surface to be surveyed.
- Perform surveys at approximately 1 meter (waist level) from surface to establish posting requirements for the area.
- Verify the exposure rates of known hot spots.

4.2.2 Removable Contamination Surveys

4.2.2.1 Removable Contamination Swipe

The following guidance shall be used unless an approved site-specific survey/work instruction directs otherwise.

4.2.2.2 Swipe Surveys

1. Label or number swipes, as necessary, to identify each swipe.
2. Wipe the swipes over approximately 100 square centimeters (cm^2) (16 square inches) of the surface to be sampled.
3. Apply moderate pressure.
4. Exercise care on rough surfaces so as not to tear the swipes.
5. Exercise care on wet surfaces so as not to degrade the swipes. Ensure that surfaces are not submerged in water and that cloth swipes or similar are used on wet/damp surfaces.

When surveying an area:

1. Obtain swipes from sample points, which are representative of the average and maximum contamination levels in the area, as identified during preliminary surveys. These areas could include:
    a. Areas of high traffic
    b. On and under benches or tables
    c. Beneath piping and components
    d. On accessible wall surfaces

e. On piping and significant components

f. Near drains, sumps and low spots

2. Swipe floor and component surfaces, which display evidence of (potentially) contaminated water leakage.

3. Ensure that contamination is not spread to clean areas when obtaining swipes.

When surveying equipment:

1. Obtain swipes on large surfaces.
2. Obtain swipes in cracks or crevices where contamination may have settled.
3. Obtain swipes on openings to internal surfaces.
4. Handle swipes in a manner that will prevent cross-contamination such as by placing each swipe in a separate envelope.

4.2.2.3 Counting Swipes

Low-background gas-proportional counters should be used whenever practical. Typically, a Protean IPC 9025 and/or a Tennelec Series 5 XLB gas-flow-proportional alpha/beta radiation counter will be employed to count swipes. As a backup to the gas-flow-proportional counters a Ludlum Model 2929 scaler with a Model 43-10-1 ZnS(Ag) scintillation probe (or equivalent) may be used.

1. Count the swipes in accordance with the operating procedure for the instrument.
2. Record swipe results in dpm/100 cm^2.
3. Store/archive used swipes as radioactive material until disposal is approved by the Radiological Affairs Support Office (RASO).

4.2.2.4 Removable Contamination Surveys Using Large-area Wipes (LAWs)

Large-area contamination surveys using LAWs are appropriate for monitoring the radiological cleanliness of non-contaminated areas or equipment, to track area decontamination progress, or for initially verifying that surfaces are free from contamination.

There are no specific requirements concerning the amount of area to be wiped when performing LAWs. The area wiped should be determined based on the use of the survey data and the dust loading of the LAW material.

4.2.2.5 Performing LAWs

Use masslin, oil-impregnated cloths, or equivalent media to perform LAWs. Select an appropriate collection material and method based upon the survey conditions such as wet surfaces, rough surfaces, heavily soiled area and oily and greasy surfaces.

1. Label or number the cloths, as necessary, to assist in determining the location of the sample.
2. Determine the size of the area to be sampled based on the results of the survey.
3. Wipe the collection media over the surface using moderate pressure by hand, with a masslin mop, or other approved techniques.

4.2.2.6 Evaluating LAWs

1. Allow wet swipe to dry prior to counting.
2. Scan the swipe with an appropriate field instrument (2360/43-89, or equivalent), in an area with a low background.
3. Hold the detector within ½ inch of the swipe and move the detector over the swipe at a maximum rate of 1 inch per second.
4. If any indication of an increased count rate is noted, pause to allow the meter reading to stabilize.
5. If the swipe reading is indistinguishable from background, consider the surveyed surface to be free from contamination. If the LAW reading is greater, conduct further surveys to isolate the boundaries of the contamination.
6. Dispose of used LAW media as radioactive waste.

4.2.3 Surveys for Fixed Alpha/Beta Contamination

Fixed contamination surveys are used to obtain indications of fixed contamination levels on surface areas, pieces of equipment, or tools for characterization and/or release surveys. Fixed contamination surveys are also performed to assess if residual contamination is present greater than the release criteria for the radionuclide(s) of concern.

A Ludlum Model-2360/43-68 or equivalent should be used for performing fixed contamination surveys for alpha and beta radiation.

4.2.3.1 Scans

1. When surveying for fixed alpha/beta contamination, the probe should be held within ¼ inch or less from the surface being surveyed. The movement rate of the detector probe should be 1 inch per second or slower.
2. When performing direct scan surveys of objects, surfaces, materials, equipment, etc., static measurements should be performed frequently to ensure the detection of residual activity.
3. Whenever practical, 100 percent of accessible areas being surveyed should be direct-scan surveyed, unless the applicable work planning document indicates otherwise.
4. Scan ranges are documented as the range from the lowest measurement to the highest measurement observed.

4.2.3.2 Static

1. Count time for conducting static measurements will be dependent upon the isotope of concern and the MDA for the instrument being used.
2. Static measurements should be performed as required by a work-specific document or frequently enough to ensure the detection of residual activity.
3. When taking a static measurement for fixed alpha/beta contamination, the probe should be held within ¼ inch or less from the surface being surveyed.
4. Results should be reported in units of net counts per minute (cpm) above background or dpm/100 cm^2.

The following formula should be used for converting direct probe readings in cpm to dpm/100 cm^2:

$$A_S = \frac{R_{S+B} - R_B}{\varepsilon_i \varepsilon_S \frac{W_A}{100\ cm^2}}$$

where,

A_S	= total surface activity (dpm/100 cm^2)
R_{S+B}	= the gross count rate of the measurement in cpm
R_B	= the background count rate in cpm
ε_i	= the instrument efficiency (counts per particle)
ε_s	= the contaminated surface efficiency (particles per disintegration)
W_A	= the physical area of the detector window (cm^2)

In the absence of experimentally determined surface efficiencies, ISO-7503-1 and NUREG-1507, provide conservative recommendations for surface efficiencies. ISO-7503-1, recommends a surface efficiency of 0.25 for alpha emitters. NUREG-1507 provides surface efficiencies based on studies performed primarily at Oak Ridge Institute for Science and Education. A surface efficiency of 0.25 will be used for alpha/beta emitters.

4.2.4 Gamma Surveys

A Ludlum Model-2350-1/44-10 or equivalent should be used for gamma radiation surveys.

A single detector or an array of detectors may be used to perform gamma scans.

4.2.4.1 Scans

1. Set the audio response switch to the "on" position.
2. If a single detector is used, traverse a path at a maximum speed of approximately 0.5 meters per second and slowly move the detector assembly in a serpentine (S-shaped) pattern, while maintaining the detector approximately 10 centimeters (cm) (4 inches) from the area being surveyed.
3. If a detector array is used, it will be pushed or pulled in a straight line with the detector centers positioned approximately 30 cm apart.
4. Scan ranges should be recorded from the lowest reading to the highest reading noted.
5. If data logging is being performed, the scan data will be collected at the time interval necessary to obtain the measurements required for the survey.
6. Locations of radiation levels greater than 3 standard deviations above background shall be marked and identified for further investigations.
7. Measurement results are recorded in cpm.

4.2.4.2 Static

1. Static photon measurements require positioning the detector assembly approximately 10 cm (4 inches) above the surface and completing a stationary 60-second survey.

2. Static measurements should be performed as required in the applicable work planning document or frequently enough to ensure the detection of residual activity.
3. Record results in cpm.

5.0 RECORDS

Radiation/Contamination Survey Form

Radiation/Contamination Survey Supplement

Survey Log

6.0 REFERENCES

Number	*Title*
NUREG-1575	*Multi-Agency Radiation Survey and Site Investigation Manual*

7.0 ATTACHMENTS

Forms provided in this section illustrate the minimum requirements for their respective subject matter. Alternative documents or electronic data logging may be used providing the information is presented in a clear and concise manner and the content meets or exceeds the information required to complete these documents.

Attachment 1, Radiation/Contamination Survey Form

Attachment 2, Radiation/Contamination Survey Supplement

Attachment 3, Survey Log

ATTACHMENT 1 – RADIATION/CONTAMINATION SURVEY FORM

DATE: TIME:	INSTRUMENTATION USED					
SURVEY NUMBER:	**Model Inst/Det.**	**Serial Number**	**Calibration Due Date**	**% Efficiency**	**MDC/MDA ($dpm/100cm^2$)**	**Background ($dpm/100cm^2$)**
LOCATION:						
SURVEYOR:						
REVIEWED BY:						
RSO/RTM:						

Isotopes of Concern:

Description or drawing:

Routine (Daily / Weekly / Monthly) ☐ Non-routine ☐

All radiation readings in $\mu r/hr$ unless otherwise noted.
(#)....denotes swipe location or fixed α/β readings.
#.......denotes G/A radiation readings.
#/#...denotes contact / 1 meter radiation readings.
*.........denotes highest radiation reading on contact.
Δ........denotes static location.

ATTACHMENT 2 - RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER:

SURVEYOR:	LOCATION:

Location	Exposure Rate (μR/hr)		Fixed + Removable			Removable		Comments
	Contact	1 Meter	Gamma (cpm)	Alpha dpm/probe	Beta/Gamma dpm/probe	Alpha $dpm/100cm^2$	Beta/Gamma $dpm/100cm^2$	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

Reviewer	Date/Time:	PHP	Date/Time:

ATTACHMENT 3 – SURVEY LOG

Survey Number			Date	Survey Description	Surveyor (Init.)
Project	#	Year			

Reviewed/Approved By: ______________________________ / ______________

RSO/RTM Date

APPENDIX D-2
STANDARD OPERATING PROCEDURE (SOP) 2
LASER-ASSISTED RANGING AND DATA SYSTEM
(VEHICLE- AND BACKPACK-BASED) PROCEDURES

1.0 PURPOSE AND SCOPE

1. This procedure provides guidance for a qualified Radiological Control Technician (RCT) to operate the Laser-assisted Ranging and Data System (LARADS) and the associated auto-tracking total station to perform vehicle- or backpack-based radiological surveys.

2.0 EQUIPMENT/MATERIALS

1. LARADS equipment

2. LARADS calibrated Eberline E-600 ratemeter or other appropriate instrument

3. Supplemental equipment (for example, flashlight depending upon lighting and working conditions in the survey area)

3.0 PROCEDURE FOR USING LARADS

1. Identify the area to be surveyed, at least two "benchmark" points with known state plane coordinates must be identified near or within the survey area.

2. Prepare the auto-tracking total station for operation.

   a. Erect the tripod at a height suitable for the operator and level so the tripod platen is perpendicular to the survey marker. The platen must be as level as possible and centered over the marker as closely as possible.

   b. Gently place the LARADS total station on the tripod platen, aligning the triangular-shaped base platen of the total station with the triangular top of the tripod platen. <u>Do not release the total station from your grip</u>. Insert and tighten the tripod platen screw mount to the bottom platen of the total station. Hand-tighten only. Do not over-tighten. The total station may now be released.

   c. Using the round bubble level on total station base, perform coarse leveling by adjusting the black thumb wheels on the total station tribrach.

   d. Using the optical plummet on the total station, locate the total station directly over the marker as follows:

      i. Focus the optical plummet as needed by using the outer ring on the eyepiece.

      ii. Center the total station by <u>slightly loosening</u> the tripod platen screw and, while grasping the total station tribrach, observe the survey marker. Gently slide the total station on the tripod platen (avoid horizontal rotation) to center the marker in the lens crosshairs. Re-tighten the tripod platen screw.

      iii. Depress the total station free-release button and rotate the unit head until it is aligned with two of the black thumb wheels. Observe the fine bubble level located above the keypad on the total station head. Adjust the aligned thumb wheels to fine-adjust the level of the unit in this orientation. When the unit is level in this orientation, press the free-release button and rotate the head 90 degrees to align the unit head over the opposite thumb wheel. Observe the bubble level in this orientation and adjust the single thumb wheel, as necessary.

iv. Repeat the process described in Steps ii. and iii. until the unit is fine-leveled in both orientations and the unit is aligned with the survey marker.

e. Connect the power and data leads to total station connections.

f. Carefully measure the height from the survey marker to the scope axis mark on the side of the total station. Note the height, rounding to the nearest 100th. Record this as the "Instrument Height" in the LARADS log to two decimal places (for example, "4.53").

g. Connect the other end of the power lead to total station battery. The battery may be placed within the tripod legs but not over the survey marker.

h. Connect the other end of data lead to "COM1/SERIAL 1" port of the system computer.

i. Depress the power button to turn the total station ON. Observe the total station and confirm that the APL-1 completes a vertical angle tilt-over self check on power-up. Pressing the number "9" on the keypad will turn on the display's back light.

j. Using the sights on total station, adjust the horizontal and vertical control knobs on the side of the total station to aim the total station at the prism positioned on the floor, a second benchmark point (prism on a range pole), or against the wall. Optics may be focused with the large outer ring on the eyepiece of the sights.

3. Prepare system for survey.

a. From the mode submenu, select "SETUP ON INITIAL POINT" then press the "ENTER/RETURN" key.

b. Select the State Plane Coordinate option then press the "ENTER/RETURN" key.

c. Enter the instrument height then press the "ENTER/RETURN" key.

d. Enter in the values for the occupied point for N (Northing) then press the "ENTER/RETURN" key.

e. Enter values for E (Easting) then press the "ENTER/RETURN" key.

<u>NOTE</u>: Enter the entire Northing and Easting values (for example, 156537.336, 6576219.325 and so forth).

f. The total station and computer are now ready for surveying. Proceed to step 5.

4. Operating the LARADS

   a. To perform the survey, the steps listed below should be followed.

   NOTE: Pressing "ESCAPE" at any time will pause the survey. Pressing "ESCAPE" a second time will act as a toggle to restart the survey.

      i. Position the detector with the attached prism at the survey area start point.

      ii. Using the horizontal and vertical control knobs on the LARADS total station, point the laser at the prism. At the system computer display, select "MODE" (if not already selected) then press the "ENTER/RETURN" key.

      iii. From the mode submenu select "AREA SWEEP SURVEY" then press the "ENTER/RETURN" key.

      NOTE: LARADS is now tracking detector and logging information.

5. Perform survey as per the survey plan and/or pre-job discussions.

   a. Begin the survey.

   b. When the survey is completed, press "ESCAPE." Press the "ENTER/RETURN" key at the "MODE" menu. From the mode submenu, select "END SESSION/PROCESS" then press the "ENTER/RETURN" key.

   NOTE: Pressing "ESCAPE," "M," then "E" is a shortcut to this step.

4.0 ATTACHMENTS

None.

APPENDIX D-3
STANDARD OPERATING PROCEDURE (SOP) 3
GAMMA SPECTROSCOPY SYSTEM

1.0 PURPOSE AND SCOPE

This procedure describes the setup, operation, and disassembly of the Gamma Spectroscopy System.

This procedure applies to personnel operating a Gamma Spectroscopy System to acquire spectral data from which reports and records are generated. Use of the system to provide information only is also performed according to this procedure and the instrument operating manual.

2.0 DEFINITIONS

Background Count – A spectrum collected while all samples or items of interest are absent from the detector's field of view. During background counts, the radiation detector responds to radiation from sources other than the samples or items to be measured. The energies and intensities of background radiation in a background count are assumed to be present during subsequent measurements of samples, items, or containers.

Calibrate – To determine, by measurement or comparison with a standard, the correct value of each scale reading of a meter or the correct value for each setting of a control knob or switch.

Calibration Reference – A radioactive standard with known activity and gamma-ray emission rates, which is used to determine if the instrument is working within prescribed limits.

Full Width at Half-Maximum – The width of a peak at half of the maximum peak height with the baseline removed.

Quality Control (QC) Count – An energy spectrum collected to quantitatively assess the response of the Gamma Spectroscopy System to known radiations emitted from a radiation check source.

Sample Count – An energy spectrum collected with the sample, item, or container of interest that is appropriately placed in the detector's field of view.

3.0 PROCEDURE

3.1 Precautions

Use the following precautions when operating the Gamma Spectroscopy System:

1. The protective plastic cap on the detector face is maintained in place, when possible, to protect the beryllium window and detector crystal.

2. Handle liquid nitrogen (LN) to fill detector dewar according to the steps described in this procedure.

3. Never exceed the voltage marked on the label on the detector crystal.

4. The full, or partially full, LN dewar should not be stored in small, enclosed areas. Off-gassing LN can displace oxygen in the atmosphere and make the space unsafe for human occupancy.

5. Cable connectors are easily damaged. Careful handling and storage of cables will prolong their usefulness.

6. When graphing results of daily QC checks on the QC chart (Attachment 1), take note of the space remaining on the chart. New charts should be made at least 1 week prior to completion of the chart in use.

3.2 Quality Control Checks

QC checks include the following:

1. QC check source(s) specified on QC data form (Attachment 2).

2. QC check source fixture, which holds check sources at a prescribed distance and position from the detector during QC counts.

3. QC check source with decay characteristics and activity sufficient to provide:

   a. For QC checks, multi-gamma source(s) with a minimum of two distinct gamma energies, including:

      i. One or more gamma energies between 10 and 500 kilovolts (keV).

      ii. One or more gamma energies between 500 and 1500 keV.

   b. For all sources, a gamma emission rate in each energy line of at least 200 gammas per second.

3.3 Setup Instructions

Follow the setup instructions below:

3.3.1 Verify LN Fill in Dewar

The full 7.0-liter dewar has an approximate holding time of 5 days. If the dewar is dry and the germanium crystal warm, fill the dewar using the following steps, and allow the crystal to cool completely before high voltage (HV) is applied. The 7.0-liter dewar requires a minimum of 4 hours to cool. If the remaining LN in the dewar is likely to run dry before the end of use for the day, fill according to the following steps:

1. Don the appropriate personal protective equipment (PPE) (gloves, safety glasses).

2. Place the dewar in the horizontal position.

3. Remove fill port vent cover, and connect the free end of the LN transfer line over either one of the fill port tubes.

4. Open LN source fill valve and fill dewar until LN begins to run freely out of the open port tube.

5. Close fill valve and disconnect transfer tube.

6. Replace the vent cover.

7. Record time and date of fill in the equipment operating form (Attachment 3).

3.3.2 Assemble Inspector System

1. If AC power is not available, plug a battery into one or both the "A" and "B" battery connectors on the rear of the inspector.

2. Connect system cables from detector to inspector in the following order:

   a. Connect the large rectangular connector to the inspector's preamp connector.

   b. Connect the barrel-shaped Shield High Voltage (SHV) connector to inspector's HV connector.

   c. Connect the rectangular connector to the detector preamp's 9-pin power connector.

   d. Connect the cable's green INHIBIT connector to the detector preamp's HV INHIBIT connector and the inspector's HV INHIBIT connector.

   e. Place the protective sleeve over the green connector (optional).

   f. Connect the red energy connector to the detector preamp energy output connector and the inspector's energy input plug.

   g. Connect the cable's SHV connector to the detector preamp's SHV connector.

3.3.3 Power Up the System

1. If batteries are used for power, and they have already been connected per 3.3.2.1, proceed directly to step 3.3.3.3.

2. Connect inspector system components to AC power supply in the following order:

   a. Connect DC power adapter onto the "A" battery connector on the inspector.

   b. Connect battery DC power adapter into the Sony power adapter.

   c. Plug Sony power adapter into a 110-volt (V) AC power source.

   d. Plug computer AC power adapter into a 110-V AC power source.

   e. Plug computer AC power adapter into power receptacle on computer.

3. Verify that the status light on the computer is illuminated.

   a. If status light fails to illuminate, check all connections and power supplies and recheck light.

   b. If status light remains unlit, contact supervisor for assistance.

4. Power up inspector and computer in the following order:

   a. Press the inspector power switch ***ON***.

b. Check the battery indicator lights on the front of the inspector and proceed accordingly:

   i. If battery indicator lights are *steady green* or *blinking green*, you have adequate power.

   ii. If battery indicator lights are *blinking red* or *steady red*, battery charge is very low. Operator should power down system and recharge batteries before further use.

   iii. If battery indicator lights are off, both batteries are completely discharged, or no battery is connected to this port, or the inspector power switch is ***OFF***. Recharge and/or reconnect batteries, or press power switch ***ON***.

c. Turn on computer and start the acquisition software.

d. Verify the green LED on the detector next to "COLD" is illuminated. If LED is not lit, verify the LN level in the dewar and perform one of the following:

   i. If the dewar is out of LN, fill according to step 3.3.1 and wait for detector to cool completely.

   ii. If the dewar has adequate LN, check the equipment operating form (Attachment 3) to determine if the detector has had the minimum amount of time to cool. If the detector has had adequate time to cool, the detector may be broken or a cable connection may be loose. Verify that all connections are tight. If the problem persists, then contact the supervisor for assistance.

e. Under the ***MCA*** menu bar, select ***Adjust***.

f. If inspector battery power is used, select ***PwrMgr***. If AC power is used, proceed to step 3.3.3.5.

g. In ***PwrMgr***, select either ***Bat Save*** or ***Bat Full***.

Caution: NEVER SET THE DETECTOR HIGH VOLTAGE TO EXCEED THE MAGNITUDE OR POLARITY PRINTED ON THE SIDE OF THE DETECTOR!

5. Select ***HVPS*** and verify that the voltage setting and polarity are correct for that particular detector, as specified on the side of the detector crystal. If the ***HVPS*** is set at any other voltage, adjust to the proper operating voltage before proceeding.

6. Click the ***Status On*** button. The Wait indicator in the upper left hand corner of the window will be on for 1 to 2 minutes while the HV is applied.

7. When the ***Wait*** indicator goes off, select ***Exit*** to close the ***Adjust*** window.

3.4 Operating Instructions

3.4.1 Perform System QC Check

Note: QC checks are normally performed once daily on days the equipment is used to obtain quality data. Quality data is data that is bracketed by successful QC checks on consecutive days of system use. QC checks may also be conducted anytime the operator suspects that the system is not performing satisfactorily.

1. Center QC check source 30 centimeters (cm) in front of detector, on center line of detector.

2. Under the ***MCA*** menu bar, select ***Acquire Setup***.

3. In the ***Time Preset*** block, select ***Live Time*** and ***Sec*** and set the time to 300.

4. Under the ***Acquire*** command, select ***Start***.

5. Under the ***Edit*** menu bar, select ***Sample Info***.

6. Enter all pertinent information to identify conditions of the count per guidance included in Attachment 4 of this procedure.

7. When the QC count is complete, select the ***Display*** menu bar and select ***ROIs***, then ***Load....*** Type in the Region of Interest (ROI) filename according to the detector chosen in step 3.3.3.d.3(c).

8. Click cursor on the channel with the maximum counts for peaks 1 and 2. This channel represents the peak centroid. Record the centroid energy, net peak counts, and Full-width at Half-maximum (FWHM) for each peak in the QC data form (Attachment 2).

9. Compare results from step 3.4.1.8 to acceptance criteria in QC data form (Attachment 2).

   Note: The calculations for the QC chart may be performed with an approved spreadsheet (HPGE_QC.CLS).

   a. If peak centroid energy, net peak counts, and FWHM results are within acceptance ranges, graph value of net counts on the QC chart (Attachment 1). Place a "Y" in the Acceptable Column, initial, and proceed to step 3.4.1.10.

   b. If centroid energy results do not meet acceptance criteria, allow equipment additional time to warm up and repeat steps 3.4.1.4 through 3.4.1.9. If centroid energy results after several attempts do not meet acceptance criteria, contact supervisor.

   c. If net count or FWHM results do not meet acceptance criteria, visually check operating parameters (source-to-detector geometry, use of correct source, etc.) and repeat steps 3.4.1.4 through 3.4.1.9 immediately. If results from second attempt do not meet acceptance criteria, place a DO NOT USE tag on the detector and contact supervision for further instructions.

      Note: The Gamma Spectroscopy System may be used to acquire spectral data on days when the daily QC counts are failed. However, the associated data are not considered quality data. Under these circumstances, the operator indicates that the data are not quality data on the spectrum acquisition form (Attachment 5).

10. Save the last QC spectral file.

    a. Under the ***File*** menu bar, select ***Save As***.

    b. Type in the file name of the QC spectrum. QC spectra shall be recorded in the format MMDDYYQC.CNF.

    c. Press ***ENTER*** on keyboard or select ***OK***.

11. Log QC activities in equipment operating form (Attachment 3).

12. Record QC spectrum data in spectrum acquisition form (Attachment 5).

3.4.2 Perform Background Count

Note: A minimum of one background count accompanies each group of spectra collected on the same day at the same location. The operator may collect additional background spectra anytime he/she suspects that background conditions have changed.

1. If the lead sleeve or lead bricks are available for shielding, configure around detector crystal.

2. Ensure that potentially radioactive samples or areas are absent from the detector's field of view during the background count.

3. Under the ***MCA*** menu bar, select ***Acquire Setup***.

4. In the ***Time Preset*** block, select ***Live Time*** and ***Sec*** and enter the desired time.

   a. Normally, the ***Live Time*** of background counts are set to the same duration as the anticipated sample count time.

   b. Occasionally, upon discretion of the operator, the background count time can be set different to the sample count time.

5. Under the ***Acquire*** command, select ***Start***.

6. Under the ***Edit*** menu bar, select ***Sample Info***.

7. Enter all pertinent information to identify conditions of the count per the guidance provided in Attachment 4 of this procedure.

8. Save spectral data.

   a. Under the ***File*** menu bar, select ***Save As***.

   b. Type in file name. Save background spectrums in the format MMDDYYB#, where B indicates background and # is the next sequential number for the day.

   c. Press ***ENTER*** on the keyboard.

   d. Record background count information in spectrum acquisition form (Attachment 5).

      Note: Unwanted signals are those at energies which would interfere with the analysis to be performed. Example: A high background at 413.7 keV, when sample to be analyzed has expected peak at the same energy.

9. Qualitatively review background spectrum to ensure that unwanted radiation signals are not present in the detector's field of view. If unwanted signals are present, take the appropriate steps to have them removed or minimized, or reposition the detector. Once unwanted signals have been eliminated, repeat steps 3.4.2.1 through 3.4.2.8.

10. Select ***Clear***.

11. Select ***No***.

3.4.3 Perform Sample Count(s)

1. Before proceeding with sample counts, verify the following:

    a. The QC check results are in the acceptable range.

    b. A background spectrum was collected at the sample counting location within the last 24 hours.

    c. There are no known or measured non-background radiation sources in the field of view of the detector that could confuse the spectral data from the sample (e.g., previously determined radioactive samples are moved from the detector field of view).

2. Position sample, item, or container in the detector's field of view.

3. Ensure that the detector shielding configuration is identical to the conditions of the background count. If not, adjust appropriately before proceeding to the next step.

4. Acquire and save spectra in accordance with steps 3.4.2.3 through 3.4.2.8, with the following exceptions:

    a. Save sample spectra in the format MMDDYY##, where the number (##) is sequential on a daily basis and determined from the spectrum acquisition form (Attachment 5). The first spectra on each new day begins with number 01.

    b. Write an item name or identifier on all items that do not have individual bar-code stickers or waste container labels present. This is a descriptive name the operator gives to items so they can be uniquely identified after the assay results are complete. This name should correspond to the entry made in the ***SAMPLE ID*** field during performance of step 3.4.2.7.

    c. At times, it may be desirable to perform an investigative count to determine the optimal source to detector configuration. Short counts for this purpose do not need to be saved.

    d. At times, it may be desirable to suspend a count in order to re-orient the source to detector configuration. The decision to perform this step is based upon the professional judgment of the operator.

5. To collect additional spectra, select ***Clear***.

6. Select ***No***.

7. Repeat steps 1 through 6 for each additional spectra.

3.5 Power Down and Disassembly Instructions

3.5.1 Power Down

1. Under the ***MCA*** menu bar, select ***Adjust***.

2. Select ***HVPS***, and click the ***Status Off*** button.

3. The ***Wait*** indicator should be on. When the ***Wait*** indicator goes off, select ***Exit*** to close the ***Adjust*** window.

4. Select ***File***, ***Exit*** to close the Gamma Acquisition & Analysis Window.

5. Select ***Start***, then ***Shut down***. At the question **"Shut down the computer,"** select ***Yes***. The computer will automatically turn itself off.

6. Turn the inspector power switch ***OFF***.

3.5.2 Disconnect Cables

1. Disconnect inspector from computer cables in the following order:

   a. Unplug the computer AC power adapter from the AC source.

   b. Unplug the DC power from the computer.

   c. Unplug the Sony power adapter from the AC source.

   d. Unplug the battery DC power adapter from the Sony power adapter.

   e. Disconnect the battery DC power adapter from the inspector.

   Caution: TO AVOID HARMING THE GERMANIUM CRYSTAL, THE FOLLOWING INSTRUCTIONS MUST BE PERFORMED IN THE EXACT SEQUENCE.

2. Disconnect inspector from detector cables in the following order:

   a. Disconnect the SHV connector from the detector.

   b. Disconnect the RED connector from the detector and the inspector.

   c. Disconnect the GREEN connector from the detector and the inspector.

   d. Disconnect the rectangular connector from the detector.

   e. Disconnect the SHV connector from the inspector.

   f. Disconnect the rectangular connector from the inspector.

3. Remove batteries

   a. Unplug batteries from the inspector connectors and store properly, OR, if necessary, recharge.

4.0 QUALITY RECORDS

Note: Forms referred to in this procedure are reproduced directly from the procedure for use.

4.1 Spectra Files

Copy spectra files from computer hard drive to removable media. Label and date all media.

4.2 Generated Records

The following records are generated in the performance of this procedure:

- QC chart (Attachment 1)
- QC data form (Attachment 2)
- Equipment operating form (Attachment 3)
- Spectrum acquisition form (Attachment 5)

4.3 Record Maintenance

Operating forms and charts are maintained with the equipment until completed and forwarded for filing in the central files as described below.

1. Spectrum Acquisition Forms

    a. When an individual page in the spectrum acquisition form is full, start a new page.

    b. Submit completed forms for filing.

2. Equipment Operating Forms

    a. When equipment operating form is full, start a new page.

    b. Submit completed forms for filing.

3. Quality Control Data Form

    a. Generate new QC data form as indicated in the performance of this procedure.

    b. Close out old QC data form by drawing one line across all remaining data lines and record the following data next to the line:

    "Record closed out _(date)_, due to recalibration of equipment."

    c. Attach old QC data form to old QC charts and QC data worksheet.

    d. Submit completed forms for filing.

4. Quality Control Chart

    a. Generate new QC chart as indicated in the performance of this procedure.

    b. Close out old QC chart by drawing one line across all remaining data lines and record the following data next to the line:

    "Record closed out _(date)_, due to recalibration of equipment."

    c. Remove all but the latest QC charts and the new chart generated following equipment calibration.

    d. Attach QC charts to old QC data form and QC data worksheet.

    e. Submit completed forms for filing.

5. Quality Control Data Worksheet

   a. Generate new worksheet as indicated in the performance of this procedure.

   b. Attach old QC data worksheet to old QC data form and QC chart.

   c. Submit completed forms for filing.

5.0 ATTACHMENTS

Attachment 1: Quality Control Chart

Attachment 2: Quality Control Data Form

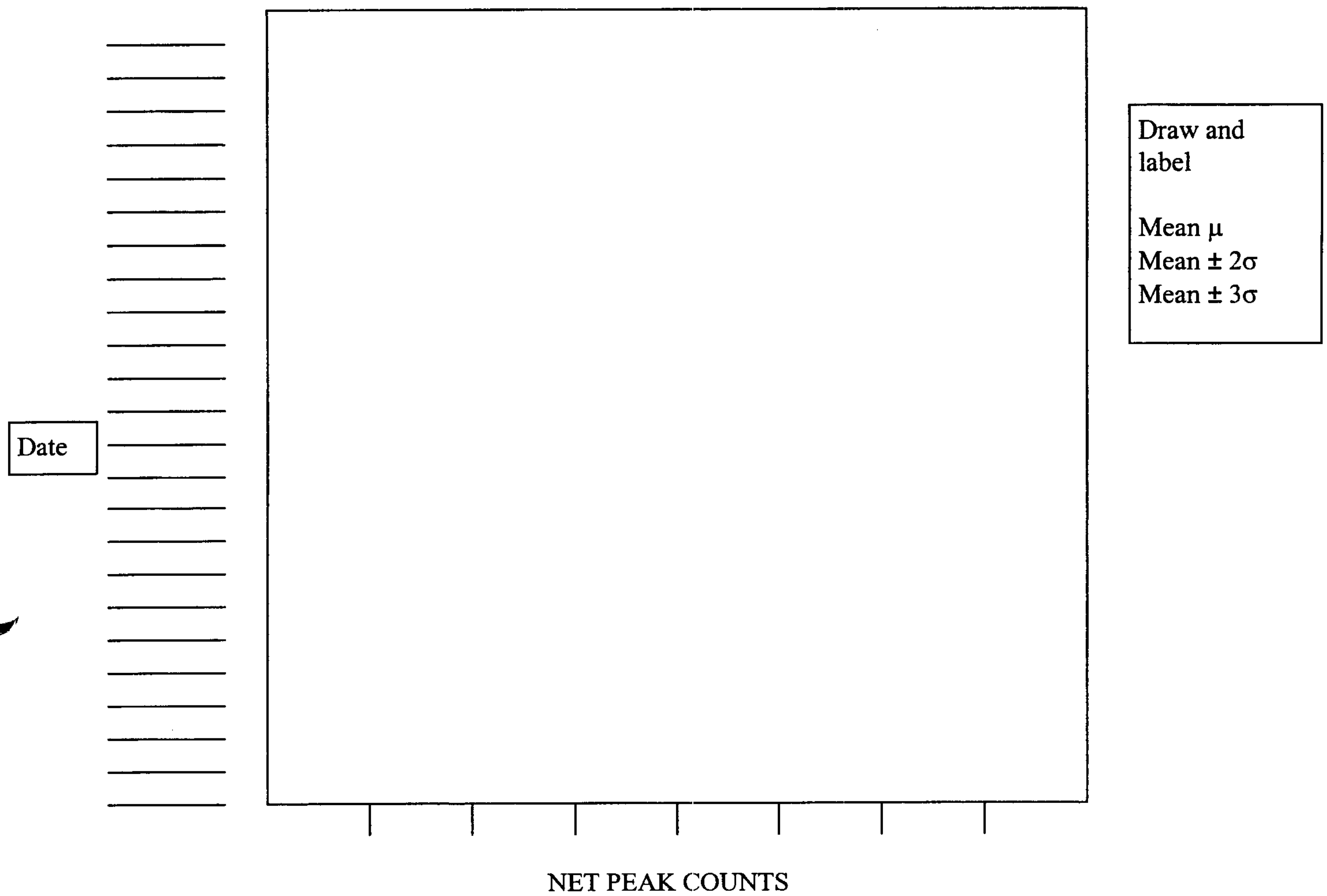
Attachment 3: Equipment Operating Form

Attachment 4: Guidance for Determination of Sample Identification Data

Attachment 5: Spectrum Acquisition Form

ATTACHMENT 1

QUALITY CONTROL CHART



ATTACHMENT 2

QUALITY CONTROL DATA FORM

Equipment Model: ______________________ Property Number: ______________

Source IDs: ______________

Peak 1 Centroid Energy Range (±1.0 keV): ______________________
Peak 2 Centroid Energy Range (±1.0 keV): ______________________

Net Area Range: ______________________ Net Area Range: ______________________
FWHM Range: <1.65 keV FWHM Range: <2.4 KeV
Ranges valid through (date): ______________

Date	Filename	Centroid Energy (keV)	Net Area	FWHM	Acceptable? (Y/N)	Initials

ATTACHMENT 3

EQUIPMENT OPERATING FORM

Equipment Model: ______________________________ Property Number: ________________

Date	Action	Initials

F-09-10-B

ATTACHMENT 4

GUIDANCE FOR DETERMINATION OF SAMPLE IDENTIFICATION DATA

The following provides guidance for entering information into the **Sample Info** menu for spectral files generated with the Gamma Spectroscopy System. Information should be entered similarly for QC, background, and sample counts, unless otherwise noted.

1. SAMPLE TITLE: Enter the filename for the spectra according to one of the following formats. The default for the system saves all files as **.cnf**.

   QC counts: MMDDYYQC
   Background counts: MMDDYYB#
   Sample counts: MMDDYY##

2. SAMPLE ID: If an Eberline Services' item bar-code number or container label number has already been assigned, enter that information. Otherwise, enter the spectra filename (e.g., 09199703).

3. COLLECTOR NAME: Enter your name.

4. TYPE: Choose the appropriate container type from the pull down box. Designate all atypical container/items as "Other."

5. QUANTITY: Normally used to enter the weight of the sample, with the corresponding units (lbs or kg) entered in the UNITS field. (If information on the weight is determined to be unnecessary, the operator could enter other relevant technical information.) If count is background count, enter 1 in "QUANTITY."

6. SAMPLE DESCRIPTION: Enter a comprehensive description of information about the count that is not included in other fields. This includes, but is not limited to, the following:

   Location: Enter the site name, building, and room (or area) where the count was conducted.

   Item Description: Fully describe the physical characteristics of the item including dimensions, shape or volume, constituents, orientation to detector, and potential location of contamination in the item (if known).

7. UNCERTAINTY: This field is not used.

8. UNITS: Enter the units of weight, lbs or kg, corresponding with the entry in the QUANTITY field. If other technical information is entered in the QUANTITY field, enter the corresponding units here as appropriate. If count is background enter BG, or if a quality control count is performed enter QC.

9. SAMPLE GEOMETRY: Enter the distance from the front of the item to the face of the detector and the associated units (e.g., "@ 6 in.").

10. RANDOM ERROR (percent): This field is not used.

11. SYSTEMATIC ERROR (%): This field is not used.

12. LOAD CAL: This field is usually not used.

13. BUILDUP TYPE: This field is not used. The default should indicate the **None** button is selected.

14. SAMPLE DATE: This field is not used.

ATTACHMENT 5

SPECTRUM ACQUISITION FORM

Equipment Model: ______________________________ Property Number: ____________________

Date	Spectrum Number	Description	Initials

APPENDIX D-4
STANDARD OPERATING PROCEDURE (SOP) 4
PREPARATION OF PORTABLE RADIATION AND CONTAMINATION SURVEY METERS AND INSTRUMENTS FOR FIELD USE

1.0 PURPOSE

This procedure is used to specify the general requirements for preparing portable radiation and contamination survey meters and instruments for use at field locations. The procedures presented below will be supplemented by the specific instrument operation manuals, Tetra Tech EC, Inc. (TtEC)-approved subcontractor procedures, and specific work documents.

2.0 SCOPE

This procedure will be used by TtEC personnel and its subcontractors for preparation of portable radiation and contamination survey meters and instruments used on site. This procedure is intended to provide general instructions for preparing radiation and contamination survey meters and instruments for field operations. Development of specific procedures for the implementation of the requirements of this procedure is the responsibility of the end users.

In certain instances the requirements of this procedure may need to be added to or modified for specific field operations. Additional requirements and guidance for these cases will be provided in work-specific documents (i.e., Time Critical Removal Action Work Plan, etc.), will be subject to the same review process as this document, and will have precedence over the guidelines in this document as appropriate.

3.0 DEFINITIONS AND ABBREVIATIONS

Acceptance Range – A range of values that describes an acceptable instrument check result. An acceptance range is typically determined by adding ± 20 percent or $\pm 2\sigma$ to the expected value.

Calibration Sticker – A label affixed to a properly calibrated instrument. The calibration sticker may be applied by the calibration facility or the end user. The calibration sticker should indicate the date through which the calibration is valid.

Chi-Square Test – A probability density function that gives the distribution of the sum of the squares of a number of independent random variables each with a normal distribution with zero mean and unit variance, that has the property that the sum of two or more random variables with such a distribution also has one, and that is widely used in testing statistical hypotheses especially about the theoretical and observed values of a quantity and about population variances and standard deviations. This test is used to evaluate the operation of an instrument, generally upon return from calibration.

Check Log – A form or series of forms which are used to document that an instrument was checked prior to usage in the field. Check logs can consist of multiple pages and must contain at least one page identifying the instrument. At least one page must also specify the parameters (source, geometry, etc.) used for the daily check. Space shall be provided to document the daily tests in the log. The log should be designed so as to clearly associate the required verifications with the signature or initials of the individual performing the check and date of each check.

Instrument Efficiency – A measure of the response (counts) obtained with a particular instrument when exposed to a known fluence of radioactive particles. Instrument efficiency has units of counts per particle.

4.0 PROCEDURE DETAILS

4.1 Calibration

Instrument calibrations shall be performed using measuring and test equipment and National Institute of Standards and Technology (NIST) traceable sources. Calibrations will be performed at an accredited calibration laboratory. Calibration will be performed in accordance with the equipment manufacturers' manuals or a subcontractor's TtEC-approved procedure. Properly calibrated instruments shall be marked with a calibration sticker and include an accompanying calibration certificate.

Calibration shall be performed annually (± 15 days) or on a schedule consistent with the manufacturer's recommendation if more restrictive. The routine frequency may be extended by up to one additional month with written approval of the Project Health Physicist (PHP), or designee. However, the frequency of calibration may not be extended when instruments are being used for surveys of record (i.e., Final Status Surveys, Characterization Surveys, etc.) In addition to the routine frequency of performance, calibration shall be performed under the following conditions:

- Prior to placing a new instrument into service.
- After any major repair or alteration to the instrument or detector.

4.2 General Considerations

Determination of instrument background, chi-square testing and instrument efficiency should be conducted in a controlled environment. This typically will consist of a secured office or lab area located in a non-impacted area and which is known to be free of contamination. Testing jigs or apparatus may be employed as necessary to ensure that consistent, reproducible geometries are used, particularly during repeated measurements.

Table 4-1 gives suggested geometries to use for the most common instrument types to be used at Alameda Point. Alternate geometries can be used provided that they are more appropriate for the intended usage of the instrument.

TABLE 4-1

SUGGESTED GEOMETRIES FOR BACKGROUND MEASUREMENTS AND SOURCE CHECKS

Measurement	Instrument/Detector Combinations	Probe Location
Exposure Rate	Eberline MicroREM Meter or equivalent with integral tissue equivalent plastic or sodium iodide (NaI) 1"x1" detector	contact[a]
Gamma	Eberline E-600 or equivalent with a Ludlum Model 44-10 or equivalent detector	4 inches above ground surface/source
Beta/Gamma	Ludlum Model 3 portable survey meter with Eberline SHP380AB probe or equivalent	¼ inch above ground surface/source
Alpha/Beta	Eberline E-600 or equivalent portable survey meter with Eberline SHP380AB or equivalent detector	¼ inch from surface/source

Notes:

[a] Field readings with exposure rate instruments are conducted at 1 meter; background determination, chi-square test and operational checks are typically performed at a more convenient distance. Geometry should be documented as appropriate on the relevant data forms and logs.

4.3 Determination of Instrument Background

The determination of an instrument-specific background is an optional procedure which may be employed at discretion of the subcontractor. There is no regulatory requirement that necessitates the determination of background for each instrument. Instrument background determination is typically performed in a controlled environment and usually consists of a series of repeated background measurements that are statistically analyzed to obtain an expected range of valid background values. The established instrument background range can be used as a means of performing daily operation checks.

Instrument background determinations, when necessary, are considered valid for as long as the instrument has been properly maintained per the requirements of this procedure. If instrument backgrounds are required, a new background determination should be performed following each calibration.

When determining instrument background, the appropriate approved subcontractor's procedures shall be followed; however, any specific instructions for background determination in governing work-specific documents shall have precedence.

When required, background determinations will be documented on an approved subcontractor form or as specified in the work-specific procedures. The form should include the following information at a minimum:

- Identification information (i.e., model and serial numbers) for the instrument and detector
- Conditions used for determination (geometry, radiation type, operating voltage, etc.)
- Date and time of determination
- Identification and signature or initials of technician
- Identification and signature of reviewer

The end result of a background determination should be to obtain an acceptance range for subsequent background checks.

4.4 Chi-Square Test

When chi-square tests are required by work-specific documents, the appropriate approved subcontractor's procedures shall be followed; however, any specific instructions for chi-square testing in governing work specific documents shall have precedence. When required, chi-square tests shall be performed annually (± 15 days), following calibration, or if there is reason to suspect that the instrument calibration may no longer be valid (i.e., inability to obtain a valid range of chi-square values).

Chi-square tests shall be performed with NIST traceable sources with isotopic content appropriate to the detector being evaluated and the anticipated contaminants in the survey area. The source should be of sufficient activity to yield a counting rate of 1,000 to 50,000 counts per minute (cpm). The source should not exceed 50,000 cpm.

When required, chi-square tests should be documented on an approved subcontractor form or as specified in the work-specific documents. The form should include the following information at a minimum:

- Identification information (i.e., model and serial numbers) for the instrument and detector
- Conditions used for the test (geometry, radiation type, operating voltage, etc.)
- Source ID number

- Date and time of determination
- Identification and signature or initials of technician
- Identification and signature of reviewer

The chi-square test procedure will produce a chi-squared value (χ^2), which should be between 10.11 and 30.14. Failure to obtain a chi-squared value in this range indicates a problem with either the instrument or the methodology used to perform the chi-square test and requires further investigation. The PHP should be notified of the failure to assist in planning a course of action.

4.5 Instrument Efficiency for Portable Instruments

The instrument efficiency (ϵ_i) is the ratio between the net count rate (in cpm) of the instrument and the surface emission rate of the efficiency check source for a specified geometry. The surface emission rate is the 2π particle fluence that is affected by both the attenuation and backscatter of the radiation emitted from the efficiency check source.

The following equation is used to calculate the instrument efficiency in counts per particle:

$$\varepsilon_i = \frac{R_{S+B} - R_B}{q_{2\pi}\left(W_A / S_A\right)}$$

Where,

R_{S+B} = the gross count rate of the efficiency check source, measured in cpm
R_B = the background count rate in cpm
$q_{2\pi}$ = the 2 π surface emission rate of the calibration source (NIST traceable)
W_A = the active area of the probe window in square centimeters (cm^2)
S_A = the area of the source in cm^2

Note: This equation assumes that the dimensions of the efficiency check source are sufficient to cover the window of the instrument detector. If the dimensions of the efficiency check source are smaller than the detector's window, set W_A equal to the dimensions of the efficiency source (i.e., set the quotient of W_A and S_A equal to 1).

Instrument efficiency shall be determined for all instruments and radiation and contamination survey meters that are to be used for alpha and beta surveys prior to use for field operations. Instrument efficiency is dependent upon energy of the incident radiation. Multiple energy-specific instrument efficiencies may be determined when isotopes with significantly varying energies are analyzed.

The procedures in the approved subcontractor's procedures shall be followed to determine the instrument efficiency for those instruments for which it is required. In instances where governing work-specific documents specify a means or expanded scope of inclusion for instrument efficiency determination, they shall have precedence.

All instrument efficiency determinations should be documented on an approved subcontractor form or as specified in the work-specific documents. The form should include the following information at a minimum:

- Identification information (i.e., model and serial numbers) for the instrument and detector

- Conditions used for determination (geometry, radiation type, operating voltage, etc.)
- Source-specific information (ID number, surface emission rate, area)
- Detector window area
- Date and time of determination
- Identification and signature or initials of technician
- Identification and signature of reviewer (typically the PHP)

The resulting instrument efficiency should be reported in units of counts per particle.

4.6 Operation Check

An operation check for each instrument should be performed at the beginning of each workday that a particular instrument is used. The operations check should include the following checks at a minimum:

- Check that instrument calibration is still valid (date on sticker not yet passed)
- Check the instrument (including the probe) for physical defects (knobs, displays, cables, connectors, Mylar windows, etc.)
- Check of instrument battery (per manufacturers' instructions)
- Source check (should give consistently reproducible results with same source)

Failure of any of the above checks shall result in the instrument being removed from active service until the condition can be addressed. The PHP should be notified of any instrument failing an operations check for reasons other than failure of a battery check. In cases of battery check failure, the battery should be replaced and the check repeated.

The specified checks should each be performed every day and documented on a new line of the check log. A separate check log shall be maintained for each instrument. The check log shall contain the following information at a minimum:

- Identification information (i.e., model and serial numbers) for the instrument and detector
- Conditions used for the check (geometry, radiation type, etc.)
- Source ID number
- Source check readings in appropriate measurements
- Verification of current calibration
- Verification of physical condition
- Verification of battery check
- Verification that source check is in acceptance range
- Date of operational check
- Signature or initials of technician
- Identification and signature of reviewer

Of the required information given above, only the verifications, date and signature or initials need to be completed on a daily basis. The remaining information can be completed once and kept in the check log with the additional pages for daily checks, provided that none of the information changes. If the information changes, then a new check log should be started.

4.7 Maintenance

Instruments shall be stored in areas, which prevent damage by movement, accumulation of moisture or dust. Detector covers shall be used for storage when practical.

Instrument maintenance (except external adjustments and cable or Mylar window replacements) shall be performed by the manufacturer or an approved vendor.

5.0 RECORDS

Records that result from this procedure may include forms that document background determinations, chi-square tests, instrument efficiency and check logs. Record forms shall be obtained from approved subcontractor procedures or specified in work-specific procedures.

6.0 REFERENCES

None.

7.0 ATTACHMENTS

None.

APPENDIX D-5
STANDARD OPERATING PROCEDURE (SOP) 5
RELEASE OF MATERIALS AND EQUIPMENT
FROM RADIOLOGICALLY CONTROLLED AREAS

1.0 PURPOSE

The purpose of this procedure is to specify the radiological survey requirements for releasing materials and equipment from radiologically controlled areas (RCAs).

2.0 SCOPE

This procedure will be used by Tetra Tech EC, Inc. (TtEC) personnel and its subcontractors to release materials from RCAs.

3.0 DEFINITIONS AND ABBREVIATIONS

Contamination – Radioactive material in any place it is not desired. Contamination may be due to the presence of alpha particle, beta particle or gamma-ray-emitting radionuclides.

Fixed Surface Contamination – Contamination that is not readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe or masslin.

Radiologically Controlled Area (RCA) – An area to which access is controlled in order to protect individuals from exposure to radiation and radioactive materials and/or to prevent the release of radioactive materials to the uncontrolled areas.

Release for Unrestricted Use – The authorization to remove or reuse equipment and/or material from an RCA. Such authorization will be based on review of survey data confirming that the material and/or equipment being released does not exhibit radiation levels exceeding those in Table 4-1.

Removable Surface Contamination – Contamination that is readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe or masslin.

4.0 PROCEDURE DETAILS

4.1 General

Surveys for fixed and removable surface contamination shall be conducted and documented in accordance with Appendix D-6, Radiation and Contamination Surveys.

Items presented for release shall be surveyed in an area of relatively low background.

4.2 Limitations

This procedure shall not be used for personnel surveys. Personnel will be surveyed in accordance with Appendix D-7, Radiological Protective Clothing Selection, Monitoring, and Decontamination.

4.3 Release Procedure

4.3.1 Material History

Upon receipt of an item presented for release from RCAs, the history of the item should be determined. This determination should include if possible:

- The current and past use of the item.
- The location(s) in which the item was used or stored.
- If the item was in an area where radioactive material was used or stored.

This history will be used, if applicable, to evaluate the potential for contamination to be present on inaccessible surfaces of the item.

4.3.2 Contamination Surveys

All accessible surfaces will be surveyed for removable and fixed surface contamination in accordance with Appendix D-6, Radiation and Contamination Surveys.

Swipes collected for removable surface contamination shall be analyzed with low-background gas-proportional counters. Typically a Protean IPC 9025 and/or a Tennelec Series 5 XLB gas-flow-proportional alpha/beta radiation counter will be employed to count swipes for the release of materials and equipment. As a backup to the gas-flow-proportional counters, an Eberline HandeCount portable alpha/beta counter (or equivalent) may be used.

Following the scan survey, the number of static survey measurements to be collected shall be determined by:

- Size and history of the item.
- Preliminary results of the swipe and scan surveys.
- If an increase in the audible and/or digital/analog count rate was detected.
- If, during the survey, the Radiological Control Technician determines that there may be fixed activity present.

4.3.3 Inaccessible Surfaces

Items with inaccessible surfaces, that may have been exposed to contamination or it is unknown if they have been exposed to contamination, should be disassembled as completely as possible to facilitate release surveys. Items with inaccessible surfaces will not be released from an RCA, unless evaluated and documented by the Project Health Physicist or designee in conjunction with the Radiological Affairs Support Office.

4.3.4 Release of Material and Equipment

The following steps shall be taken for release of material and equipment:

1. If the results of the swipe, scan, and static surveys do not exceed the limits of Table 4-1, then the material may be released for unrestricted use.
2. If the swipe, scan, or static survey results indicate contamination, which exceeds the limits of Table 4-1, the material shall not be released for unrestricted use. Material and equipment that

cannot be released for unrestricted use will be evaluated for decontamination in accordance with Appendix D-8, Decontamination of Equipment and Tools, or packaged for disposal.

3. Results of the swipe, scan, and static surveys shall be documented in accordance with Appendix D-6, Radiation and Contamination Surveys.

4. If the equipment and/or materials are being returned to a vendor or removed from Alameda Point, a completed Attachment 1 – Unconditional Release of Equipment or Materials Form – will accompany the equipment and/or material.

TABLE 4-1

RELEASE LIMITS FOR MATERIALS AND EQUIPMENT

Radiation Type	Release Limits[1] (Fixed) (dpm per 100 cm^2)	Release Limits[1] (Removable) (dpm per 100 cm^2)
Alpha (α)	100	20
Beta (β-)	1000	200
Gamma (γ)	5,000	1,000

Notes:

[1] These limits are based on AEC Regulatory Guide 1.86 (AEC, 1974)

AEC – Atomic Energy Commission
cm^2 – square centimeters
dpm – disintegrations per minute

5.0 REFERENCES

Number	***Title***
AEC Regulatory Guide 1.86	*Termination of Operating Licenses for Nuclear Reactors*
Appendix D-6, SOP 6	*Radiation and Contamination Surveys*
Appendix D-7, SOP 7	*Radiological Protective Clothing Selection, Monitoring, and Decontamination*
Appendix D-8, SOP 8	*Decontamination of Equipment and Tools*

6.0 ATTACHMENTS

Attachment 1 – Unconditional Release of Equipment or Materials Form

ATTACHMENT 1

UNCONDITIONAL RELEASE OF EQUIPMENT OR MATERIALS FORM

Survey #:		Date:		
Description of equipment or materials:				
SURVEY EQUIPMENT:				
Model No:	S/N:	Background:	Eff:	Cal Due Date:
Model No:	S/N:	Background:	Eff:	Cal Due Date:
Model No:	S/N:	Background:	Eff:	Cal Due Date:

CONTAMINATION LEVELS:

	dpm/100 cm^2 βγ	Removable
	dpm/100 cm^2 α	Removable
	dpm/100 cm βγ	Fixed
	dpm/100 cm^2 α	Fixed

This is to certify that the above described equipment or materials have been surveyed and found to be within acceptable surface contamination levels for unconditional release as required by AEC Regulatory Guide 1.86.

Radiological Control Technician:	Date/Time:
Disposition of equipment or materials:	
Reviewed By:	Date:

APPENDIX D-6
STANDARD OPERATING PROCEDURE (SOP) 6
RADIOLOGICAL RECORDS

1.0 PURPOSE

The purpose of this procedure is to define Tetra Tech EC, Inc. (TtEC) standards for the maintenance and retention of radiological records including personal protection.

2.0 OVERVIEW

Radiological records provide valuable historical data, radiological conditions, and exposure for use in future site operations, health studies, and litigation support. The following types of radiological records are required to be maintained:

- Radiological control procedures
- Individual radiological doses
- Internal and external dosimetry policies and procedures
- Radiological control (RadCon) Personnel Training (course records and individual records)
- As low as reasonably achieveable (ALARA) program implementation records
- Radiological instrumentation test, repair, and calibration records
- Radiological surveys
- Area monitoring dosimetry results
- Radiological work permits
- Radiological incident reports
- Facility design and control actions taken to maintain exposures ALARA
- The results of internal audits and other reviews of program content and implementation
- Written declarations of pregnancy, including the estimated date of conception
- Changes in equipment, techniques, and procedures used for monitoring
- Records for release of material to controlled areas
- Field logbooks

Radiological records are transferred to the project file located in San Diego following completion.

3.0 RESPONSIBILITIES

3.1 Project Manager

The Project Manager is responsible for:

- Ensuring effective implementation of the RadCon records management program and that the program is in compliance with regulatory requirements.

3.2 Project Health Physicist

The Project Health Physicist:

- Directs and assists Radiological Control Technicians and project personnel in proper completion of radiological records.
- Ensures that records are in compliance with the quality standards outlined in this procedure.
- Ensures timely and thorough review of records, in accordance with this procedure, prior to approval.
- Approves records with verifiable signature and date once records meet the quality standards.
- Ensures that records are transferred or transmitted to the San Diego office following completion.

3.3 Other Project Personnel

Other project personnel will:

- Create, review, or transmit radiological records for retention.
- Ensure that all document quality standards are met.

4.0 REQUIREMENTS

Records resulting from the implementation of the Time-critical Removal Action Work Plan are comprised of legal and historical documentation. Therefore, all records shall meet the quality standards as outlined in this procedure. All records must be retrievable and maintained for their prescribed retention time.

Completed records awaiting transfer to storage shall be stored in an appropriate manner to minimize loss and damage that could result from exposure to weather, fire, or other conditions.

The signature and initials of all personnel who sign RadCon records shall be on file. This file shall be updated when a change in personnel warrants.

All personnel who create, review and approve radiological records must sign and date the record and follow all quality standards in accordance with this procedure.

Once a document has been created, reviewed, and signed by appropriate supervision, it is a completed radiological record. Technical errors or omissions subsequently identified in a completed record may be corrected by creating a supplemental record that includes traceability to the original document.

If working copies of records are used for reference, store them separately from the original.

5.0 DOCUMENT QUALITY STANDARDS

Records shall be legible and completed with an indelible ink that provides reproducible and legible copies. Records shall be dated and contain a verifiable signature of the originator. Errors shall be corrected by marking a single line through the error and by initialing and dating the correction. Radiological records shall not be corrected using an opaque substances. Shorthand, or other nonstandardized terms, may not be used.

To ensure retrievability, each record shall clearly indicate:

- Identification of the facility
- Specific location

- Function and process
- Document number (if applicable)

The quantities used in records shall be clearly indicated in standard units (curie, rad, rem, disintegrations per minute [dpm]), including multiples and subdivisions of these units.

6.0 PROCEDURE

6.1 Preparation of Radiological Records

Prior to preparing a document for which a standard form exists, verify that the form is current. Verify that copies of master forms are in good quality.

Prepare the document in accordance with the applicable guidance for that specific document, if any, and in accordance with the quality standards established by this procedure.

Review the completed document for accuracy of calculations, legibility, proper units, proper forms, and so forth. The document should meet all quality standards before it is submitted for final review and approval.

6.2 Review of Records

Review radiological documents in a timely manner. Supervisory reviews should focus on identification of trends, validity of recorded data and information, and identification of originators.

Subsequent quality reviews should verify that documents are complete, legible, and in compliance with the quality standards outlined in this procedure.

6.3 Approval of Records

Verify that all documents are correct and in compliance with this procedure and applicable regulatory requirements prior to transmittal to storage.

6.4 Individual Monitoring

The records required by this procedure will be protected from public disclosure because of their personal privacy nature. The results of individual external and internal dose monitoring that is performed will be recorded at least annually, including doses received during planned special exposures, unplanned doses exceeding TtEC dose limits, and authorized emergency exposures.

Monitoring records will be maintained on Nuclear Regulatory Commission (NRC) Form 5 or in clear and legible records containing all of the information required by NRC Form 5.

- Be sufficient to evaluate compliance with RP2-2, Standards for Internal and External Exposure.
- Be sufficient to provide dose information necessary to complete reports required by RP2-9, Reports to Individuals.
- Data necessary for future verification or reassessment of the recorded doses will be recorded.
- Individual monitoring records that are identified with a specific individual will be readily available to that individual.

6.4.1 Monitoring Records

For personnel whose occupational dose is monitored, reasonable efforts will be made to obtain complete records of prior years for occupational internal and external doses. If complete records documenting previous occupational dose during the year cannot be obtained, a written estimate signed by the individual may be accepted to demonstrate compliance.

External dose records include the following:

- The effective dose equivalent from external sources of radiation (deep dose equivalent may be used as effective dose equivalent for external exposure).
- The lens of the eye dose equivalent.
- The shallow dose equivalent to the skin.
- The shallow dose equivalent to the extremities.

Internal doses from intakes received during the year include the following:

- An estimate of the identified intake of radionuclides.
- Committed effective dose equivalent.
- Committed dose equivalent to any organ or tissue of concern.

The summation of external and internal doses includes:

- Total effective dose equivalent in a year.
- For any organ or tissue assigned an internal dose during the year, the sum of the deep dose equivalent from external exposures and the committed dose equivalent to that organ or tissue.
- The dose equivalent to the embryo/fetus of a declared pregnant worker will be located with the records of dose to the declared pregnant woman.
- Incident reports, findings, conclusions, or other information describing off-normal events in which the employee was involved. These include, but are not limited to, cases of accidental exposures, skin contamination, failure of personal protective equipment (PPE), exceeding TtEC dose limits (unauthorized), injuries inside a radiological area, positive bioassay, or lost dosimetry.

6.4.2 Other Monitoring Records

The following other information will be documented and maintained:

- Results of area monitoring as specified in RP2-3 and RP2-7
- Results of dosimetry, surveys, air sampling/monitoring, and bioassay results used to determine individual doses
- Results of monitoring for the release and control of material and equipment, as required by RP2-7, Radioactive Contamination Control; the records of released property will include:
  - (a) A description or identification of the property
  - (b) The date of the last radiation survey
  - (c) The identity of the organization and the individual who performed the monitoring operation
  - (d) The type and identification number of monitoring instruments
  - (e) The results of the monitoring operation
  - (f) The identity of the recipient of the released material
- Results of maintenance and calibration performed on instruments and equipment as required by RP2-3, Radiological Monitoring of Individuals and Areas
- Results of monitoring and documentation of approval for planned special exposures

7.0 RECORD RETENTION

All radiation records will be retained by TtEC for a minimum of 3 years from the date of the generation of the record.

8.0 REFERENCES

Number	*Title*
RP202	*Standards for Internal and External Exposure*
RP2-9	*Reports to Individuals*
RP2-3	*Radiological Monitoring of Individual and Areas*
RP207	*Radioactive Contamination Control*

9.0 ATTACHMENTS

None.

APPENDIX D-7
STANDARD OPERATING PROCEDURE (SOP) 7
RADIOLOGICAL PROTECTIVE CLOTHING SELECTION, MONITORING, AND DECONTAMINATION

1.0 PURPOSE

This procedure provides the guidance for selecting protective clothing, performing personnel surveys, and decontaminating personnel.

2.0 SCOPE

This procedure will be used by Tetra Tech EC, Inc. (TtEC) personnel and its subcontractors while performing activities in known or suspected areas with radioactive contamination.

3.0 DEFINITIONS AND ABBREVIATIONS

Contaminated Area – Any area where removable surface contamination levels exceed the following limits in Table 3-1:

TABLE 3-1

EQUIPMENT AND MATERIAL SURFACE CONTAMINATION LIMITS

Radionuclide	Removable[1] (dpm/100 cm^2)	Fixed[1] (dpm/100 cm^2)
Alpha	20 α	100 α
Beta (Strontium-90)	200 β^-	1,000 β^-
Beta / Gamma	1,000 β^-, γ	5,000 β^-,γ

Notes:

[1] Limits for equipment and materials based on Regulatory Guide 1.86 (AEC, 1974)
AEC – Atomic Energy Commission
cm^2 – square centimeter
dpm – disintegration per minute
Types of radiation: α - alpha, β - beta, γ - gamma

Hot Particle – A discrete, minute, fragment of radioactive material.

Radiologically Controlled Area (RCA) – An area containing radioactive materials to which access is controlled to protect individuals from exposure to ionizing radiation.

4.0 PROCEDURE DETAILS

4.1 Selection of Protective Clothing

The following factors should be considered when selecting protective clothing (PC):

- The levels and types of radiological material present or expected in the work area
- The presence of chemical hazards
- The base in which the contamination is carried (dry, wet, oily)
- The work to be performed or work in progress
- The location of the contamination (e.g., floor, walls, overhead, air handling systems, sewer systems)
- The physical configuration of the work area
- Environmental conditions such as heat and humidity
- Exposure situation (vapor, pressured splash, liquid splash, intermittent liquid contact, and continuous liquid contact)
- Toxicity of the radioactive materials and/or chemical(s) (ability to permeate the skin and systemic toxicity)
- Physical properties of the contaminant (vapor pressure, molecular weight, and polarity)
- Functional requirements of the task (dexterity, thermal protection, fire protection, and mechanical durability requirements)

Table 4-1 provides guidance for the selection of PC when radiological hazards are present or suspected.

The guidelines specified in Table 4-1 for PC selection may be modified under unusual circumstances. The following are examples:

- Wet areas – Where splashing water or spray is present, use rain suits in addition to the protective clothing listed in Table 4-1. A second set of coveralls may not be necessary when a rain suit is worn.
- Standing water - In addition to the clothing requirements for wet areas, use hip boots or waders for deep standing water areas.
- Face shields – Consider for use when there is significant beta radiation or a likelihood of water splashing and respirators are not required.
- High temperature areas – Consult with the Project Health Physicist (PHP) and Site Health and Safety Specialist (SHSS).

TABLE 4-1

GUIDE FOR THE SELECTION OF RADIOLOGICAL PROTECTIVE CLOTHING

Removable Contamination Levels	Clothing for Access Only No Work *	Clothing for Work or Access During Work *
General contamination levels < 1,000 dpm/100 cm^2	Level D PPE	Level D PPE
General contamination levels > 1,000 dpm/100 cm^2, but ≤ 10,000 dpm/100 cm^2	Glove liners Gloves Booties, cloth or PVC Tyvek Rubber shoe covers**	Glove liners Gloves Booties, cloth or PVC Tyvek Rubber shoe covers**
General contamination levels > 10,000 dpm/ 100 cm^2, but ≤ 100,000 dpm/100 cm^2	Glove liners Gloves Booties, cloth or PVC Tyvek Cap (or hood) Rubber shoe covers**	Glove liners Gloves Booties, cloth or PVC Tyvek Cap (optional) Hood Rubber shoe covers**
General contamination levels > 100,000 dpm/100 cm^2	Glove liners Gloves (2 pair) Booties, cloth or PVC Tyvek Cap (optional) Hood Rubber shoe covers**	Glove liners Gloves (2 pair) Booties (2 pair), cloth or PVC Tyvek (2 pair) Cap Hood Rubber shoe covers**

Notes:

* Plastics or partial plastics may be required anytime water or liquid chemicals are present, such as when handling wet components.

** Composition of rubber shoe covers will be selected based on work area conditions and presence of any chemical hazards.

cm^2 – square centimeter
dpm – disintegration per minute
PPE – personal protective equipment
PVC – polyvinyl chloride

4.2 Procedure Process

4.2.1 Donning Protective Clothing

1. Select the appropriate PC.
2. Inspect the clothing for holes, tears, or other indications of damage. If damaged, remove PC from service.
3. Don clothing.

4.2.2 Removal of Protective Clothing

1. Remove any tape and place in the designated collection receptacle.
2. Remove outer gloves, if worn.

3. Remove coveralls, if worn, by peeling off inside out and rolling downward over the shoes or inner booties.
4. Remove booties.
5. Carefully place coveralls in the designated collection receptacle.

> **CAUTION**: Pushing clothing or trash into an already full collection container to compress the contents is forbidden as the act can result in the potential for airborne radioactivity.

6. Have the Radiological Control Technician (RCT) perform a personnel exit survey.

The sequence for protective clothing removal may vary from that described above:

- At the discretion of the RCT, providing job coverage
- As designated in the assigned Radiation Work permit (RWP)
- Dependent upon radiological and hazardous material conditions encountered during the work evolution

4.2.3 Monitoring

4.2.3.1 Exit Surveys

> **Note:** Site conditions may merit only a hand and foot survey. If this is the case, only the hands and shoe bottom are surveyed by the RCT.

1. Use the portable instrument staged for the area of concern, which should have both a visual and an audible response.
2. Ensure that the instrument is set on slow response, if available, and operating with an audible response.
3. Verify that the instrument is operational on the lowest scale and that the area background count rate is acceptable.
4. Hold the detector with the window at approximately ½ inch from the surface being monitored.
5. Move the detector over the surface being monitored at a rate not to exceed 2 to 3 inches per second.
6. If an increase in the audible response is noted, then cease detector movement and allow the meter 5 to 10 seconds to stabilize.
7. Pause (approximately 5 seconds) at the nose and mouth area to check for indications of inhalation/ingestion of radioactive material.
8. Pay particular attention to hands, feet (shoes), elbows, knees, or other areas with a high potential for contamination.
9. If no contamination can be detected as indicated by an alarm or by an audible or visual response distinguishable from background, then exit the area.
10. If an audible or visual response distinguishable from background is noted, then the RCT will further investigate to verify if contamination is present.
11. If personnel are found to be contaminated, proceed to the procedures outlined in Section 4.2.3.2.

4.2.3.2 Contaminated Personnel

1. Notify the PHP of any individual with known or suspected contamination.
2. If the contamination is on a personal article of clothing, then perform the following:
    - Survey the inside surface(s), which was against the skin.
    - Verify that no contamination was transferred to the skin.
3. If the contamination is on the skin, then determine if the contamination is in the form of a hot particle.
4. If the contamination is a hot particle, then:
    - Quickly evaluate the particle.
        - Particle size
        - Radiation type
        - Visible characteristics
    - Attempt to collect and retain the particle for subsequent evaluation.
    - Decontaminate the individual in accordance with Section 4.2.4.
5. If the contamination is not a particle, then:
    - Evaluate the contamination levels.
    - Decontaminate the individual in accordance with Section 4.2.4.
6. Complete the applicable parts of the Personnel Contamination Report (Attachment 1).

4.2.4 Personnel Decontamination

> **NOTE**: First aid measures take precedence over decontamination efforts. The RCT shall request support from qualified medical personnel when an injured person requires decontamination.

1. Perform personnel decontamination in a manner that prevents the spread of contamination to other body parts or the ingestion or inhalation of radioactive material.
2. Take appropriate precautions to minimize the spread of contamination when proceeding from the control point or step-off pad to the decontamination area.
3. Personnel will not be released if detectable skin contamination is present, unless authorized by the PHP.
4. When performing skin decontamination:
    - Exercise care to avoid damaging the skin.
    - If skin irritation becomes apparent, then discontinue the decontamination and notify the PHP.
    - Record results after each decontamination attempt.
    - Indicate the method of decontamination used.
    - Decontamination of ears, eyes and mouth shall be limited to damp swabs, water or saline solution rinses conducted by the individual. Further decontamination shall be performed under the direction of qualified medical personnel.

- Decontamination of nasal passages shall be limited to repeated nose blowing by the individual. Supplemental nasal irrigations shall be performed under the direction of qualified medical personnel, as required.
- Use of decontamination processes or materials other than those listed in Table 4-2 will only be performed under the specific direction of qualified medical personnel.
- Immediately report incidents of individual contamination to the PHP.
- Note the final survey results and time of survey.
- Record the area of the skin contaminated in cm^2 on the Personnel Contamination Report (Attachment 1).
- For contamination distributed over an area greater than or equal to the area of the probe, the measured activity may be assumed to be distributed over the probe area (area of typical pancake probe is 15.5 cm^2).
- If the area of contamination is less than the area of the probe but greater than 1 cm^2, the actual area of the activity must be determined.
- If the contamination area is less than or equal to 1 cm^2, assume an area of 1 cm^2.
- When skin decontamination has been successfully completed, obtain the information needed to complete the Personnel Contamination Report (Attachment 1).
- Complete the applicable parts of the Personnel Contamination Report (Attachment 1).

TABLE 4-2

PERSONNEL DECONTAMINATION METHODS

METHOD	EFFECTIVE FOR	INSTRUCTIONS
Masking Tape	Dry contamination, hot particles	Apply tape to skin by lightly patting. Remove carefully.
Waterless Hand Cleaner	All skin contamination	Apply to affected area and allow it to melt onto the skin. Remove with cotton or soft disposable towel.
Soap and Tepid Water	All skin contamination except tritium	Wash area with soap and lukewarm water. Repeat until further attempts do not reduce the level. A cloth or surgical hand brush may be used with moderate pressure.
Soap and Cool Water	Tritium contamination	Wash area with soap and cool water. Repeat until further attempts do not reduce the level. A cloth may be used with moderate pressure.
Carbonated Water	All skin contamination	Apply to affected area with cotton or soft disposable towel and wipe with dry towel.
Cornmeal Detergent Paste	All skin contamination	Mix cornmeal and powder detergent in equal parts with enough water to form a paste. Rub onto affected area for 5 minutes. Remove with cotton or disposable towel. Rinse skin.
Shampoo	Hair contamination	Wash hair and rinse. Repeat as necessary.
Parafilm	All particulate contamination	Apply to affected area of skin. Remove.
Sweating	All skin contaminations	Cover affected area with impermeable cover (plastic, glove, Parafilm) to cause sweating. Remove after sweating has occurred and wipe area.

4.2.5 Radiological Follow-up

The RCT shall:

1. Ensure that the Personnel Contamination Report (Attachment 1) has been completed.
2. Check the location of the contamination event – Contaminated Area, Hot Particle Area, clean area inside a RCA, or clean area outside RCA.
3. Enter any additional information felt to be pertinent.
4. Complete the "Contamination Event Description and Cause" sections of Attachment 1.
5. If the event was directly related to wearing PC, then complete Section A, "Event Directly Related to Wearing PC."
   - Check the appropriate Contamination Event Description.
   - Check the appropriate Basic Cause.
6. If the contamination occurred while removing PC, then complete Section B, "Event Occurred While Removing PC."
   - Check the appropriate "Contaminating Event Description."
   - Check the appropriate "Basic Cause."
7. If the contamination event was not related to wearing PC, then complete Section C, "Event Not Directly Related to Using PC."
   - Check the appropriate "Contaminating Event Description."
   - Check the appropriate "Basic Cause."
8. Review the report with the individual and have them sign and date the form.
9. Sign and date the form.

The PHP shall:

1. Review the Personnel Contamination Report to verify that all required information has been accurately recorded.
2. Complete the "Radiological Task Supervisor" section.
   - Check the appropriate brackets ([ ]) to indicate actions taken.
   - Enter any comments.
3. Sign and date the form.
4. Request support from the qualified medical personnel when:
   - The personnel decontamination methods provided in this procedure are ineffective; or
   - Injured personnel require decontamination.
5. Determine reimbursements and disposition of personal property that cannot be decontaminated.
6. Forward the completed Personnel Contamination Report to the SHSS for review.

The SHSS shall:

1. Review and sign the Personnel Contamination Report (Attachment 1).
2. Conduct an investigation into the cause of the contamination.
3. Conduct training on the cause of the contamination and lessons learned and preventive measures.
4. Sign and transmit the Personnel Contamination Report (Attachment 1) to the PHP for review.

5.0 RECORDS

The administrative form included in this procedure (Personnel Contamination Report) shall not be modified without the written authorization of the Project Manager and the documented concurrence of the PHP or designee. In no case shall modifications reduce the content required by the original form.

6.0 REFERENCES

Number	*Title*
AEC Regulatory Guide 1.86	*Termination of Operating Licenses for Nuclear Reactors*

7.0 ATTACHMENTS

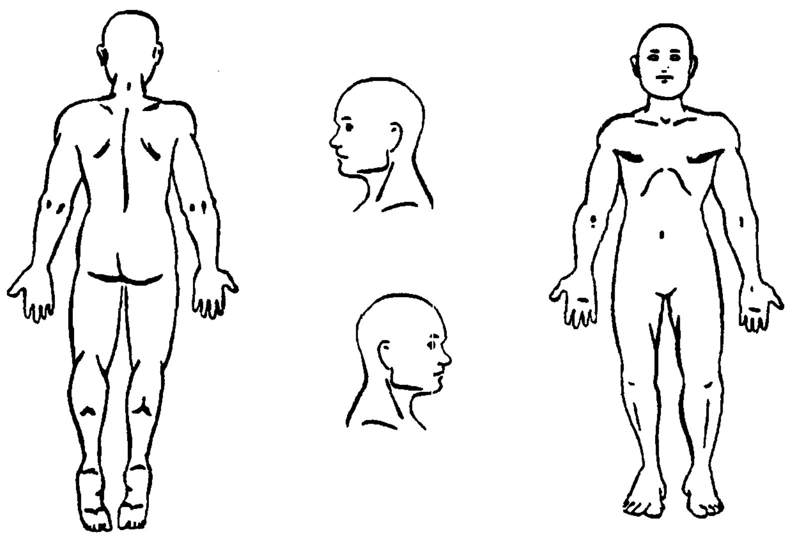
The following form is attached to this procedure:

Attachment 1, Personnel Contamination Report

ATTACHMENT 1

PERSONNEL CONTAMINATION REPORT

Name		Company	Date	Time
EID	Dosimeter#	Dept.	Supervisor	
Instrument		Serial #	Cal. Due Date	
Probe		Serial #	Cal. Due Date	
Location of Personnel Contamination			RWP # Survey #	



Contamination Levels (Use # to reference drawing)					
Number	Time	Initial Count Rate	Size of Area (cm^2)	Time	Final Count Rate

Decontamination Methods	__ Wash __ Number of washes __ Shower __ Number of showers	__ Other:
Radiological Control Technician Signature:		Date
I acknowledge the above information represents the contamination event.		
Individual Signature:		Date

Name EID

CLOTHING CONTAMINATION

Item:	Max cpm	[ ] Decon/Return	[ ] Contaminated/Retained
Item:	Max cpm	[ ] Decon/Return	[ ] Contaminated/Retained
Item:	Max cpm	[ ] Decon/Return	[ ] Contaminated/Retained

RADIOLOGICAL FOLLOW-UP

Location of Event:	[ ] Contamination Area	[ ] Clean area inside RCA	[ ] Clean area outside RCA

Follow-up actions:

Additional information:

CONTAMINATION EVENT DESCRIPTION and CAUSE

A - Event Directly Related To Wearing PC

Contaminating Event Description	Basic Cause
[ ] Contaminated by physical compromise of PC (tear, etc.)	[ ] Improper donning of PC
[ ] Contamination penetration of intact PC	[ ] Improper PC use related to worker knowledge/experience
[ ] Contamination came from PC	[ ] Work area not deconned to extent practicable
[ ] Contaminated skin by touching contaminated item	[ ] Practical limitation of available alternatives
[ ] Contamination came from contaminated liquid	[ ] Improper PC requirement on RWP
[ ] Contamination came from airborne radioactivity	[ ] Improper control by RCT of worker activity in PC
	[ ] Improper laundry/monitoring of PC

B - Event Occurred While Removing PC

Contaminating Event Description	Basic Cause
[ ] Contaminated during removal of hood	[ ] Lack of knowledge in proper methods to remove PC
[ ] Contaminated during removal of respiratory equipment	[ ] Lack of knowledge in proper methods to remove respirator
[ ] Contaminated during removal of outer PC	[ ] [ ] Worker actions while removing PC - accident
[ ] Contaminated during removal of inner PC	[ ] RCT technician actions
[ ] Contaminated during removal of plastics	[ ] [ ] Improper monitoring of PC
[ ] Contamination came from airborne radioactivity	

C - Event Not Directly Related To Using PC

Contaminating Event Description	Basic Cause
[ ] Contaminated while in area designated as clean RCA	[ ] Noncompliance with postings/rad controls
[ ] Contaminated while in area designated clean non - RCA	[ ] Improper monitoring/control of rad material by worker
[ ] Contaminated by liquid	[ ] Improper actions at work area (sitting, lying)
[ ] Contamination spread to area and not identified	[ ] Accidental contact with contamination beyond worker control
[ ] Improper control of airborne radioactive material	[ ] Surveys not appropriate for existing conditions

Health Physics Supervisor

[ ] Interview with job coverage RCT	[ ] Released with residual contamination
[ ] Exclude individual from further RCA access	[ ] Initiated skin dose calculation
[ ] Discussed with individual and supervisor	[ ] No further action required, routine close out

PHP /

Print Sign Date

APPENDIX D-8
STANDARD OPERATING PROCEDURE (SOP) 8
SAMPLING PROCEDURES
FOR RADIOLOGICAL SURVEYS

1.0 PURPOSE

This procedure will be used by Tetra Tech EC, Inc. (TtEC) personnel and its subcontractors to perform swipe sampling and sampling of various types of media including soil and water. This procedure also details sample packaging and transporting samples to the laboratory.

2.0 SCOPE

This procedure shall be implemented by TtEC staff and subcontractor personnel when collecting samples on field projects related to radiological surveys.

3.0 DEFINITIONS AND ABBREVIATIONS

Swipe Samples – Swipe samples are materials, which after being wiped over a surface, are analyzed to determine the presence of removable radioactivity on the surface area that was wiped.

Soil Samples – Soil samples are defined as soil collected for analytical purposes. Soil samples will be collected for confirmation and waste characterization purposes as well as from import fill material.

Liquid Samples – Liquid samples are defined as liquid collected for analytical purposes from rinsate and liquid investigation-derived waste.

4.0 SAMPLING PROCEDURE DETAILS

4.1 General Procedures

Field instruments used for measurements required by this procedure shall be checked with standards and verified to have current calibration.

Anytime this procedure is in effect, the Project Health Physicist (PHP) (or qualified designee) should ensure, by periodic personal observation, that samples are appropriately collected and controlled.

Surface scan surveys are to be performed at each location before initiating sampling. This will identify the presence of gross contamination, which will require that samples and equipment be treated as radioactive and handled in accordance with applicable license requirements. Samples will be recorded on chain-of-custody (COC) documentation.

4.2 Sampling Procedure Process

Sample activities will be recorded in the field logbook as directed by the applicable Sampling and Analysis Plan (SAP). Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.

4.2.1 Swipe Sampling

Swipe samples will be obtained in accordance with Appendix D-6, Radiation and Contamination Surveys. Swipe samples will be documented in the sample logbook as applicable. Sample COC records shall be completed in accordance with the SAP.

4.2.2 Soil Sampling

1. Soil samples will be collected with a hand-auger, slide hammer, disposable scoop, En Core sampler, or equivalent. The sampling protocol is described in detail in Section 6.3 of the SAP.

4.3 Sample Packaging and Transport

Samples will be delivered for analysis to an on-site laboratory via a box, cooler, or similar container (ice is not required if only radiological analysis will be performed) along with the completed COC. Upon arrival at the on-site laboratory, the sampler will sign the "Relinquished By" on the COC, and the laboratory manager will sign the "Received By" on the COC. The white copy of the COC will be submitted with the final analytical report of data from the on-site laboratory to the TtEC project chemist, the pink and yellow copies will be maintained by the on-site laboratory for their project files, and the manila copy will be submitted to the TtEC project chemist. A duplicate of the manila copy may also be kept in the TtEC project file on site.

Ten percent of the solid or liquid samples analyzed by the on-site laboratory will be sent to an off-site laboratory for quality assurance purposes. Additional samples may be sent for off-site analysis, as described in the Time-critical Removal Action Work Plan. A new COC will be generated by the laboratory manager for samples designated for off-site laboratory analysis. Samples designated for transport off site will be packaged in accordance with applicable Department of Transportation (DOT) and International Air Transport Association (IATA) procedures. At a minimum, sample containers will be placed in a box, cooler, or similar container for shipment and packaged with bubble wrap or other materials as necessary to prevent container breakage.

For samples transported by an off-site laboratory courier, two custody seals will be taped across the lid of the box or cooler: one seal in the front and one seal in the back. The appropriate section(s) of the COC will be completed by the assigned courier. The box/cooler and the top two copies (white and pink) of the COC will then be released to the courier for transportation to the laboratory.

For samples shipped via a commercial carrier, the COC will include the airbill number, and the "Received By" box will be labeled with the commercial courier's name. The top two copies (white and pink) of the COC will be sealed in a resealable bag and then taped to the inside of the sample cooler lid or placed inside the box. The yellow copy of the COC will be maintained by the on-site laboratory and the manila copy will be submitted to the TtEC project chemist. A duplicate of the manila copy may also be kept in the TtEC project file on site. The box/cooler will be taped shut with strapping tape as necessary. Two custody seals will be taped across the lid: one seal in the front and one seal in the back. The pouch for the airbill will be placed on the box/cooler and secured with clear tape. The airbill will be completed for priority overnight delivery and placed in the pouch. If multiple boxes/coolers are being shipped, then the original airbill will be placed on the box/cooler with the COC, and copies of the airbill will be placed on the other boxes/coolers. The number of packages should be included on each airbill (1 of 2, 2 of 2). Saturday deliveries should be coordinated in advance with the designated off-site laboratory and placement of "Saturday Delivery" stickers on each box and/or cooler to be shipped should be confirmed with the commercial courier prior to release. Prepared packages will also be surveyed prior to shipment.

5.0 RECORDS

Sample collection records will include field logbooks and COCs. These records will be completed and maintained in accordance with the SAP.

6.0 REFERENCES

Number	*Title*
Appendix D-6, SOP 6	*Radiation and Contamination Surveys*

7.0 ATTACHMENTS

None.

APPENDIX D-9
STANDARD OPERATING PROCEDURE (SOP) 9
DECONTAMINATION OF EQUIPMENT AND TOOLS

1.0 PURPOSE

This procedure provides instruction and methods for the decontamination of equipment and tools that are contaminated with radiation.

2.0 SCOPE

This procedure provides the methods Tetra Tech EC, Inc. (TtEC) personnel and its subcontractors will use for decontamination of equipment and tools that are contaminated with radioactive material.

3.0 DEFINITIONS AND ABBREVIATIONS

Decontamination – The processes whereby contamination can be safely and effectively removed from equipment and tools.

HERCULITE® – A plastic or polyethylene floor covering and containment material used for decontamination operations. HERCULITE is a brand name.

Material Safety Data Sheet (MSDS) – Manufacturer directions, safety information and limitations for use of decontamination-related solvents or cleaning solution.

4.0 PROCEDURE DETAILS

4.1 General

4.1.1 Precautions

The following precautions shall be observed during decontamination activities:

- Decontamination of contaminated tools or equipment shall be performed under the supervision of the Radiological Control Technician (RCT) providing the job coverage.

- Controls to contain the spread of loose contamination during the decontamination activity shall be planned and established prior to the decontamination of equipment, material, and tools.

- Use of chemicals or solvents for decontamination purposes that have the potential to produce mixed waste shall be avoided whenever possible. Use of these chemicals or solvents requires the prior approval of the Project Health Physicist (PHP) and Radiological Affairs Support Office (RASO).

- Survey instruments that will be used to survey suspected contaminated equipment or tools should be protected (wrapped in plastic, etc.) against possible contamination before use.

- Abrasive measures should only be applied to surfaces that are not critical for operation of devices being returned to working condition.
- Electric power tools should not be used on a wet working surface. Liquids will be kept away from electric power tools.

4.1.2 Limitations

The following limitations apply to decontamination activities:

- Protective clothing worn by the personnel involved in decontamination activities as determined by the PHP.
- Decontamination cleaning solvents/solutions shall only be used in accordance with the directions and limitations listed on the manufacturer-supplied MSDS.
- Contamination controls shall be observed throughout a decontamination operation.
- Radiation and contamination surveys shall be performed in accordance with the provisions of Appendix D-6, Radiation and Contamination Surveys.
- Release of equipment and tools from the decontamination area shall be performed in accordance with Appendix D-5, Release of Materials and Equipment from Radiologically Controlled Areas.

4.2 Pre-Decontamination Preparation

The following steps shall be used for pre-decontamination preparation:

1. The PHP, or designee, shall review available data regarding the item(s) requiring decontamination and develop a decontamination approach based on conditions of the Radiation Work Permit (RWP) and the cost-effectiveness of the operation versus disposal costs.
2. A radiological survey shall be performed to identify the level of radioactive contamination that is present by an RCT on objects that are to be removed from a controlled area.

4.3 Establishment of the Decontamination Area

The PHP, working with the Project Manager, shall determine a location for setup of the decontamination area. As applicable to the specific decontamination activity being performed, the decontamination area may consist of and contain one or more of the following (as needed):

- Covered floor surfaces. A double-layer of HERCULITE (or equivalent) may be laid on the floor at the direction of the RCT.
- Covered (HERCULITE or equivalent) wall surfaces.
- Engineering controls (high-efficiency particulate air [HEPA] ventilation, vacuum cleaners, containment tent walls, glove bags, etc.). Engineering controls shall be determined on the basis of the as low as reasonably achievable (ALARA) philosophy.
- Safe, sturdy work stations with contamination-resistant surfaces, tables that will support decontamination attempts on heavy pieces of equipment.
- Adequate lighting, electrical and compressed air supply for the operation of electrical and/or pneumatic-driven equipment.

- Overhead lifting equipment.
- Adequate supply of approved cleaning solutions and solvents; adequate supply of decontamination equipment such as:
  - Light-duty decontamination equipment such as paper wipes, paper towels, masslin towels, etc.
  - Medium- to heavy-duty decontamination equipment such as scrub pads, wire brushes, steel wool, files, sandpaper, etc.
  - Fully stocked hand tool kit for disassembly of contaminated equipment
  - Power tools, such as drills, saws, needle-guns, electric screwdrivers, etc.
  - Radioactive material storage bags and stickers
  - Buckets, barrels or drums for the storage of contaminated liquids, sludges or slurries
  - Blotter paper or sorbent
  - Approved absorbent material such as oil dry
  - Storage drums/bags for the storage of contaminated protective clothing
  - Proper surveillance instruments (air monitor/sampler, contamination monitor, friskers, exposure rate meter, etc.)
  - Adequate supply of personal protective clothing, gloves, respiratory equipment
  - A designated area within the decontamination area for the segregation of radioactive waste
  - Fire extinguisher(s)

4.4 Item Preparation for Decontamination

Contaminated or controlled items should always be escorted under the direction of a RCT to the decontamination area.

If an item is wrapped, position it so that the written information on the wrapping is visible and then perform the following:

- The RCT shall direct the removal of the item from the wrapping in such a manner (rolling plastic wrapping inside out, etc.) to control the spread of contamination.
- An item that is highly contaminated with removable contamination may need to be misted with an approved liquid to minimize the possibility of creating airborne contamination.
- Once the item has been removed from the wrapping and has been properly positioned, discard the wrapping as radioactive waste.

The following conditions shall be considered for the decontamination of equipment and tools:

- Any equipment with inaccessible areas shall be dismantled so that all surfaces are accessible for decontamination and survey.
- Decontamination shall be performed in a safe, effective manner.
- The RCT shall be notified immediately if the job conditions change (e.g., suspected asbestos is found, the presence of mercury in a switch or a light bulb, a fluid leak, or any other special circumstances).

- A fire watch shall be assigned to watch if any spark-producing decontamination techniques (grinding, etc.) are used. There shall be a dedicated fire extinguisher located within the decontamination area.
- The decontamination area shall remain organized and free of debris. The Radiological Control/ Decontamination Technicians shall "clean as they go."
- Air monitoring for airborne radioactivity shall be conducted as needed or directed by the PHP.
- A HEPA vacuum cleaner may be used during the decontamination operation.

4.5 Decontamination of Removable Contamination

When an item is properly positioned for decontamination and the pre-survey activities have been completed, the RCT will perform one or more of the following activities in accordance with the decontamination action approach approved by the PHP:

- Moisten the surface of the item with an approved liquid.
- Fold a paper or cloth wipe into sections. Using one surface of the wipe, gently wipe contamination off in one direction away from the user's body to reduce the possibility of personnel contamination.
- Re-fold the paper or cloth wipe so that a clean surface is available to prevent cross-contamination and continue until item is ready for survey.
- For some equipment or tools, duct tape will effectively remove removable contamination. Wrap the duct tape loosely around the gloved hand, adhesive side out. Roll the tape over the contaminated area.

4.6 Decontamination of Fixed Contamination

There are many techniques that can be used to remove fixed contamination. The general idea is to remove the material that is fixing the activity to the surface, or remove a very thin layer of the surface material. It is very important to note that fixed contamination decontamination methods can and do result in the creation of removable surface contamination. This creates a condition that may generate airborne radioactive materials. The activities should be controlled in such a manner that airborne radioactivity is minimized. Air sampling shall be performed during these operations to properly evaluate any resultant airborne radioactivity.

For the purposes of this procedure, the potential removal techniques have been divided into the following two categories:

- Abrasive hand decontamination
- Power tool decontamination

In addition, the following methods could be used, but are not defined in this procedure and would require the development of a Task-specific Plan or Work Instruction:

- Machine decontamination (use of abrasive bead blasters, grit blasters, high-pressure water wash systems, etc.)
- Cleaning solutions/solvents (use of ultrasonic cleaners, acid baths, electropolishing, etc.)

The actual method or combination of methods applied will be in accordance with the decontamination approach approved by the PHP.

4.6.1 Abrasive Hand Decontamination

Abrasive hand decontamination shall be performed in the following manner:

1. Remove as much removable contamination as possible as indicated in Section 4.5 of this procedure.
2. Moisten the surface of the item(s) to help contain contamination.
3. Use an abrasive cleaning tool (e.g., sandpaper, steel wool, steel brush, hand grinder, etc.) to loosen fixed contamination. Clean in one direction only, away from the body to prevent personnel contamination.
4. Continue to moisten the surface of the item(s) to contain contamination.
5. Remove as much of the loosened contamination as possible as per Section 4.5 of this procedure.

4.6.2 Power Tool Decontamination

Power tool decontamination shall be performed under the direction of the RCT, with concurrence from the PHP.

4.6.2.1 Electric Power Tools

Electric power tools that may be used in decontamination operations are:

- Drills – used to drill out contaminated areas, to disassemble contaminated components, and when used with grinding wheels or disks, may be used as an abrasive tool
- Saws – used to separate contaminated pieces from clean pieces
- Grinders – used to grind fixed contamination from surfaces
- Electric screwdrivers – used in the disassembly of component parts

4.6.2.2 Air-powered Tools

Air-powered tools that may be used in decontamination operations are:

- Needle gun – a pneumatic tool that can remove contamination from concrete and/or steel surfaces
- Socket tools or impact hammer – used in disassembly of component parts
- Jackhammer/rotary hammer – a pneumatic tool which can remove contamination from concrete and/or steel surfaces

4.6.2.3 Decontamination of Power Tools

Power tool decontamination shall be performed in the following manner:

1. Remove as much removable contamination as possible as per Section 4.5 of this procedure.

2. Moisten the surface of the item lightly to help contain contamination. Use a spray bottle for moistening.
3. Whenever feasible, the use of containment devices (e.g., glove box, etc.) should be used to contain the spread of contamination when using power tools for decontamination operations.
4. Use the power tool to remove fixed contamination. Clean in one direction only and away from the body to prevent personnel contamination.

4.7 Post-Decontamination

Following decontamination procedures, the RCT shall perform a release survey. The survey will include the work area and any tools, equipment and materials used during decontamination activities and shall be conducted in accordance with Appendix D-5, Release of Materials and Equipment from Radiologically Controlled Areas. Post-decontamination release shall be performed as follows:

1. If the item satisfies the criteria for release, remove the item to a holding area and document results.
2. If the item remains contaminated, inform the PHP and repeat the decontamination.
3. If the item remains contaminated, attempt a third decontamination only by direction of the PHP.

If an item cannot be effectively or economically decontaminated, the Project Manager may direct the crew to volume-reduce (reduce to component parts) the equipment, material, or tools as much as possible. If the item is expendable, the individual parts may be surveyed and released.

Any tools, equipment or materials that cannot be decontaminated will be packaged in an appropriate waste container for subsequent disposal as radioactive waste. The waste containers will be staged in an area agreed upon by RASO and the Department of the Navy.

After decontamination operations have been completed, an RCT shall perform a release survey of the decontamination area in accordance with Appendix D-6, Radiation and Contamination Surveys and Appendix D-5, Release of Materials and Equipment from Radiologically Controlled Areas.

5.0 RECORDS

The records generated by the use of this procedure are documented in accordance with the provisions of Appendix D-5, Release of Materials and Equipment from Radiologically Controlled Areas.

6.0 REFERENCES

Number	***Title***
Appendix D-5, SOP 5	*Release of Materials and Equipment from Radiologically Controlled Areas*
Appendix D-6, SOP 6	*Radiation and Contamination Surveys*

7.0 ATTACHMENTS

None.

APPENDIX D-10
STANDARD OPERATING PROCEDURE (SOP) 10
DRUM HANDLING PROCEDURES

1.0 PURPOSE

The purpose of this procedure is to define Tetra Tech EC, Inc. (TtEC) standards and minimum requirements for work activities involving drum and container handling and sampling and to ensure compliance with the requirements of 29 Code of Federal Regulations (CFR) 1910.120(j).

2.0 SCOPE

This procedure shall be implemented by TtEC staff and subcontractor personnel when buried drums, containers or jars are encountered during soil excavation activities.

3.0 BURIED DRUMS, BOTTLES, JARS AND CONTAINERS WITH UNKNOWN CONTENTS

The following sections outline the procedures for handling and removal of buried drums, bottles, jars and/or containers (containers) unearthed during excavation. The procedure addresses the identification and inspection of buried containers, their recovery and removal from the excavation, Hazardous Categorization (HazCat), waste categorization sampling, temporary staging on site and disposal.

Specialized equipment, tools, and supplies that may be required for container removal activities include (the need for the specialized equipment will be evaluated on a case-by-case basis):

- Excavator equipped with drum grappler, bladed bucket (demolition grading)
- Loader/backhoe
- Shovels
- Blast shields for personnel protection
- Non-sparking/brass hand tools
- Remote drum opener/punch
- Air monitoring equipment, flame ionization detector (FID), photoionization detector (PID), radiation meter, combustible gas indicator/oxygen meter or similar
- Level B personal protection equipment (PPE) to include: saranax suits, silvershield gloves, supplied air respirators
- Over-pack containers
- Spill containment kit (pads, oil dry, etc.)
- ABC fire extinguisher
- Air/water hoses
- Pumping equipment
- Radiation detection instrumentation
- Sampling and characterization kit

- Camera
- Labeling equipment

The following sequence will be followed once a container is encountered during the excavation activities:

1. Uncovering chemical or unknown containers
2. Previous site characterization data review (see geophysical survey results)
3. Mobilization of recovery team for evaluation/inspection of exposed containers
4. Establishment work zones/containment
5. Radiological screening of containers
6. Material excavation and transfer
7. Waste compatibility screening/HazCat
8. Container sampling
9. Over-packing or lab-packing (container selection conducted following the HazCat analysis)
10. Segregation, sampling and containerization of soil impacted with chemicals from the unknown containers
11. Labeling of all containers with preliminary determination and accumulation start date and staging of all containers within the 90-day accumulation area
12. Pre-disposal analysis and authorization for disposal
13. Final labeling of containers based on analytical results
14. Preparation of manifests
15. Loading, transportation and disposal

Weather conditions will be considered prior to excavation where the probability of encountering drums, containers, cans, etc. is high. Primary weather concerns are wind direction/velocity and precipitation. Wind direction will be considered and a safe distance during the removal of unknown contaminants will be established to ensure that workers downwind are not at risk. Airborne releases may be controlled by water mists, foam blankets, airtight enclosures, covering the container with earthen materials, or other suitable means. Precipitation is a concern due to the potential for contaminant migration (including inadvertent discharge, overflow, etc.), cross contamination, and chemical reactions. The potential for cross contamination and materials migration can be controlled by berms, trenches, covers, and/or sumps.

3.1 Excavation of Containers and Soil

Once a container with unknown content has been uncovered, all nonessential personnel will remain a minimum 25 feet away from the excavation area. When possible, personnel should be upwind of the excavation and behind a solid barrier such as a berm, vehicle or heavy equipment. A recovery team will be deployed to inspect the container and/or area with unknown chemicals and together with the Site Superintendent determine the approach for the removal.

The excavation area will be examined to determine the general condition and burial depth of the containers. Air monitoring will be performed to determine if contaminant concentrations within the excavation exceeds background readings. If radioactive materials are encountered, work will not proceed until the Site Health and Safety Supervisor (SHSS), who will also possess the required training to act as the site radiation safety officer, has inspected and evaluated the situation. Removal of radioactive material and mixed waste will be carried out in accordance with this Time-critical Removal Action (TCRA) Work Plan.

Once an area with containers of unknown materials is uncovered, and after air monitoring has been conducted, the recovery team will inspect for external markings that may reveal the drum or container content and/or generator. If the container is a drum, the feasibility of using a mechanical grappler will be evaluated. If the burial site is severely decayed, the appropriateness for mass excavation of the site will also be evaluated.

Prior to physically handling any container, the following checklist will be applied:

1. Is the container radioactively contaminated?
2. Does the container appear to be intact or open/damaged? Does the container exhibit leakage or deterioration (i.e., is it unsound)?
3. Does the container exhibit apparent internal pressure?
4. Is the container empty?
5. Does the container contain markings that would indicate that the contents are potentially explosive or reactive?
6. If the container is open or broken, does the container contain radioactive material(s)?

Specific items to look for when evaluating the integrity of buried containers include corrosion, rust, scaling, leakage, crystallization, bulging, smoking, hissing, fuming, unusual discoloration, etc. If compressed gas cylinders are discovered, they will be inspected thoroughly by a competent employee prior to movement.

The primary requirement for successful movement of a container is the integrity of the container shell; if the walls or ends are decayed, lifting of the container safely may not be possible.

After the exposed face of the burial site has been examined and the approach determined, the equipment operator can begin removing the containers.

3.2 Mass Excavation

Mass excavation is usually performed when containers containing solid matter are in a serious state of decay, indistinguishable from one another, the contents are compatible, and the issue of ownership has been determined or there is little possibility of finding meaningful evidence of origin or prior use.

Prior to excavation, the area will be surveyed for radioactive material, as well as inspected for compressed gas cylinders or other similar pressurized containers or surficial large containers with contents. The burial area will be excavated or removed in an orderly manner. Once the area to be excavated has been evaluated to be safe for mass excavation and clearly delineated, the removal activities can start. The excavated soil and container materials will be spread out at a temporary laydown area consisting of two 20-mil layers of polyethylene, polyvinyl chloride (PVC) liner or solid polyethylene trays as appropriate located next to the identified burial site. A recovery team in Level B PPE will go through and remove containers from the excavated material. Liners will be inspected for evidence of breaches (including breaks, bubbles or distortion) on a frequent basis. If liner breaches are observed, the field team will evaluate substitution to solid trays. The excavated soil will be segregated for separate waste profile sampling and disposal. Each waste container will be sampled and analyzed for radioactive material and waste compatibility screened (HazCat). The excavated material will also be isolated from any potential source of run-on from surface water or other liquids. Areas with pooled liquids will be pumped dry and the liquids contained.

4.0 CONTAINER IDENTIFICATION NUMBERS

Prior to removal of the container, a unique container identification number will be assigned to each buried container in accordance with an established numbering system for the project. The identification number will be marked on the exterior of the container with fluorescent paint or a grease stick, by application of a label, or by other approved means. The expected duration of any anticipated temporary storage will be considered when determining the type of marking/labeling system to be employed. Some markings, such as grease pencils and fluorescent paints, may become illegible after relatively short exposures to the environment.

The following information will be recorded in the field logbook:

- Container number
- Name of person logging data
- Date and time of container removal
- Container type
- Location where container was found
- Container condition
- Container size
- Labels and markings
- Disposition of container
- Photographic documentation

Once the condition of a container has been determined, it will be removed from the excavation either individually or by mass excavation. If necessary, containers will be transferred into an over-pack container prior to removal from the excavation. Each container or over-pack will be assigned a unique number, which will be marked on the exterior using either fluorescent paint or a grease stick. The drum number will also be recorded in the TtEC site drum log. If there is evidence of container breakage or leaking, soil generated and associated with mass excavation of small containers or bottles will be segregated, analyzed and profiled for disposal.

5.0 HANDLING AND STAGING OF CONTAINERS

Moving and transporting containers will be accomplished with the use of mechanical equipment. Manual handling of containers will be kept to a minimum and only used should mechanical equipment not be practical. Remote container handling equipment may consist of a grappler-equipped backhoe or front-end loader. Container transportation will be with front-end loaders or fork lifts with modified carrying platforms. Handling and transport equipment will be equipped with full frontal and side splash shields as appropriate. Container handling equipment will be fitted with a Class ABC fire extinguisher that is immediately accessible to the operator. The size and number of extinguishers will be determined by the SHSS.

Special Handling

Containers exhibiting the following characteristics require special treatment in handling and sampling:

- Leaking or deteriorated drums
- Bulging drums

- Drums containing explosive or shock-sensitive waste
- Drums containing or contaminated with radioactive waste
- Packaged laboratory wastes (Lab-packs)
- Air reactive waste

When containers are moved, they will be taken to an upwind staging and sampling area located upwind of the burial site or excavation area. This area will be away from other drums on the site until HazCat analysis to prevent a chain reaction from occurring between incompatible materials.

5.1 Leaking of Deteriorated Containers

If containers exhibit leakage or apparent deterioration such that movement may cause rupture (determined by the SHSS or recovery team lead), they will immediately be inspected and, if deemed appropriate, transferred to an over-pack drum.

5.2 Bulging Containers

Containers that potentially may be under internal pressure, as evidenced by bulging, will be sampled in place. Extreme care will be exercised when working with and adjacent to potentially pressurized containers. Should movement of a pressurized drum be unavoidable, they will be handled only by a grappler unit constructed for explosive containment. The bulging container will be moved only as far as necessary to allow seating on firm ground or it will be carefully over-packed.

Any open bungs or drill openings in pressurized containers will be plugged with pressure-venting caps set to a 5-pound-per-square-inch (psi) release to allow venting of vapor pressure as outlined in the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (National Institute for Occupational Safety and Health [NIOSH], 1985). Creation of explosive conditions will be avoided. If intact, compressed gas cylinders when encountered will be handled and removed by a specialized gas cylinder disposal subcontractor.

5.3 Containers Containing Explosive Shock-sensitive Waste

If containers are found containing wastes that have been identified by prior sampling or are suspected by visual examination to be explosive in nature, the Site Superintendent and SHSS will be notified immediately, before the drums are handled in any way. If the Site Superintendent and/or SHSS approve handling of these drums, they will be handled with extreme caution. Initial handling will be by a grappler unit constructed for explosive containment. Containers will be palletized prior to transport to a hazardous waste interim storage area prior to disposal.

If at any time during remedial activities, an explosive, pursuant to provisions of Title 18, United States Code (USC), Chapter 40 (Importation, Manufacture, Distribution, and Storage of Explosive Materials, 1975 Explosives List) is identified, it will be secured and the appropriate state and federal agencies notified. Identification of an explosive substance will be done by an on-site Unexploded Ordinance (UXO) Technician. Potentially explosive materials usually may be identified by their physical characteristics (texture, color, density, etc.), as well as the way they are packaged or labeled. Most explosives are solids. In some cases, they are packaged in water-tight containers to exclude water, while in other cases, they are packaged wet to preclude explosion.

Prior to handling or transporting containers containing explosive wastes, personnel working in the area will be removed to a safe distance (as determined by the SHSS). Continuous contact between handlers and the Site Superintendent and the SHSS will be maintained until handling or transporting operations are complete. An audible siren signal system, similar to that employed in conventional blasting operations, will be used to signify the commencement and completion of explosive waste handling or transporting activities.

5.4 Containers Containing Radioactive Waste

Containers containing radioactive or mixed wastes may be encountered at the site; however, no container will be handled until radiation and contamination levels have been determined by an initial field survey. The survey will include direct radiation and contamination measurements, as detailed in Appendix D-1, Radiation and Contamination Surveys, and Appendix D-8, Sampling Procedures for Radiological Surveys.

5.5 Packaged Laboratory Wastes

If individual containers suspected of containing discarded laboratory chemicals, reagents or other potentially dangerous materials in small volumes are found, the Site Superintendent and SHSS, who will possess the necessary training to act as the Site Radiation Safety Officer, will be notified immediately, prior to any removal or opening of the containers or bottles. If the Site Superintendent and/or SHSS approve the handling of these containers, they will be handled with extreme caution. Until otherwise identified or categorized, they will be considered explosive or shock sensitive wastes and will be handled as described in the section above.

5.6 Air Reactive Wastes

If the presence of an air reactive substance is verified or suspected, as concluded by the recovery team, the material will be immediately segregated and transported to a separate hazardous waste interim storage and disposal area.

Air reactive wastes may be discovered during opening or sampling operations. Air reactive substances normally require special packaging. They may be stored under water or some other liquid to minimize air contact. They may also be found in sealed ampules, corrugated drums, stainless steel canisters, or specially lined drums. If conditions become reactive, clean sand can be used to smother flammable materials.

6.0 OVER-PACKING OF DRUMS

An over-packing station will be constructed adjacent to the burial site in the temporary laydown area. Straw bales, 20-mil high-density polyethylene (HDPE), PVC liner and/or solid polyethylene trays may be used for construction of this station. In situations where over-packing needs to take place outside the excavation boundary, it will be carried out on top of already existing pads. Only materials screened for radioactive materials may be over-packed.

When using mechanical equipment, the equipment operator will pick up a container from the burial area, move to the over-pack station, and gently slide the container into the over-pack. When handling a container, whether by mechanical means or by hand, the container will be examined for any sign of collapse or excessive leaking prior to lifting. The container will only be lifted as high as necessary to clear obstacles between the point of removal and the staging/over-pack area. Safe lifting practices will be observed at all times.

After the container has been screened for radioactive materials, it can be placed into the over-pack, and the lid of the defective container can be pierced with a brass punch. The brass punch is attached to the bucket of a backhoe, or other remotely operated device. The brass punch will be surveyed for radioactive contamination after piercing the container. The purpose of this operation is to provide an access port for sampling. Following this operation, the drum is either sampled or prepared for movement to the sampling area. Preparation for movement includes placing a stopper in the access port and securely installing the over-pack drum lid.

7.0 CONTAINER SAMPLE COLLECTION PROCEDURES

Sampling activities will be coordinated with the over-packing operations or container HazCat analysis. Sampling protocols are established in the Sampling Analysis Plan (SAP), Appendix B. All containers will be sampled and analyzed for the presence of radioactive materials. Samples collected for radiological analyses will be collected using Appendix D-8, Sampling Procedures for Radiological Surveys. Samples will be analyzed by gamma spectroscopy and for gross alpha/beta. Additional analysis may be requested based upon sample results. Smaller containers and bottles will be transported in a safe manner to the HazCat area, the location to be established upon mobilization to the field. The terms "waste compatibility screening" or "HazCat," as used in this document, refer to a series of rapid, qualitative chemical and physical tests conducted to determine potential hazards, handling precautions, storage criteria and disposal classification of the material in question. Container sample material will not be shipped until waste compatibility results have been reviewed and radiological screening complete.

7.1 Container Sampling for Waste Compatibility Screening/Hazardous Characterization

All containers or over-packs will be kept sealed and resealed after sampling to prevent the escape of vapors and possible reactions from intrusion of rainwater, air, etc.

No container sampling may be performed until the drum has been examined from a health and safety standpoint. If radiation levels greater than 3 sigma above background are not detected, the SHSS, in conjunction with the Radiation Control Technician (RCT), may then, at their discretion, issue clearance to begin field sampling of inspected drums. If containers are deemed non-radioactive, sampling can take place.

Containers identified as containing radioactive material (radioactivity greater than 3 sigma above background) will require support from a RCT during the opening or sampling.

The SHSS will continuously monitor the atmosphere around the work area before and during sample collection to ensure that sampling personnel employ an appropriate level of respiratory protection. Air sampling for radioactive particulates will also be performed.

During sampling, a thorough qualitative visual description of the contents of each container will be obtained and recorded in the Container Removal Inventory Logbook. This initial visual characterization includes noting the following:

- Any and all exterior markings (photographing if practical)
- Any unique or unusual container conditions (e.g., reinforced, lined, exotic construction materials, etc.) and the type of opening(s)
- The approximate amount of material contained in the container
- Physical state, color, clarity, viscosity, number and relative estimated volume of each identified discrete layer or phase
- Readings from real-time monitors

For liquids, samples will be extracted through the bunghole, if there is one on the container. If the container contains mostly solid material rather than liquids, the entire top of the container will be removed and the contents will be sampled for chemicals in a star pattern. Sampling for radiological material will be executed in accordance with Appendix D-8, Sampling Procedures for Radiological Surveys. Using the appropriate sampling device or a combination of devices, several representative grab samples with a combined volume of approximately 250 milliliters (mL) will be withdrawn and carefully placed into a labeled, clean, clear glass sampling container with a Teflon-lined plastic lid. If a container contains more than one phase (e.g., solids and liquids or multi-phase liquids), separate samples are to be taken from each phase. If the volume of any individual phase is so small as to preclude recovery of a sufficient sample, a remark to this effect will be recorded in the Container Removal Inventory Logbook.

Information to be entered into the field logbook during sampling activities may also include the following:

- Container contents
- Physical state
- pH
- Air monitoring results
- Color
- Clarity
- Thickness of layers
- Radiological monitoring results
- Other observations

The log should be photocopied, a chain-of-custody completed, and samples delivered to a State of California-certified analytical laboratory.

Used disposable sampling equipment, paper towels or waste rags used to wipe up spills will be placed into an empty metal container for subsequent disposal. If glass tubing is used, it may be broken and left inside the container being sampled.

The bung or covers on containers will be replaced and the top of the over-pack secured, if used. Two custody seals will be affixed to opposite sides of the outermost cover, lid or across the bung opening.

The outside surface of the sample containers will be thoroughly cleaned then transferred to the HazCat area (to be determined upon mobilization) where the HazCat technician(s) will carry out waste compatibility screening. The waste compatibility screening tests include:

- Water reactivity (air or water reactive)
- Miscibility (aqueous vs. organic solubility)
- Flammability and explosivity
- pH
- Presence of sulfide and cyanide
- Presence of significant halogen content
- Presence of oxidizers and peroxides
- Field compatibility for uncharacterized wastes

7.2 Sampling of Intact Excavated Drums and Large Containers

The required method of opening drums is by remote means. Three types of equipment for opening drums remotely are available: the bung spinner, the remote-controlled drill, and the hydraulic or pneumatic drum piercer. When any of these pieces of equipment are used, the opening device is attached to the drum and the control lines are extended to their maximum length (typically 100 feet). Drum-opening personnel will operate the controls from behind sandbags, a concrete or brick structure, or other solid barriers. The contact surfaces of the drum opening equipment will be decontaminated after each use. The drum opening equipment will be surveyed for radioactive contamination prior to chemical decontamination.

7.3 Resealing Containers

All drums/containers opened during the sampling investigation need to be resealed to prevent the escape of vapors and any possible reactions with rainwater, air, etc. The resealing methods will depend on the opening methods used and will include the following:

- Replacing the bung, screw cap, etc.
- Replacing the lid and retaining ring
- Placing the drum in an over-pack
- Using the non-reactive special rubber or plastic plug if a hole was drilled. If used, these plugs will be checked periodically for soundness since material within the drum may react with the plug and cause it to corrode/leak. A drum bonnet will also be used to ensure that rainwater does not seep around the plug.

These sealing methods are for the purpose of preventing leakage from containers while in storage on site. If a container is moved off site, Department of Transportation (DOT) drum sealing requirements must be met. DOT regulations generally have more rigorous sealing procedures than the sealing methods listed above.

Once containers are sampled and resealed, they will be placed where they cannot react with other containers on the site. Slowly progressing chemical reactions can start when a container is moved and/or opened, as the contents get exposed to air and/or disturbed by handling the drum. Such a reaction could take hours or even days to occur. Segregation of the containers will be carried out according to hazard class, to prevent any potential chemical reactions between containers. For a small number of containers, the storage area(s) may be the staging and opening area. Mixed waste will be transferred and stored in the mixed waste storage area.

Sample identification, packaging, shipment and analytical protocols are provided in the SAP (Appendix B).

8.0 STAGING

Containers will be stored in a secure area according to compatibility grouping. The staging area will be located in a remote or controlled environment area away from other operations. Staging area construction usually includes: an impermeable liner, secondary containment, run-on collection systems, a roof, and a location above the floodplain. The minimum requirements may be met with double 20-mil liners, straw bales for sidewalls, a tarp cover, and caution tape.

9.0 RECORDS

Drum inventory records will include field logbooks and tracking forms. These records will be completed and maintained in accordance with the TCRA Work Plan.

10.0 REFERENCES

National Institute for Occupational Safety and Health (NIOSH). 1985. *Occupational Safety and Health Guidance for Hazardous Waste Site Activities*.

APPENDIX D-11
STANDARD OPERATING PROCEDURE (SOP) 11
MPPEH REMOVAL

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish procedures for the recovery, processing and disposition of recovered Material Potentially Presenting an Explosive Hazard (MPPEH) in support of the Time Critical Removal Action (TCRA) at Installation Restoration (IR) Site 1, Operable Unit 3 (OU-3) of the former Naval Air Station (NAS) Alameda, Alameda Point, Alameda, California, by Tetra Tech EC, Inc (TtEC). Figure 1-1 shows the location of Alameda Point in the State of California, and Figure 1-2 shows the location of IR Site 1 on Alameda Point.

Directives governing the processing of MPPEH require an approved SOP. This SOP is meant to meet that requirement, and is being submitted with the Explosives Safety Submission (ESS) that was developed specifically for this project.

The MPPEH recovery will be conducted in conjunction with a radiological survey and removal of radiological anomalies. The primary consideration of this SOP is the protection of human health and the environment.

2.0 SCOPE

This procedure will be implemented by TtEC staff and subcontractor personnel when conducting geophysical surveying and MPPEH recovery activities. The work will be primarily comprised of the following components:

- Mobilization
- Establishing a 320 foot exclusion zone (EZ)
- Conducting a pre-vegetation removal surface MPPEH survey
- Providing Unexploded Ordnance (UXO) support to laborers or equipment operators cutting vegetation
- Completing a post-vegetation removal surface MPPEH survey
- Completing a geophysical survey of the north-western portion of IR Site 1
- Excavating burial pits, debris fields and disposal trenches suspected to contain MPPEH or radiological anomalies
- Completing a radiological survey and removal of discovered radiological anomalies
- Removing the small arms range backstop berm
- Restoring the site
- Demobilization

3.0 DEFINITIONS

Blow in Place— (BIP) An intentional detonation of an MPPEH item because it is deemed unsafe to move or transport and it poses a threat to human health or the environment.

Exclusion Zone—(EZ) Areas where contamination (hazards) is known or likely to be present or areas that, because of activity, have the potential to cause harm to personnel. An initial EZ of 320 feet will be established before activities commence, which is based on the fragment range of an explosive filled 20 mm projectile. If MPPEH items are encountered that are larger than 20 mm, the EZ will be adjusted using tables 13-1 or 13-2 from Naval Sea Systems Command (NAVSEA) OP 5 (or other appropriate document). The EZ shall be large enough to protect other personnel from the blast and fragmentation hazards of accidental detonation. The minimum EZ for MPPEH operations will be 320 feet.

Explosive Ordnance Disposal (EOD) Personnel—Active-duty military personnel who have completed the training course at the U.S. Naval Explosive Ordnance Disposal (EOD) School, Indian Head, Maryland, and are currently assigned to a military EOD unit.

TtEC Command Center—A designated location staffed by personnel to relay and control

Inert Ordnance—Ordnance that never contained explosives, or ordnance that has had all explosive components removed and has been certified as safe.

Intrusive Investigation—Excavating for suspected UXO items or for plotted anomalies. Excavation will be by hand or will be done using heavy equipment as deemed appropriate.

Material Potentially Presenting an Explosive Hazard—MPPEH may be referred to as, generated from, or included in the following categories of material: Ammunition, Explosives, and Dangerous Articles (AEDA); AEDA residue, range residue; range, demilitarized, or metal scrap; munitions debris, range-related debris, explosive contaminated property; explosive contaminated scrap; tooling, hardware, equipment and building debris from facilities used in munitions processing; Munitions and Explosives of Concern (MEC); 3X material. The term "safe" when used for MPPEH is not necessarily the same as "safed", "safe to ship","inert", or "inerted".

Practice Ordnance—Munitions that demonstrate characteristics similar to their high explosive counterparts and that may or may not contain pyrotechnic, explosive, or chemical (that is, titanium tetrachloride) spotting charges.

Unexploded Ordnance (UXO)—Military munitions that have been primed, fused, armed, or otherwise prepared for action that have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material, and that remain unexploded either by malfunction, design, or any other cause. For the purpose of this project, the definition of UXO is limited to items larger than 50-caliber.

UXO Personnel—Any individual who has graduated from a Department of Defense (DoD)-approved UXO specialist course. Examples are the U.S. Naval Explosive Ordnance Disposal School, the International UXO Training Program, or Texas A&M University.

4.0 PERSONNEL REQUIREMENTS

All personnel involved in MPPEH removal operations will become familiar with, and follow the procedures outlined in this SOP and applicable references.

This project will use a minimum of 4 UXO Technicians; a Senior UXO Supervisor (SUXOS), a Site Health and Safety and Specialist/Quality Control Representative (SHSS/QC), and two UXO Technicians. The UXO staff may be increased, if required.

4.1 Personal Responsibilities

The personnel that will be assigned to work on this TCRA will each have responsibilities that will contribute to the successful attainment of project goals. The responsibilities of these individuals are discussed as follows:

4.1.1 Site Superintendent

TtEC's Site Superintendent is ultimately responsible for the on-site health and safety of TtEC personnel working on this project. The Site Superintendent, with the support of TtEC's SHSS, is responsible for the implementation of the Work Plan, Health and Safety Plan (HASP), and all on-site activities on a daily basis. Other responsibilities include, but are not limited to: (1) project planning, (2) scheduling, (3) site documentation, (4) regulatory compliance, (5) personnel assignments, (6) customer and subcontractor relations, (7) enforcing health and safety rules and SHSP requirements, and (8) conducting routine safety inspections and incident investigations. The Site Superintendent reports directly to the Project Manager (PjM).

4.1.2 Senior UXO Supervisor

For this project, The SUXOS may act as the Site Superintendent. He assists in the development of site-specific work plans, identifies personnel and equipment requirements, and directly supervises all daily activities of the field team. The SUXOS is responsible for the successful performance of the field team, the early detection and identification of potential problem areas, and instituting corrective measures. The SUXOS is also responsible for the execution of instructions received from the TtEC PjM and the Navy's Remedial Project Manager (RPM), documenting site conditions, photographing MPPEH, preparing project progress reports, and identifying efforts required to accomplish the Scope of Work. The SUXOS is responsible for all aspects of explosive safety.

4.1.3 Site Health and Safety Specialist/Quality Control Representative

The SHSS/QC is UXO-qualified and is responsible for the implementation of the SHSP, on-site training requirements, and recommending changes to level of PPE to the certified industrial hygienist (CIH) as site conditions warrant. The SHSS/QC has Stop Work authority for safety conditions. The SHSS/QC evaluates and analyzes any potential safety problems, implements safety-related corrective actions, and maintains a daily safety log. The SHSS/QC is also responsible for the implementation of the *Project Contractor Quality Control Plan* (TtEC, 2006).

4.1.4 UXO Technician

The UXO Technician performs on-site duties including locating MPPEH, equipment operation, UXO safety, excavation, and escort duties as required. The UXO Technician reports to the SUXOS.

4.2 Minimum Qualification Standards

Department of Defense Explosives Safety Board (DDESB) Technical Paper 18 provides the minimum qualification standards for personnel conducting UXO-related operations in support of the Department of Defense (DoD). Such operations include, but are not limited to munitions responses, range clearance activities and/or the inspection or certification of munitions debris being considered for transfer or release from DoD control. The requirements apply to all workers performing DOD operations requiring UXO Technicians or UXO-qualified personnel.

The specific UXO-related position titles, tasks duties and responsibilities as listed in target practice (TP) 18 are too numerous to list in this document. The TtEC UXO Operations Manager will ensure that UXO personnel assigned to this project meet the minimum qualification standards for their assigned positions and are capable of performing the duties and responsibilities of those positions as required by TP 18. When assigned, the project SUXOS will review the training and qualification records of UXO personnel assigned to support the MPPEH activities on the site.

4.2.1 Minimum Qualification Standards

The minimum qualification standards for workers to qualify as UXO Technicians or UXO qualified personnel are contained in the following table:

Table 4-1
Minimum Qualification Standards

Position Description	Training Required (Notes 1, 2 and 3)	Minimum Years of EOD/UXO Experience (Note 4)	Special Requirements (Note 5)
Senior UXO Supervisor	1, 2, or 3	10 years	Significant experience in all aspects of munitions response actions or range clearance activities, as appropriate for the contracted operation. Five years experience in supervisory positions.
UXO Safety Officer	1, 2, or 3	8 years	Significant experience in all aspects of munitions response actions or range clearance activities, as appropriate for the contracted operation, and applicable safety standards.
UXO Quality Control Specialist	1, 2, or 3	8 years	Significant experience in all aspects of munitions response actions or range clearance activities, as appropriate for the contracted operation, and the transportation, handling and storage of munitions and command the transportation, handling and storage of munitions and commercial explosives
UXO Technician III	1, 2, or 3	8 years	Significant experience in all aspects of munitions response actions or range clearance activities, as appropriate for the contracted operation.
UXO Technician II	1 or 2 ----or----- 3	N/A ------or------- 3 years	Prior military EOD experience -------------------------or------------------------- Experience in response munitions response activities, as appropriate for the contracted operation, plus specific project/explosives safety training.
UXO Technician I	3	0	Successfully completed a formal course of instruction appropriate to this skill level

Note
1. Graduate of a military EOD School of the United States.
2. Graduate of a military EOD School of Canada, Great Britain, Germany or Australia
3. Graduate of a formal training course of instruction or EOD Assistant course. (Refer to DDESB TP 18 for detailed requirements.
4. Personnel working in the commercial industry may have significant breaks between jobs. Only actual time performing UXO-related tasks should be counted (2080 hours = 1 man year)
5. Divers conducting underwater detection and identification of munitions must have completed both the basic and the underwater portions of EOD School (or foreign equivalent) training.

4.3 Training Requirements

All personnel assigned to this project will attend a site-specific orientation. The purpose of this orientation will be to review site-specific and emergency response procedures. Orientation attendance sheets, with attached training schedule, will be used to document completion of each orientation session. The topics to be covered during the orientation are provided as follows:

- Introduction
- Operation overview

- HASP review
- Review Work Plan
- Review Site Health and Safety Plans
- Review SOP
- Review Explosives Safety Submission (ESS)
- Safety precautions
- Equipment training
- QA/QC training
- Emergency procedures
- Review of emergency response equipment
- Talk/walk through of emergency procedures
- Emergency drill

All personnel assigned to the project are responsible for reading and understanding the Work Plan. After reading the work plan, the Site Supervisor/SUXOS will sign and date the Field Supervisor Review Sheet found in Attachment 1 and all other site personnel will sign and date the Field Team Review sheet found in Attachment 2. These sheets will be kept in project files.

5.0 MPPEH

Relatively new changes to policy governing munitions, and munitions-related materials engendered new requirements for handling practice or inert ordnance, as well as scrap, or debris generated from the use of munitions. MPPEH is material either known to present an explosive hazard, or NOT known with certainty to present an explosion hazard, but may contain hidden explosive material, or minor amounts of explosive material. MPPEH must be assumed to present an explosion hazard until it is visually inspected and/or processed, and certified *safe*.

Live ordnance that has functioned as designed, and unexploded ordnance detonated during clearance or cleanup operations result in a variety of MPPEH, and require inspection, certification and disposition. Examples of MPPEH found on Alameda Point include cartridge casings, small arms rounds, expended shotgun shells, and 20mm projectiles.

5.1 MPPEH Explosive Safety Status

Safe means certified as not presenting an explosion hazard and safe for transfer or release pending the completion of demilitarization requirements. *Hazardous* means certified as known or suspected to present an explosion hazard. The term *Safe* is not necessarily the same as "safed", "safe to ship", "inert" or "inerted".

5.2 MPPEH Contamination

MPPEH explosive contamination falls into one of four categories: 5X, 3X 1X and 0X. This terminology is meant to be used in correspondence and documentation to indicate the degree of explosive hazard. Processes and procedures to attain these levels are determined locally. The definitions of these categories are provided as follows:

- ***Category 5X.*** Items that have been completely decontaminated are entirely safe and may be released for general use, when certain provisions (demilitarization) are met. Items can only be classified 5X by visual inspection when every surface is visible and is capable of being inspected. Visual inspection is only applicable to pieces of metal that have no holes, cavities, blind spaces or other obscured features, and probes are NOT used to inspect any blind cavities. Thermal or chemical processing is the most effective way to ensure that material is 5X. 5X items are not MPPEH, and have an explosive safety status of *safe*.

- ***Category 3X***. Items that have been visually examined and no contamination can be visually noted on accessible surfaces or in concealed housings. 3X items are expected to be free of explosives/energetic, but not enough information is available to certify them as safe because of inaccessible cavities, or because the items have not been 100% inspected, or because the certification process is not complete. When there is the slightest doubt concerning the presence of explosive material, the material shall be subjected to whatever treatment is necessary to ensure that it has an explosives safety status as safe before it is released from government control. 3X items may be treated in a variety of methods with written approval of operating procedures. 3X items are MPPEH, and have an explosive safety status of "hazardous".
- ***Category 1X***. Items that are contaminated or partially decontaminated and are likely to present an explosion hazard. 1X items differ from 3X items in that it is thought LIKELY to present an explosive hazard, while 3X materials are NOT expected to present an explosion hazard. 1X items are MPPEH, and have an explosive safety status of *hazardous*. Every piece of recovered ordnance, or ordnance related material is considered 3X until they are certified *safe*.
- ***Category 0X***. Articles, equipment or buildings that were never contaminated and do not pose an explosion hazard. 0X material is not MPPEH, and have an explosive safety status of *safe*.

5.3 MPPEH Processing

MPPEH processing includes any action or operation involving MPPEH, including (but not limited to): collecting, consolidating, sorting, segregating, separating (by metal type), inspecting, storing, decontaminating, transferring, demilitarizing and transporting. MPPEH processing is considered to be an operation involving Ammunition and Explosives (A&E) handling until the material is certified as *safe*. The locations used to process MPPEH must be designated as Potential Explosion Sites (PES), they must have site approval and they must meet established requirements for, and be designated as a "Restricted Area". Processing MPPEH requires an approved SOP. These requirements are addressed in the Explosives Safety Submission (ESS) that was submitted for this project, and is located in Appendix F. The area designated for MPPEH processing is the area in the magazine compound between magazines M353 and M354.

5.4 MPPEH Storage

Storage of MPPEH is considered A&E storage, until the material is certified *safe*. MPPEH must be stored in approved storage facilities (magazines) which must have site approval, must be designated as PES and "Restricted Areas", when the MPPEH has not been certified, or has been certified *hazardous*.

The Site Approval Request (SAR) was submitted to the Naval Ordnance Safety and Security Activity (NOSSA) in accordance with guidelines provided in NAVSEA OP-5 and Naval Facilities Command (NAVFAC) instruction 11010.45. The SAR was submitted as a part of the ESS prepared for this project. Both documents were provided to the Explosive Safety and Support Office, Pacific (ESSOPAC) who may provide oversight for MPPEH activities.

Magazines M353 and M354 were originally sited for a Net Explosive Weight (NEW) of 15,000 pounds of Hazard Division 1.1 material each, but SAR requested a reduced NEW of 500 pounds and requires an Explosives Safety Quantity-Distance (ESQD) arc of 1,250 feet. There are no inhabited buildings or public traffic routes within the ESQD arc.

MPPEH will be stored in suitable containers on pallets in the magazine. The containers will be clearly marked as to their explosive safety status and explosive contamination category.

5.5 Chain of Custody

Documentation is the key to safe management of MPPEH, and allows certification, chain of custody, and explosive safety status to be tracked and known at all times. To maintain the chain of custody, the following categories of materials will not be commingled:

- MPPEH awaiting documentation of its explosive safety status (3X)
- Materials that have been certified *safe*.
- Materials that have been certified *hazardous*.
- 1X and 3X materials

Should commingling occur, the material certified *safe* will lose its *safe* certification. To prevent commingling, a combination of controls, storage locations, gates, barriers, containers or other locally determined methods included in approved, written operating procedures will be used. Materials certified *safe* must be segregated in a location with controlled access, preferably a locked facility. For the purpose of this project, either magazine M353, M354, or both will be used to store and segregate the various classes of MPPEH.

5.6 MPPEH Certification Methods and Requirements

Certification as *safe* by visual inspection requires a 100% examination by one qualified individual, followed by an independent 100% re-inspection by another. This will be accomplished during the course of the project by immediately completing the certification/verification process as MPPEH items are encountered, if that effort is practical. (e.g., if large quantities of MPPEH are found, time constraints may prevent the immediate certification/verification.)

The SUXOS will delegate a project UXO Technician as the MPPEH Certification Inspector. That individual will conduct a 100% visual inspection of the item(s), complete the "General" section of the *MPPEH Safe – 5X and Demilitarization Certification/Verification Manifes*t sign and date the "TtEC UXO Technician Inspector Certification" block on the form. The SUXOS will act as the Verifying Inspector, and will conduct a second, 100% visual inspection of the item(s), sign and date the "Senior UXO Supervisor Verification" portion of the form. Both personnel will also print (or type) their names on the form, and it will be retained in the project files. The item(s) will be tagged, photographed, entered into the MPPEH inventory and stored in suitable container (e.g., drum, case) on a pallet in Magazine M353 or M354. The container will be clearly marked as "5X Material – Do Not Commingle" (or a similar statement). An example of a *safe* certification/verification form can be found in Attachment 3.

Should MPPEH items be encountered that cannot be certified/verified as 5X, or if items are found that are known or suspected to present an explosive hazard (1X) and are safe to move, those items will be placed in a separate container on a pallet in one of the magazines. That container will also be suitably marked as to the hazard present, and either 1X or 3X, as appropriate. If the same magazine is used to store MPPEH and non-MPPEH items, the containers will be clearly marked and segregated in different sections of the magazine with barricades (or other suitable structures or marking devices).

.Treatment of MPPEH by technical methods requires NOSSA approval and will either thermal or chemical in nature. If MPPEH items are encountered that are 3X, and cannot be 100% visually inspected, they will be certified as *hazardous*, and stored in either Magazine M 353 or 354 until the end of the project, at which time a thermal flashing unit will be brought in to thermally treat the items. Certification as *safe* by technical methods (other than 100% visual inspection) requires a post-processing sampling inspection with one signature by an authorized person.

Certification as *hazardous* (1X) requires a 100% visual inspection by a qualified and authorized person and does not require a second examination. The SUXOS will make this certification. These items will be stored in one of the magazines apart from 3X and 5X material until they are disposed of by Travis Air Force Base Explosive Ordnance Disposal (EOD) Technicians. An example of a *hazardous* certification/verification form can be found in Attachment 4.

Documents used to certify material *safe* or *hazardous* may be standard government forms (DD Forms 1348.1 or 2271) or locally generated. All require the signatures of the individuals performing the certification/verification directly over their typed or printed names. The SUXOS and Certifying Inspector will perform these functions.

The certification documents will accompany certified materials from the time of collection through final disposition. The chain of custody forms will be completed to ensure that the activities and procedures taken throughout the inspection, re-inspection and documentation process to maintain positive control of MPPEH and ensure the explosion hazard status can be determined at any time. Documents supporting the safety status of material and any documents associated with the inspection/re-inspection will be retained in the project files for three years, to include the MPPEH inventory and accountability log.

Detailed guidance on the management and disposition of MPPEH can be found in TtEC procedure UXO-8, *Management and Disposition of MPPEH*, which is available in the TtEC Corporate Reference Library (CRL).

6.0 OPERATIONAL CONSIDERATIONS

6.1 Notification, Scheduling, and Coordination

Coordination of all personnel involved in the IR Site 1 MPPEH removal will be vital to the safe conduct of site activities. The removal effort by TtEC will ensure that IR Site 1 on Alameda Point will be safe from radiological and MPPEH concerns for the intended use of the land. Coordination activities will begin with a meeting with all involved parties and agencies to identify shared and individual responsibilities. The community will be informed of the project schedule and the expected impacts. The coordination, notification, and verification activities are outlined below:

- **Coordination Meeting**—Before MPPEH removal operations are scheduled to begin, a coordination meeting will be conducted to address specific elements of planning and will involve representatives from the following organizations:
  - NAS Caretaker/Environmental Compliance Manager (ECM)
  - Resident Officer in Charge of Construction (ROICC)
  - Other Navy representatives if necessary
  - TtEC
- **Topics** will include:
  - Explosive handling and transportation
  - Required support services, fire, medical, security, and so forth
  - Notifications
  - Community impact
  - Daily hours of operation
  - EZ procedures
  - Emergency procedures
- **Notifications**—The TtEC SUXOS will notify the appropriate personnel prior to scheduled removal activities as far in advance as possible to facilitate timely coordination arrangements for establishing the EZ and closing required roads, if necessary. The SUXOS will ensure that the following activities/agencies are informed of the planned field activities:
  - Concentra Medical Center 510) 465-9585
  - Alameda Fire Department (925)-447-6880

- Alameda Police Department (510) 522-2423
- NAS Alameda (ECM) (510) 772-8832

6.2 Equipment/Material Requirements

The SUXOS will ensure health and safety equipment is inspected prior to commencing operations. Two equipment checklists are provided in Attachments 5 and 6 that may be used as the basis for tailored checklists that will be developed on site by the SHSS/QC and/or SUXOS to ensure a proper load-out is accomplished before departing for daily activities. It is anticipated that all tasks will be performed in Level D personal protective equipment (PPE). The following publications are required to be on-site in either paper or electronic versions:

Approved Work Plan with this SOP
Approved ESS
Naval Sea Systems Command (NAVSEA) OP 5 Volume 1
DOD Instruction 6055.9-STD

6.3 MPPEH Emergency Response

If items are encountered that are suspected to be MPPEH, the SUXOS will be notified to positively identify and assess the MPPEH item(s) to determine the condition of the item(s) and the associated potential hazards. If the item is MPPEH and is deemed safe to move and transport, it will be driven to the magazine area for storage, pending treatment. It should be noted that safe-to-move does not always mean safe-to-transport. The Senior UXO Supervisor will make this determination.

If it is determined that encountered MPPEH is unsafe to move or transport, and that it poses an immediate threat to human health, public safety, property or the environment, the United States Air Force (USAF) Explosive Ordnance Disposal (EOD) Detachment located on Travis Air Force Base (AFB) will be contacted and requested to dispose of the unsafe MPPEH. The disposal actions will take place in the form of an explosives or munitions emergency response (EMER) to control, mitigate, or eliminate the threat. [40 Code of Federal Regulations (CFR) 260.10] The following procedures will be used to coordinate the response:

- The SUXOS will establish an EZ of appropriate distance for the type and size of MPPEH encountered
- The site will be clearly marked (stakes, surveyor's tape, etc.)
- Gates to the site will be closed and barriers placed in front of them
- The SUXOS will contact the following personnel/agencies:
  - Concentra Medical Center : (510) 465-9585
  - Alameda Fire Department (925) 447-6880 (emergency medical also)
  - Alameda Police Department (510) 522-2423
  - Alameda Point caretaker Site Office (CSO): Doug Delong (510) 772-8832
  - Travis AFB Command Post (707) 424-5517
  - Travis AFB EOD Detachment (707) 424-2040/3146
  - RPM :Andrew Baughman , (619) 532-0902
  - Project Manager , Abram Eloskof, (949) 756 7521
  - UXO Coordinator :Lance Humphrey, (619) 471-3519

TtEC UXO Technicians will assist the Alameda ECM and the USAF EOD Detachment as required.

6.4 Engineering Controls

Engineering controls (tamping, wetting the soil, tarpaulin-tenting, etc.) will be used to limit/control the spread of dust and soil-borne contaminants (if present) during emergency Blow in Place (BIP) operations. TtEC UXO and USAF EOD personnel will determine the type of controls that will be used based on the situation encountered.

6.5 Contingency Plan for Large MPPEH

Should large MPPEH be encountered that is unsafe to move, the EZ will be expanded and evacuated prior to conducting BIP procedures. The SUXOS will adjust the EZ based on the size and type of MPPEH present. If an evacuation of a large EZ (2,500 feet or greater) is required, the Alameda Fire and Police Departments will be notified and their assistance requested in conducting the evacuation. The following agencies/personnel will be notified if an evacuation is required:

- Concentra Medical Center : (510) 465-9585
- Alameda Fire Department : (925) 447-6880 (emergency medical also)
- Alameda Police Department : (510) 522-2423
- Alameda Point ECM : Doug Delong, (510) 772-8832
- Travis AFB Command Post : (707) 424-5517
- Travis AFB EOD Detachment : (707) 424-2040/3146
- RPM : Andrew Baugman , (619) 532-0952
- Project Manager :Abram Eloskof, (949) 756 7521
- UXO Coordinator :Lance Humphrey, (619) 471-3519

The Alameda police and fire department no longer share a joint-dispatch office. Both telephone numbers must be called to contact each of those organizations. TtEC UXO personnel will assist the responding military EOD unit and the law enforcement agencies in preparing for the BIP operation and evacuating the EZ. The TtEC SUXOS and EOD Commander will brief Police and Department officials on the planned BIP procedures and activities will not commence until the Alameda Police Department Watch Commander has verified the evacuation of the EZ and given the EOD unit permission to proceed with the operation.

6.6 Handling, Transportation, and Storage

The requirements for processing (handling, transporting, storing, etc.) MPPEH are derived from federal regulations and military instructions. Certain elements of these processes are discussed in the following sections.

6.6.1 Explosive Transport Vehicle

The Explosive Transport Vehicle will be a pick-up truck equipped with sand bags, a non-sparking bed liner or wooden boxes to prevent explosive items from coming into contact with spark producing materials. The vehicle will be inspected prior to transporting any explosive ordnance items to ensure the following conditions are present during loading or unloading MPPEH:

- Brakes are set and the wheels chocked (sandbags may be used)
- The vehicle's engine is turned off during the loading or unloading process
- Appropriate Department of Transportation (DOT) warning placards are temporarily attached to the vehicle prior to transporting explosive items
- A cellular telephone and a two-way radio are available to the driver
- Emergency warning triangles, barricade tape, a first aid kit, wheel chocks, a general purpose tool kit, and tow chain are readily available

- Two multipurpose, dry-chemical fire extinguishers or two class IA-10BC fire extinguishers are in the vehicle
- Sufficient sand bags are in place to chock the container(s) in the vehicle bed
- A fire resistant bed cover/tarpaulin is available to cover the explosive item after it has been secured within the truck bed

6.6.2 Packaging for Transport

Explosive items will be placed in a suitable container, preferably wood; a typical container would be a rectangular box with rope-type grab handles. The explosive item(s) will be immobilized in the container to prevent movement. A suitable, inflammable material (i.e., sand) should be added to all sides, and bottom to act as a shock stabilizer, heat insulator and friction eliminator. A minimum of 3 inches of packing material should surround each item secured within the container. The container will then be hand-loaded into the truck bed. Sand bags will be placed around the container in place to prevent movement, and additional sand bags will be placed atop of the container.

6.6.3 MPPEH Storage and Processing

Two existing earth covered magazines (ECM) are planned for the storage of recovered MPPEH. The magazines (M353 and M354) are located inside a fenced compound immediately to the south of IR Site 1. The area between the two magazines inside the magazine compound will be used for the processing of MPPEH.

Recovered MPPEH that has been deemed safe to move and safe to transport will be conveyed to the magazine area for consolidation and temporary storage. The magazine will be certified for the storage of up to 250 pounds Net Explosive Weight (NEW) of Class/Division 1.2.2 materials. Other compatible MPPEH items may also be stored in the magazines, if any are found. If MPPEH items are found that are not compatible for storage, they will either be segregated in another magazine (M353 or 354) or be separated by physical barriers (sandbags or other suitable material) to isolate the different compatibility groups.

The following general magazine practices will be followed:

- All material stored in the magazines will be stored on pallets.
- At no time will the rated explosive capacity of the magazine be exceeded.
- All flammable materials and vegetation will be removed from the perimeter of the magazine
- The magazine door(s) will remain open while personnel are working inside
- Housekeeping – the magazines will be kept neat and orderly at all times
- A red flag will be flown outside the magazine when personnel are working in the magazine
- The magazines will be locked with high security padlocks. The SUXOS will maintain custody of the keys.
- The fenced compound that encloses the magazines will also be padlocked and the two access gates that provide access to the magazine compound will be locked as well. Access to the area is restricted to Base Caretaker Personnel.

6.6.4 Inventory

An inventory of the recovered MPPEH will be maintained inside the storage magazines and in the project administrative structure. The Ordnance Accountability Inventory found in Attachment 6 may be used for this purpose, or another suitable method as determined by the SUXOS. The inventory will be updated each time an MPPEH item is placed in, or removed from a magazine.

6.7 Demilitarization

Although certified/verified 5X items are not considered MPPEH, the demilitarization requirements for ordnance-related material (projectiles, casings, etc.) provided in DoD Instruction 4160.21-M are germane. The NOSSA approved method for demilitarizing inert 20 mm TP projectiles that has been used in previous projects uses a large, hydraulically-operated re-enforcing bar cutter. Each projectile is placed in the cutter jaws and the machine operator functions the machine remotely behind a sandbag barricade. Once demilitarized, the metal fragments are placed in a drum and sent to a landfill. An approved SOP and Activity Hazard Analysis (AHA) are available if this type of demilitarization is selected for use.

If MPPEH items other than 20 mm projectiles are recovered and can be certified/verified 5X, an alternate method of demilitarization will be employed to render the items indistinguishable as munitions. The SUXOS, PjM and UXO Coordinator will collectively select the method to be used, the SHSS/QC will prepare an AHA for the operation and submit it to the program CIH for approval. The SUXOS will thoroughly brief the UXO Technicians that will be performing the work before the operation begins.

6.8 Communications

Communications equipment consisting of cellular telephones and hand-held radios will be available to site personnel. The radios will be used for communications on the project site and the cellular telephones will be used for emergency communications with fire and medical support activities. There are no electricity or land-line telephones on the site.

6.9 Fire Fighting and Support

No attempt will be made to extinguish a fire involving explosives until the explosives have been consumed. Some general guidelines for fires involving explosives are provided as follows:

- Do not fight any fires that involve explosives
- Notify the Alameda Fire Department 925-447-6880 prior to conducting demolition operations and contact them immediately upon the discovery of a fire
- If a fire develops in the vicinity of the small arms range backstop berm, the area will be evacuated until the fire is out. Fire Department personnel will be briefed on the potential danger of live 20 mm projectiles present in the fire before they enter the site.
- Attachment 5 (Daily Health and Safety Checklist) may be used as a basis for developing tailored load-out checklist that will be generated on-site and used to provide a guide for equipment that will be loaded into vehicles prior to departing for site activities.

6.10 Emergency Medical Support

The ambulances from Concentra Medical Center or fire trucks from the Alameda Fire Department (located on the former NAS Alameda) will be the first responders for emergency medical support. They can be contacted by dialing 911. A complete first-aid kit will be maintained on-site and at least two UXO Technicians will be trained in CPR and first aid procedures.

6.11 Personal Protective Equipment (Ppe)

All TCRA operations are planned to be conducted in Level "D" PPE with safety glasses. The SHSS can direct a modification to this level of protection after conferring with the Program CIH .Geoscientists and UXO assisting them in the geophysical survey will not be required to wear hardhats.

6.12 Recordkeeping

Attachments 7 and 8 may be used for recordkeeping purposes, or serve as the basis for a tailored accountability/inventory form, as determined by the SUXOS. Maintaining the inventory electronically in a spreadsheet or other form is also acceptable. The type of inventory/accountability tool should contain spaces to identify the MPPEH item(s), the location found, the storage location and the disposition. The inventory will form a part of the chain of custody for the MPPEH that will be maintained until the material is demilitarized and disposed of. The inventory must remain in the project files for a period of 3 years after disposal. The forms used to certify and verify the MPPEH 5X will be filed with the inventories.

Regardless of the format used for the inventory and accountability of MPPEH, photographs of the materials must accompany the inventory. If a paper document is used for this purpose, paper photographs should be attached to the respective pages of the accountability log/inventory. If an electronic version of the log is maintained, digital photographs of the MPPEH items should be linked to each log entry.

6.13 Two-Man Rule

The two-man rule is a concept of fail-safe, where two knowledgeable individuals perform potentially hazardous operations in which each is the safety backup and watch person for the other. The two-man rule shall apply whenever MPPEH is handled or transported.

7.0 PROCEDURE DETAILS

A geophysical survey will be conducted to locate a disposal trench where radiological material might have been buried, and to determine locations and approximate boundaries of debris pits in the vicinity of the backstop berm that are known to contain 20mm projectiles. Prior to conducting the geophysical survey, however, a surface search aided by metals detectors will be completed to remove 20 mm projectiles (and other MPPEH items) on the ground surface of the backstop berm and the area immediately to the north of the small arms range

7.1 Munition with the Greatest Fragmentation Distance (MGFD)

For the purpose of this project, the MPPEH item selected as the MGFD is the 20 mm High Explosive (HE) filled projectile, (MK 3 typical) with a maximum fragment throw range (case fragments) of 320 feet. (OP 5, Table 13-2). This is the distance that will be used for the EZ on this project.

7.2 Exclusion Zone

A 320 foot EZ will be established around the backstop berm (with the northern toe of the backstop berm as the EZ center) and screen plant. All non-essential personnel will remain outside the EZ perimeter while the removal activities are taking place. The limits of the EZ will be clearly marked (i.e., traffic cones, caution tape, etc.). Barricades on the northern and southern peripheries of the EZ that intersect the road through IR Site 1 will be established, and the gates on either end of the site will be closed. If visitors or non-essential personnel are required to enter the EZ, the SUXOS or SHSS will order the removal operations to cease until the area is free from non-essential personnel. A 320-foot EZ will also be applied to the MPPEH processing area inside the magazine compound. The EZ arcs planned for use in this project can be seen in Figures 7-1 and 7-2.

7.3 MPPEH Surface Search/Survey

If vegetation on the site requires cutting (i.e., higher than 4 inches), the SUXOS will direct a pre-vegetation-removal surface sweep to prepare the site for the laborers/equipment operators who will cut the vegetation. The area of the surface search will be bound by the coastline to the west, and the road to the east. The northern border of the small arms range will act as the center point for the north-south ambits of the search area; a distance of approximately75 feet to the north and south of the northern small arms range boundary will be searched. The SUXOS may amend this distance as site requirements dictate. These boundaries (or amended boundaries, as required) will be marked to delineate the area to be searched.

A line or other suitable marking device will be used to mark the path of advance on the initial sweep of the area along one of the boundaries. UXO Technicians will form a line abreast, perpendicular to the path of advance spaced about 10 feet apart. The UXO Technician positioned on the path marker will act as the guide and proceed in a straight line along the initial search boundary. The remaining UXO Technicians will maintain spacing and distance off the UXO guide and advance across the search area, using Schonstedt (or other suitable instruments) metal detectors to provide an audible backup to the visual search being conducted. The UXO Technician on the outside of the line will mark his/her starting and ending position on the boundaries, and when the sweep line reaches the opposite side of the search area, the marking line will be moved to provide the basis for the ensuing search. This process will be repeated until the entire site has been swept. The SUXOS may amend this process as conditions warrant.

When the actual vegetation cutting takes place, UXO Technicians will act as escorts for the persons removing the vegetation, in case more projectiles were percolated to the surface following the surface sweep. When the cutting is complete, and the vegetation has been removed (as required), the surface sweep will be repeated to ensure that all MPPEH items on the surface have been removed.

7.4 Geophysical Survey

Following the surface MPPEH sweeps and the vegetation removal, a geophysical survey will be conducted to identify the location and boundaries of any disposal pits or trenches, debris fields, and significant subsurface anomalies (SSA).

Survey control will be established and used to provide precise positional data. The geophysical data collection will use a Geonics time-domain electromagnetic (TDEM) instrument (EM61) with an integrated Leica differential global positioning system (DGPS) to provide precise location coordinates for anomaly reacquisition, if required, and trench/pit boundary locations. The system is certified under the Navy's Hazards of Electromagnetic Radiation to Ordnance (HERO) program.

The geophysical and DGPS data will be concatenated, processed, and a geophysical map that identifies pit/trench boundaries and the position, depth and estimated size of SSAs. The map and a DGPS receiver will be used to delineate the perimeters of pits/trenches and/or mark any anomalies that are of interest.

The location of the burial trench is unknown, but is believed to lie in a location west of the road that traverses the site, and north of the small arms range. The geophysical survey will use these boundaries for the initial data collection (road/coastline, small arms range/fence line). If the location of the trench cannot be determined after processing and interpreting the data, the search area will be expanded eastward after consulting with the PjM.

Where accessible, the entire backstop berm will be surveyed, however, the steep incline of the northern slope may prevent surveying activities on that part of the berm. The map produced from the trench-location survey, and from the berm survey should reveal all potential burial/disposal pits where MPPEH may be concentrated.

Due to the nature of the intended geophysical survey, TtEC does not intend to perform a geophysical prove-out to demonstrate the detection capabilities of the geophysical system. The proposed methodology (Geonics EM61 metal detector and Leica DGPS) is historically able to detect a 105 mm projectile to a depth of 4 feet. The burial pits and disposal trench are expected to contain significant amounts of metal at relatively shallow depths, and the proposed instrumentation should be able to easily detect these anomalous areas. TtEC will perform daily instrument calibration and/or functionality checks to ensure that the instrumentation is operating properly and is within specifications. The EM 61 will be run over a known target at the beginning of each file to ensure it is operating properly.

7.5 Removal Action/Excavation

To ensure that a complete removal of MPPEH items is accomplished, a three-step screening process will be used during the excavation of the backstop berm, disposal trench and debris pits. The first step in the process will be accomplished during the excavation activities, which will be effectuated with earthmoving machinery (EMM, i.e., a backhoe, excavator, or bulldozer). The EMM will be equipped with blast shields to allow non-UXO equipment operators to operate the equipment. The construction type and thickness of the blast shield authorized by the U.S. Army Engineering and Support Center, Huntsville, for the specific site MGFD will be one of 3 types shown in Table 7-1:

Table 7-1

Authorized Blast Shield Construction Materials and Thickness

Construction Material	Required Thickness	Comments
Plexiglas (cast)	2.96"	Most recommended. May be layered. Available COTS.
Lexan®	4.45"	Single Pane
Bullet-resistant Glass	2.46"	Least recommended

7.5.1 Survey Methodology

Three distinct areas are planned for excavation; the disposal trench(s) where radiological sources were thought to have been buried, debris pits where 20 mm projectiles are known to exist, and the small arms backstop berm, a part of which is suspected to also contain MPPEH items. MPEH items are not anticipated to be found in the radiological disposal trench. The potential presence of MPPEH in the disposal pits and backstop berm restricts the personnel participating in those excavations to UXO Technicians and equipment operators using armored EMM for the excavation.

The first step in the MPPEH and radiological source screening and removal is a manual survey of the top 6-10 inches of soil with hand-held radiological instruments and magnetometers. During the excavation of the radiological disposal trench, radiological technicians will conduct the radiological survey. UXO Technicians may assist them with magnetometers (for metal sources) if required. For the areas known and suspected to contain MPPEH items, the UXO Technicians will perform both the radiological and MPPEH surveys using the procedures described below

7.5.2 Disposal Trench(s)

Prior to the start of excavation, the approximate boundaries of the pits/trenches will be delineated and marked with tape, paint, lath, etc. The excavation will begin at a boundary of an excavation area and proceed inward. The top 6-10 inches of soil in the excavation area will screened for radiological items, and if any are found, they will be hand excavated and placed in a storage container. When the survey of the first layer is complete, EMM will remove the top 6-10 inches of soil in the excavation area (this may be accomplished by scraping, excavating, etc.). The excavated soil will be transported to a lay-down area, spread in a 6-10 inch layer and re-surveyed. When the entire layer of soil has been surveyed for radiological sources twice, the soil will be removed from the lay down pad and transported to a stockpile near a soil screening plant.

A radiological survey of the next 6-10 inches of soil in the excavation will then be accomplished, and when complete, EMM will remove the next 6-10 inches of soil, transport it to the lay down pad, spread it in another 6-10 inch layer and it will be surveyed for radiological anomalies again. This process will be repeated until the trench is completely excavated and native soil is reached or groundwater is encountered.

7.5.3 Burial Pits

The process for excavating the MPPEH burial pits will be identical to that used for the disposal trench, with the additional step of a MPPEH survey of the top 6-10 inches of soil in the area to be excavated with magnetometers. When that is complete, UXO Technicians will survey the excavation area with radiological instruments and remove all sources found, if any are present. EMM will then remove the top 6-10 inches of soil, transport it to the lay down pad where it will be screened a second time for MPPEH and radiological sources, and moved to the screen plant stockpile. This process will be repeated until the pit is completely excavated and native soil is reached or groundwater is encountered.

If large quantities of 20 mm (or other calibers) projectiles or other MPPEH are encountered, the SUXOS will direct the EMM to relocate outside the EZ and UXO Technicians will then excavate the exposed projectiles by hand.

7.5.4 Backstop Berm

Only the northern 25% of the backstop berm is suspected to contain buried MPPEH items, and the geophysical survey of the berm should identify their precise locations. The area containing buried debris will be marked on the ground surface (lath, stakes, caution tape, etc.) and this area will be excavated last.

The excavation of the berm will be conducted in a manner similar to the trench and pit excavation. . The vegetation on the berm will be cut as near the ground as possible. Beginning at the top of the berm, radiological technicians and UXO personnel will survey the top 6-10 inches of the berm for radiological and MPPEH sources. EMM will remove the top 6-10 inches of the berm. The soil will be relocated to the lay down pad, layered and surveyed in the manner just described. After the screening on the lay down pad, the soil will be transported to the screening plant stockpile. This process will be repeated until the berm has been removed. UXO Technicians will perform the radiological survey in the area of the berm containing the buried debris.

7.5.5 Screening

The soil and debris from the debris fields, disposal trench and the backstop berm will be processed through a screening plant that will be brought in for this project. The plant is anticipated to be a Trommel screen fitted with a six inch grizzly and a rotating drum (approximately 6' in diameter and 25' long) fitted with 3/4-inch screens. A Trommel screening plant with 2 screen drums may be used if one can be located. The excavated soil/debris will be processed as follows:

- Loaders will place the soil atop the feed hopper grizzly. All soil clumps and objects larger than 6-inches will drop off the back of the grizzly, while soil and debris smaller than 6 inches in size will drop into the feed hopper, where it will transported, via a conveyor, to the Trommel drum.
- Soil and debris larger than 3/4-inch will be transported out of one end of the Trommel drum. A conveyor may be placed there, which will move the material to a stockpile. A UXO Technician will monitor the oversized materials emerging from the Trommel plant for MPPEH items. Otherwise, the materials will accumulate at the Trommel outfall for later conveyance to a stockpile by EMM.

- Soil and objects smaller than ¾ inches (the "fines") will pass through the Trommel screen and be carried by conveyor to another stockpile.

The UXO Technician(s) monitoring the oversized materials from the Trommel as they exit the machine will be stationed in an observation booth equipped with Lexan®, or Plexi-glass shields, and a "kill switch" to halt the screen plant if MPPEH items are observed. A UXO Technician will periodically check the oversized materials from the Grizzly for MPPEH items. Figure 7-3 provides a drawing of the screen plants configuration.

A loader may be used to return soil clumps and other debris that do not break down in the Trommel to the feed hopper for re-processing. Items that do not break down after several passes through the screen plant will be inspected with radiological instruments and metals detectors to determine if MPPEH or radiological items might be present inside the clumps. Those clumps that test positive for metal and/or radiation will be mechanically disassembled with armored EMM.

8.0 QUALITY CONTROL

Quality control (QC) will be performed to ensure that encountered MPPEH is handled, transported, processed and stored in accordance with applicable regulations and directives. The SUXOS and SSHS/QC will ensure that procedures are implemented as listed below:

- Ensure functionality checks of magnetometers, radiological and geophysical instruments are conducted on a daily basis and recorded in the SUXOS log and daily QC report, as described in the CQC plan
- Perform follow-up QC for on-site packaging, transportation, processing and storage
- Perform the certification and verification and *safe* or *hazardous* determination. Ensure the certification/verification form is completely filled out and that the appropriate information is present
- Complete data entry for the Acquisition/Accountability log and/or Inventory (In the format chosen)
- Ensure photographs of MPPEH items accompany the inventory entries
- Ensure commingling of the different hazard classes (1X, 3X, 5X) does not occur
- Ensure the chain of custody is maintained from discovery through disposal

9.0 GENERAL SAFETY PRECAUTIONS

This section provides the following general safety precautions for explosive disposal operations:

- Know and observe federal, state, and local laws, and regulations which apply to the transportation, storage, and usage of explosives.
- Do not permit metal (except the approved explosive vehicle) to contact explosive containers.
- Do not transport metal, flammables, or corrosive substances with explosives.
- Do not allow smoking, or the presence of unauthorized or unnecessary persons, in vehicles containing explosives.
- Do not store explosives, time fuse, or fuse lighters in a wet or damp place, or near oil, gasoline, cleaning solution or solvents, or near radiators, steam pipes, exhaust pipes, stoves, or other sources of heat.
- Do not store any sparking metal or sparking metal tools in an explosive magazine.
- Do not permit smoking, matches, or any source of fire or flame in or near an explosive magazine.
- Do not allow leaves, grass, brush, or debris to accumulate within 50 feet of an explosive magazine.

- Do not permit the discharge of firearms in the vicinity of an explosive magazine.
- Do not place MPPEH where they may be exposed to flame, excessive heat, sparks or impact.
- Do not expose MPPEH to the direct rays of the sun. Such exposure increases sensitivity and deterioration.
- Ensure that MPPEH are returned to their proper containers and the containers are closed after use.
- Do not carry MPPEH items or explosive components in pockets or elsewhere on the body.
- Do not insert anything but fuse or detonating cord into the open end of a blasting cap.
- Carefully load and unload MPPEH from vehicles. Never throw or drop MPPEH from a vehicle.
- Do not drive vehicles containing MPPEH through cities, towns, or villages, or park them near such places as restaurants, garages, and filling stations, unless absolutely necessary.
- Store MPPEH only in a magazine that is clean, dry, well-ventilated, reasonably cool, properly located, substantially constructed, bullet and fire resistant, and securely locked.
- Ensure the Exclusion Area is clear of any unauthorized personnel before beginning investigative activities.
- Do not handle, use, or remain near MPPEH during the approach or progress of an electrical storm.
- Do not transmit on a radio within the Hazards of Electromagnetic Radiation to Ordnance (HERO) distance of that radio. If the exact distance for the radio is not known, do not transmit on the radio within 10 feet of MPPEH. Additionally, do not turn the cellular telephone within 10 feet of any MPPEH.

The two-person rule will apply whenever MPPEH is handled or transported and during disposal operations on or off the range.

10.0 REFERENCES

Department of Defense (DoD). 2004. *DOD Ammunition and Explosives Safety Standards*. (DoD Instruction 6055.9-STD). Alexandria, VA.

TetraTech, EC, Inc., (TtEC). 2006. *Draft Time Critical Removal Action Work Plan for Installation Restoration Sites 1, 2 and 32. Alameda Point, Alameda, California*. San Diego, California.

Naval Sea Systems Command (NAVSEA). 2001. *Ammunition and Explosives Safety Ashore.* (NAVSEA OP5, Volume 1, Revision 7, Change 4, 1 June 2005.) Washington Navy Yard DC.

11.0 ATTACHMENTS

Attachment 1	Field Supervisor Review Sheet
Attachment 2	Field Team Review Sheet
Attachment 3	MPPEH Safe – 5X and Demilitarization Certification/Verification Manifest
Attachment 4	MPPEH Hazardous – 3X/1X Manifest
Attachment 5	Daily Equipment Checklist
Attachment 6	Daily Health and Safety Equipment Checklist
Attachment 7	UXO Acquisition and Accountability Log
Attachment 8	Ordnance Accountability Inventory

ATTACHMENT 1

FIELD SUPERVISOR REVIEW SHEET

I have read the Project Work Plan and this Standard Operating Procedure for MPPEH/UXO Disposal Disposition. I understand it. To the best of my knowledge, the processes described in the Work Plan and this SOP can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of the Work Plan and this SOP, and have signed the worker's statement for this process. If necessary, I will conduct an annual review of the Work Plan and this SOP. If deviations from this SOP are necessary, I will ensure that project activities are stopped until the SOP is revised and approved. If unexpected safety, health, or environmental hazards are found, I will ensure that project activities are stopped until the hazards have been eliminated.

SUPERVISOR'S NAME	SIGNATURE/DATE

ATTACHMENT 2

FIELD TEAM REVIEW SHEET

Each field team member shall sign this section after site-specific training is completed and before being permitted to work on-site.

I have read the Project Work Plan and this Standard Operating Procedure for MPPEH/UXO Disposal Disposition and I have received the hazard control briefing. I understand them. I will follow the Work Plan and this SOP unless I identify a hazard(s) that are not addressed in it or encounter an operation I do not understand. If that occurs, I will stop site activities and notify my immediate supervisor of the problem.

WORKER'S NAME	SIGNATURE/ DATE	SUPERVISOR'S NAME	SIGNATURE/ DATE

MPPEH *Safe* - 5X and Demilitarization Certification/Verification Manifest

GENERAL

1. Generator's Name and Mailing Address	1.a Generator's Ph # ( )
2. Project Location	2.a Project Ph # ( )
3. MPPEH Contractor Name and Mailing Address	3.a MPPEH Contractor Ph # ( )
4. Government Assigned Verification Name and Mailing Address	4.a Certifier Ph # ( )
5. Transporter 1 Name and Mailing Address	5.a Transporter 1 Ph # ( )
6. Transporter 2 Name and Mailing Address	6.a Transporter 2 Ph # ( )
7. Recycler Name and Mailing Address	7.a Recycler Ph # ( )

MEC Contractors and Government Certifier

8. Security Seal #	9. Gross Wt. (Lbs)	10. Tare Wt (Lbs)	11. Net Wt. (Lbs)	12. Weight Ticket #

13. Description	14. Material	15. Quantity	16. Unit (Wt., Vol)

SAFE - 5X CERTIFICATION
This certifies that the Material Potentially Presenting and Explosive Hazard items listed has been 100 percent inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials.

17. Tetra Tech EC, Inc (TtEC) UXO Technician Inspector Certification

Signature	Address	Date
Printed/Typed Name		Phone

18. Senior UXO Supervisor Verification

Signature	Address	Date
Printed/Typed Name		Phone

Transporters

19. Transporter 1 Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Container was Received with Seal Intact)

Signature	Address	Date
Printed/Typed Name		Phone

20. TtEC Acknowledgement of Receipt of Materials (Signature Verifies that Container was Received with Seal Intact and Contents Loaded to Transporter 1)

Signature	Address	Date
Printed/Typed Name		Phone

21. Transporter 2 Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seals Intact)

Signature	Address	Date
Printed/Typed Name		Phone

22. Discrepancy Indication Space

Signature	Address	Date
Printed/Typed Name		Phone

Demil / Recycle Facility

23. Recycler Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seal Intact)

Signature	Address	Date
Printed/Typed Name		Phone

DEMILITARIZATION CONFIRMATION
This certifies and verifies that each item or items contained have been demilitarized to the minimum requirements of DOD 4160-M-1, Defense Department Demilitarization Trade Security Control Manual.

24. Recycler

Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name

25. TtEC UXO Technician Inspector Certification

Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name

26. Senior UXO Supervisor Verification

Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name

27. Final Disposition

MPPEH *Hazardous* – 3/1X Certification Manifest

GENERAL

1. Generator's Name and Mailing Address	1.a Generator's Ph # ( )
2. Project Location	2.a Project Ph # ( )
3. MPPEH Contractor Name and Mailing Address	3.a MPPEH Contractor Ph # ( )
4. Government Assigned Verification Name and Mailing Address	4.a Certifier Ph # ( )
5. Transporter 1 Name and Mailing Address	5.a Transporter 1 Ph # ( )
6. Transporter 2 Name and Mailing Address	6.a Transporter 2 Ph # ( )
7. Recycler Name and Mailing Address	7.a Recycler Ph # ( )

MEC Contractors and Government Certifier

8. Security Seal #	9. Gross Wt. (Lbs)	10. Tare Wt (Lbs)	11. Net Wt. (Lbs)	12. Weight Ticket #

13. Description	14. Material	15. Quantity	16. Unit (Wt., Vol)

HAZARDOUS - 1X/3X CERTIFICATION
This certifies that the Material Potentially Presenting and Explosive Hazard listed has been 100% properly inspected and to the best of my knowledge and belief, presents an explosion hazard

17. Senior UXO Supervisor Verification		
Signature	Address	Date
Printed/Typed Name		Phone
18. Tetra Tech EC, Inc (TtEC) UXO Technician Inspector Certification		
Signature	Address	Date
Printed/Typed Name		Phone

Transporters

19. Transporter 1 Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Container was Received with Seal Intact)		
Signature	Address	Date
Printed/Typed Name		Phone
20. TtEC Acknowledgement of Receipt of Materials (Signature Verifies that Container was Received with Seal Intact and Contents Loaded to Transporter 1)		
Signature	Address	Date
Printed/Typed Name		Phone
21. Transporter 2 Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seals Intact)		
Signature	Address	Date
Printed/Typed Name		Phone
22. Discrepancy Indication Space		
Signature	Address	Date
Printed/Typed Name		Phone

Demil / Recycle Facility

23. Recycler Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seal Intact)		
Signature	Address	Date
Printed/Typed Name		Phone

DEMILITARIZATION CONFIRMATION
This certifies and verifies that each item or items contained have been demilitarized to the minimum requirements of DOD 4160-M-1, Defense Department Demilitarization Trade Security Control Manual.

24. Recycler		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
25. TtEC UXO Technician Inspector Certification		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
26. Senior UXO Supervisor Verification		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
27. Final Disposition		

ATTACHMENT 5

DAILY EQUIPMENT CHECKLIST

Date: __________ **Disposal Supervisor:** ____________________

Equipment	Quantity	Comments
Explosive vehicle		
Personnel vehicle		
Camcorder/digital camera		
Air horn		
Bravo Flag (Red)		
Hand-held radios		
Ruler, 24-inch		
Schonstedt locator		
Shovel, round point, long handle		
Shovel, round point, short handle		
Tape, duct		
Tape, measuring, 50- or 100-meter		
Tape, plastic		
Toolbox, general hand tools		
Knife		

ATTACHMENT 6

DAILY HEALTH AND SAFETY EQUIPMENT CHECKLIST
(As Required)

Date: __________ **Disposal Supervisor:** ____________________

Equipment	Quantity	Comments
Air horn, emergency		
Booties, rubber slip-on (1 pair per person)		
Burn gel		
Burn kit		
Compress, 18 x 36 inches		
Compress, 8 x 10 inches		
CPR kit		
Decontamination sprayer		
Emergency eye wash		
Eye wash, 15-minute		
Fire blanket		
Fire extinguisher, 10-pound		
First aid kit, 10-person		
Gauze pads, 3 x 3 inches		
Gloves, latex		
Gloves, leather		
Gloves, nitrile		
Goggles		
Hard hat		
Radios, hand held		
Rain suit		
Safety vest		
Stretcher		
Tape		
Triangular bandages		
Voltage detector		
Water, 5-gallon bottle (emergency shower)		
Water, drinking 1 liter per person		

ATTACHMENT 7

UXO ACQUISITION AND ACCOUNTABILITY LOG

Delivery Order No.: __________ **Report No.:** ________

UXO TEAM: ______________________ **Date:** ______________

ACQUISITION DATA

Grid Number	
Ordnance length (inches)	
Ordnance diameter (inches)	
Weight (lbs/oz)	
Ordnance type (bomb, rocket, projectile, hand grenade, mortar, rifle grenade, pyrotechnics, small arms, and so forth)	
Photo roll number/disk number	
Photo exposure number/digital file number	
Video marker – Start	
Video marker – Stop	
Ordnance description	

UXO DISPOSITION

SAFE HOLDING AREA	DATE	INITIAL	TRANSFERRED TO	DATE	SIGNATURE

DESTROYED BY	DATE	SIGNATURE

Comments:____

____

____

Senior UXO Supervisor____

ATTACHMENT 8

ORDNANCE ACCOUNTABILITY INVENTORY

Date: ________________

RPT #	Item	Category*	Found	Location	Initial Disposition	Photo #	Final Disposition /Date

Notes:

* Type by category (i.e., projectiles, small arms, etc.).
RPT – Report

APPENDIX D-12
STANDARD OPERATING PROCEDURE (SOP) 12
AIR SAMPLING AND SAMPLE ANALYSIS

1.0 PURPOSE

This procedure will be used by Tetra Tech EC, Inc. (TtEC) personnel and its subcontractors to perform air sampling and document the results. Results will be used to determine what respiratory protection, if any, is required for the work area.

Air sample analysis will be performed by trained personnel using approved procedures specific to the alpha and beta radiation counting equipment. Further discussion of sample analysis is not within the scope of this procedure.

2.0 SCOPE

This procedure will be used for all TtEC and subcontractor radiological air sampling activities supporting field projects, regardless of the organization performing the work. Results will be used to determine respiratory protection requirements, and assign dose to workers from inhalation and/or ingestion when necessary.

3.0 DEFINITIONS AND ABBREVIATIONS

Airborne Radioactivity Area – A room, enclosure, or area in which airborne radioactive material, dispersed in the air in the form of dusts, fumes, particulates, mists, vapors, or gases, exist in concentrations:

- In excess of the derived air concentrations (DACs) specified in the Code of Federal Regulations (CFR), Title 10 Part 20, Appendix B; or
- To such a degree that an individual present in the area without respiratory protection could exceed, during the hours that the individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-HR.

Annual Limit on Intake (ALI) – The annual limit on intake (ALI) is the derived limit for the quantity of radioactive material taken into the body of a worker by inhalation or ingestion in a year.

Breathing Zone – That region adjacent to the worker's mouth and nostrils from which air is drawn into the lungs while he/she performs his/her assigned work. Air taken from this region will represent the air the worker is breathing while he/she works. The samples collected to assess breathing zone concentrations are normally collected from an area within 12 inches of the face.

Derived Air Concentration (DAC) – DAC is the concentration of a given radionuclide (as specified in 10 CFR 20, Appendix B) in air which, if breathed by the "reference man" for a working year (40 hours per week for 50 weeks) under the conditions of light work (inhalation rate of 1.2 cubic meters of air per hour), results in an intake of one ALI.

DAC-HR – The product of the concentration of radioactive material in air (expressed as a multiple of the DAC for each nuclide) and the time of exposure to that nuclide, in hours. Two-thousand DAC-HRs represents one ALI.

Grab Sample – A random, single sample taken over a short period of time (dependent upon flow rate) and based upon the minimum volume required.

High-volume Air Sample – Air sample taken at an air flow rate of 10 cubic feet per minute (cfm) [283.2 liters per minute (lpm)] to 30 cfm (849.6 lpm).

Lapel Sampler – A battery-operated portable air sampler with a sample collector fastened near the breathing zone.

Low-volume Air Sample – Air sample taken at an air flow rate of 1 cfm (28.32 lpm) to 5 cfm (141.6 lpm).

Particle – An aggregate of molecules forming a solid or liquid ranging in size from a few molecular diameters to some tenths of millimeters (several hundred microns).

Representative – Having the same quality and characteristics of the entire volume from which a sample is drawn.

Sample – A representative portion of an atmosphere of interest, or one or more separated constituents from a representative portion of an atmosphere.

4.0 PROCEDURE DETAILS

Air samples will be taken in areas with the potential to exceed ten (10) percent of the DAC for any radionuclide.

Ambient air monitoring equipment shall be placed in locations representative of the airborne contamination in the work location.

Data obtained from air monitoring shall be used for assessing the control of airborne radioactivity in the workplace and to evaluate the dose equivalent to radiation workers from internal sources.

Process or other engineering controls (e.g., containment or ventilation) shall be used, to the extent practicable, to control the concentration of radioactive material in air.

Air samplers shall be operated in accordance with the manufacturers' operation and calibration procedures.

Filters of different air samples shall be placed in a separate envelope, polybag, or other suitable container to ensure that there is no possibility of cross-contamination.

During collection and handling of air samples, caution must be used to prevent the samples from being contaminated by other sources of radioactive material.

4.1 PRECAUTIONS

Avoid unnecessary contamination of air sampling equipment through the use of plastic coverings and care in handling. Do not cover the air intakes or exhausts on air samplers.

Avoid unnecessary exposure when conducting air monitoring surveys by using as low as reasonably achievable (ALARA) practices.

Air samplers used in confined spaces may ignite explosive gases. Extreme care shall be exercised, including prior sampling of the atmosphere for explosive gas and oxygen content.

Samples should be taken in such a manner as not to contaminate the sample filter with materials that are not airborne or by sucking up loose contamination from surfaces near the sampling head. Caution should be used to minimize producing airborne material by the exhaust of the sampler.

When air sample results exceed 10 percent of the DAC value, report this information to the Project Health Physicist (PHP) (or qualified designee) immediately. Also, consideration should be given to isotopic analysis and area access restriction/posting in accordance with SOP 13, *Radiological Restricted Areas- Posting and Access Control.*

4.2 TYPE OF AIR SAMPLES

4.2.1 General Area Air Samples

General area air samples provide data representative of the work area for determining if the area should be controlled as an airborne radioactivity area. Samples are normally taken over a short period of time ranging from an hour up to one or more days. This type of sample is:

- Taken on a routine basis at predetermined times and locations, as specified by the Radiation Work Permit (RWP) or other work documents
- Uses a low-volume air sampler
- Consists of a minimum of 100 cubic feet (ft^3) (2,832 liters) of air passed through the sample filter
- Collected at between 3 and 6 feet above the floor level, in the vicinity of the workers performing the fieldwork
- Analyzed for alpha and beta activity at the on-site radiological counting laboratory

4.2.2 Grab Samples

Grab air samples are taken to evaluate the concentration of airborne radioactive radionuclides during the relatively short sampling period. This type of sample is useful for estimating the instantaneous or peak concentration of airborne contamination. This type of sample is:

- Taken as needed during radiological work coverage at the discretion of the Radiological Control Technician (RTC), or as directed by the PHP
- Uses a high-volume air sampler
- Consists of a minimum of 100 ft^3 (2,832 liters) of air passed through the sample filter
- Collected in the vicinity of the workers performing the fieldwork
- Analyzed for alpha and beta activity at the on-site radiological counting laboratory

4.2.3 Breathing Zone Air Samples

Breathing zone air samples provide data representative of the concentration of airborne radioactive material that a worker would be breathing during a particular task. This type of sample:

- Is used during the work activities with widely varying airborne contamination concentrations across the work area
- Uses a small portable air sampler with sample head attached on the worker's collar
- The sample head is usually positioned within 12 inches of the worker's face
- Consists of a minimum of 50 ft^3 (1,416 liters) of air passed through the sample filter
- Is analyzed for alpha and beta activity at the on-site radiological counting laboratory

4.3 AIR SAMPLING PROCEDURES

4.3.1 General

Sample types, number, locations and volumes will be collected as specified in an RWP or other work document.

Samples will be surveyed with a portable alpha/beta survey meter before placing in envelope or baggie. If the survey indicates the presence of contamination that exceeds background, appropriate steps will be taken to determine source of contamination and secure the area.

Samples will be sent to the on-site laboratory to be analyzed, as a minimum, for gross alpha and beta-gamma and determination (if any) of the DAC.

If sample analysis indicates airborne contamination, which exceed 10 percent of a DAC, appropriate steps will be taken to determine source of contamination and secure the area, notify the PHP. The PHP will notify Radiological Affairs Support Office (RASO) upon validation of the air sample analysis.

The Air Sample Identification Record (Attachment 1) and Personal Air Monitoring Log (Attachment 2) provide examples of air sampling record sheets. Equivalent or electronic forms, which provide at a minimum the information on these forms, may be used.

Air samples will be preserved and archived after analysis.

4.3.2 General Area Air Sampling

1. Determine the requirements for air sampling prior to initiating any work activities. This may be done by reviewing the Work Plan, RWP, discussion with the PHP (or designee), Project Manager (PM), and / or workers assigned to the task.
2. Test the functionality of the air sampling equipment prior to entering the work area. Check for current dates on calibration tags and recent calibration of the sampler flow meter. Any equipment not functioning properly, or with calibrations out of date will not be used. Notify the PHP (or designee) of any equipment that does not function properly.
3. Gather essential supplies before entering the work area. This may include:
    - Extension cords
    - Air sample filters
    - Tongs (if necessary)
    - Additional gloves
    - Air sample envelopes
    - Pen or marker

- Backup air sample equipment

4. Record the following information on the air sample envelope:
    - Sample identification number
    - Date
    - Location
    - Air sampler identification number
    - Start time
5. Place the air sampler on a stable surface 3 to 6 feet from the ground, in the vicinity of the workers performing the field activities.
6. Place an unused sample filter into the sample holder using care not to contaminate the filter with material on the tongs or gloves used to hold the filter while placing it into the holder. If the sampler has been in the contaminated area for some time, it is good practice to clean any visible debris or dust from around the sampler filter holder housing before placing the unused filter into the holder.
7. Operate the air sampler for the predetermined time. Verify the sampler flow rate, if a flow meter is provided on the sampler. Record any deviation from the predetermined flow rate.
8. If not provided with an automatic shut-off timer, turn the air sampler off as soon as practical after the predetermined sampling time has elapsed.
9. Prior to removing the sample from the holder, survey the sample using a hand-held alpha and beta contamination survey meter. Note the activity observed on the outside of the sample envelope.
10. If the sample survey indicates the presence of radioactive contamination and the area is not already controlled as an airborne radiation area, stop work, notify the PHP (or designee), and implement appropriate controls, including postings. Record sample information on the sample envelope, place the sample in the envelope and immediately send to the onsite laboratory for immediate analysis and percent DAC determination.
11. Using caution not to knock debris or dust from the sample filter holder housing onto the air sample, remove the air sample from the holder using clean gloved hands or clean tongs.
12. Place the sample into the sample envelope using caution not to scrape or remove contamination from the surface of the sample.
13. Record the following information on the air sample envelope:
    - Stop time
    - Sample volume
    - Sample pump flow rate
14. Send the sample to the on-site counting laboratory for analysis and percent DAC determination.
15. On Attachment 1, Air Sample Identification Record (or equivalent including electronic), note the sample analysis information provided by the laboratory as soon as the data is available, including:
    - Alpha count results [microCuries per milliliters (μCi/mL)]
    - Beta count results (μCi/mL)
    - Percent DAC

16. Complete Attachment 1 by transcribing the information from the sample envelope to Attachment 1 and initialing.

17. Report any higher than normal, higher than expected, greater than 10 percent of the DAC, or trending upward results to the PHP (or designee) immediately.

4.3.3 Breathing zone Air Sampling

The following steps will be taken for breathing zone air sampling:

1. Determine the requirements for breathing zone air sampling prior to initiating any work activities. This may be done by reviewing the Work Plan, RWP, discussion with the PHP, PM, and / or workers assigned to the task.

2. Assemble the individual breathing zone air sampler sets. Make sure that all hoses are firmly seated in the hose connectors found on the sample head and sample pump. Make sure that the sample head is not cracked or damaged in any way. Set any damaged or unusable equipment aside and notify the PHP (or designee).

3. Note the relative size of the individual to whom the sampler will be issued. It may be necessary to replace the standard length belt with a longer belt, or chain two belts together to achieve the required length. Make sure that the belt buckle is not damaged and will function properly to restrain the sampler around the worker. Set any damaged or unusable equipment aside and notify the PHP (or designee).

4. Test the functionality of the air sampling equipment prior to entering the work area. Check for current dates on calibration tags and recent calibration of the sampler flow meter. Any equipment not functioning properly, or with calibrations out of date will not be used. Notify the PHP (or designee) of any equipment that does not function properly.

   ***Note*:** Only use a sample pump containing a battery that is known to be fully charged.

5. Insert a new, unused sample filter paper into the sample head and tighten the sample head. Take care not to damage the filter paper or the sample head during this operation.

6. Prior to issuing any equipment to a worker, instruct the worker to:

   - Refrain from touching or tampering with the pump or the sample head;
   - Leave the work area if the sampler fails and note the stop time;
   - Contact the RCT for assistance when leaving the work area and at completion of work.

7. Prior to issuing any equipment to a worker, enter the following information on Attachment 2, Personal Air Monitoring Log:

   - Wearers' Name
   - Wearers' social security number
   - Sampler ID number
   - Date

8. Attach the personal breathing zone air sampler to the worker. Make sure that the belt is tight, but not uncomfortable.

9. Attach the sample head to the worker. Make sure that the sample head is clipped securely to the worker's lapel or other piece of clothing close to the worker's face. Make sure that opening in the end of the sample head is unobstructed.

10. Check the hose connecting the sample head to the sample pump. Make sure that the hose is not kinked, crimped, or folded. Make sure that the hose is not in a position where it may become kinked, crimped, or folded during work. Make sure that it will not interfere with routine work. If any of these conditions are found, reorient the hose. It may be necessary to find alternate places to position the sample head or sample pump so the hose is unobstructed.

11. Upon arrival at the work location, turn the pump ON. Note the START TIME and flow rate on Attachment 2, Personal Air Monitoring Log.

    Note: Make sure to note whether flow rate is in units of cfm or lpm.

12. Every time a worker leaves the work area, turn the sample pump OFF and note the stop time. Upon re-entering the work area, turn the sample pump back ON and make a new notation of the re-start time.

13. At the end of the sampling period (end of the task, or end of the shift), turn the pump OFF and note the stop time on Attachment 2, Personal Air Monitoring Log.

14. Calculate the total time that the sample pump was operating by adding together the operating periods of time.

15. Calculate the total sample volume by multiplying the operating time by sampler flow rate. The result may be in units of cfm or lpm.

16. Record the total sample volume on Attachment 2, Personal Air Monitoring Log. Note the appropriate units (cfm or lpm) on Attachment *2,* Personal Air Monitoring Log.

17. Select a clean, unused sample envelope. Label the envelope with the following information:

    - Sample ID number
    - Date
    - Location
    - Worker name
    - Total sample volume (use the appropriate units – cfm or lpm)

18. Open the sample holder using caution not to remove or add to the contamination on the sample.

19. Prior to removing the sample from the holder, survey the sample using a hand-held alpha and beta contamination survey meter. Note the activity observed on the outside of the sample envelope.

20. If the sample survey indicates the presence of radioactive contamination, and the area is not already controlled as an airborne radiation area, stop work, notify the PHP, and implement appropriate controls, including postings.

21. Using caution not to knock debris or dust from the sample filter holder housing onto the air sample, remove the air sample from the holder using clean gloved hands or clean tongs.

22. Place the sample into the sample envelope using caution not to scrape or remove contamination from the surface of the sample.

23. Confirm that the information on the sample envelope matches the information in Attachment 2, Personal Air Monitoring Log.

24. Immediately send the sample to the counting laboratory for analysis and percent DAC determination.

25. On Attachment 2, Personal Air Monitoring Log, note the sample analysis information provided by the laboratory as soon as the data is available, including:

- Alpha count results (µCi/ml)
- Beta count results (µCi/ml)
- Percent DAC

26. Complete the Attachment 2, Personal Air Monitoring Log.
27. Report any higher than normal, higher than expected, or trending upward results to the PHP (or designee) immediately.

4.3.4 Documentation

Air samples shall be documented using either an Air Sample Identification Record or Personal Air Monitoring Log (or equivalent).

5.0 REFERENCES

Number	***Title***
SOP 13	*Radiologically Restricted Areas - Posting and Access Control*

6.0 ATTACHMENTS

Attachment 1, Air Sample Identification Record

Attachment 2, Personal Air Monitoring Log

ATTACHMENT 1

AIR SAMPLE IDENTIFICATION RECORD

Project/Location:____ Page ____ of ____

Sample ID	Date	Location	Start Time	Stop Time	Air Sampler ID	Sample Volume	Count Results α (μCi/ml)	Count Results β (μCi/ml)	%DAC	Counter ID

DAC derived air concentration
μCi/ml microcurie per milliliter
ID identification number

α alpha
β beta

ATTACHMENT 2

PERSONAL AIR MONITORING LOG

Name of Wearer	SSN#	Sampler ID #	Date	Time On / Time Off	Flow Rate cfm /lpm	Total Volume ft^3 / Liters	Activity α ($\mu Ci/ml$)	Activity β ($\mu Ci/ml$)	Percent DAC

cfm	cubic feet per minute	lpm	liters per minute
DAC	derived air concentration	$\mu Ci/ml$	microcurie per milliliter
Ft^3	cubic feet	α	alpha
ID	identification number	β	beta

APPENDIX E

STORMWATER MANAGEMENT PLAN

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0015

APPENDIX E

FINAL

STORMWATER MANAGEMENT PLAN

March 2, 2007

INSTALLATION RESTORATION SITES 1, 2, AND 32
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-07-0748

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, CA 92101-8536

Abram S. Eloskof, M.Eng., M.Sc., CIH
Project Manager

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ABBREVIATIONS AND ACRONYMS

°F	degrees Fahrenheit
Avg.	average
BMP	Best Management Practice
CalTrans	California Department of Transportation
DON	Department of the Navy
DWQ	Division of Water Quality
EPP	Environmental Protection Plan
ESC	erosion and sediment control
HDPE	high-density polyethylene
IR	Installation Restoration
MPPEH	material potentially presenting an explosive hazard
N/A	not applicable
NAS	Naval Air Station
NPDES	National Pollutant Discharge Elimination System
Precip.	precipitation
PVC	polyvinyl chloride
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SHSP	Site Health and Safety Plan
SWMP	Stormwater Management Plan
TCRA	time-critical removal action
Temp.	temperature
TtEC	Tetra Tech EC, Inc.
USACE	United States Army Corps of Engineers
Water Board	California Regional Water Quality Control Board
WMP	Waste Management Plan

1.0 INTRODUCTION

This Stormwater Management Plan (SWMP) presents the measures that will be implemented to minimize sediment and other pollutants in stormwater discharges during the time-critical removal action (TCRA) at Installation Restoration (IR) Sites 1, 2, and 32 on the former Naval Air Station (NAS) Alameda, Alameda Point, Alameda, California. The removal of material potentially presenting an explosive hazard (MPPEH) will be in completed in conjunction with a radiological survey and will include a geophysical survey to identify locations of suspected debris pits and a disposal trench, followed by the excavation of those debris pits/trench and the removal of the entire former Firing-range Berm of the former small arms range on IR Site 1. While the removal of previously identified radiological anomalies is planned to occur at IR Sites 1, 2, and 32, the MPPEH investigation and removal activities will only take place at IR Site 1.

The TCRA activities will all occur on Alameda Point, which is Department of Navy (DON) property. IR Sites 1, 2, and 32 are not in use. Upon completion of this removal action, IR Sites 1 and 32 are planned to be transferred to the city of Alameda and used for the construction of a golf course and regional park trail. IR Site 2 is proposed to be transferred to another federal agency to become part of the planned wildlife refuge.

This SWMP has been prepared to comply with the substantive requirements of the National Pollutant Discharge Elimination System (NPDES) Program, specifically the General Construction Activity Stormwater Permit program as set forth by the California Regional Water Quality Control Board (Water Board, formerly known as RWQCB) in August 1999, Resolution No. 99-08-Division of Water Quality (DWQ). Regulated sites, including "site grading over 1 acre," are generally required to develop a SWMP. Stormwater discharge controls will be managed through implementation of this SWMP.

1.1 PURPOSE

The two major objectives for this SWMP include: 1) identifying the sources of sediment and other pollutants that may affect the quality of stormwater discharges, and 2) ensuring the implementation of Best Management Practices (BMPs) to reduce sediment and other pollutants in stormwater discharges during construction activities. This SWMP includes BMPs that address source reduction, control, and preventative measures.

This SWMP is to be used in conjunction with the TCRA Work Plan, which describes the scope of the construction activities planned to take place on IR Sites 1, 2, and 32. The planned work includes a surface sweep to remove MPPEH items on the ground surface; the cutting of existing vegetation; another surface search; geophysical, radiological and MPPEH surveys; the excavation of debris, MPPEH and radiological sources, the processing of soil and debris through a screening plant and site restoration. The excavated areas will be backfilled, compacted, and graded to their original elevations.

1.2 SCOPE

Elements of this SWMP include:

- Site description (Section 2.0)
- BMPs to be implemented for construction activities (Section 3.0)
- BMPs to be implemented for erosion and sediment control (ESC) (Section 4.0)
- Non-stormwater management (Section 5.0)
- Waste management and disposal (Section 6.0)
- Implementation of other approved plans (Section 7.0)
- Post-construction controls, including a description of local post-construction ESC requirements (Section 8.0)
- Site inspections and monitoring (Section 9.0)
- Responsible personnel (Section 10.0)
- Personnel training (Section 11.0)
- Certification of compliance (Section 12.0)
- SWMP review and modifications (Section 13.0)
- References (Section 14.0)

The BMPs presented in this document describe the actions and controls necessary to mitigate potential pollutant sources. This SWMP also contains supporting figures and tables. Inspection and monitoring reporting forms are provided in Attachment 1. BMPs are found in Attachment 2.

2.0 SITE DESCRIPTION

The following section describes the physical setting, including weather at the site, in addition to a brief discussion of construction activities and potential pollution sources.

2.1 SITE LOCATION

IR Site 1

IR Site 1 is a 78-acre (approximate) area located on the western coastline of Alameda Point, in Alameda, California. The site is relatively rectangular in shape and is bordered on the west by San Francisco Bay and on the north by the Oakland Inner Harbor. The former NAS Alameda borders the site on the east and south. IR Site 1 was used as the main disposal area for the former NAS Alameda from approximately 1943 through March 1956. Archival maps and drawings of the area during the 1940s show water as deep as 20 feet at what is now the western shoreline of the site. A rock seawall lies at the northern perimeter of the site and was in place prior to 1915. According to a survey completed by the DON in 1988, the landfill has no liner, maintenance was not performed, and the depth of the waste is unknown. A map showing various aspects of IR Site 1 can be found in Figures E.2-1 through E.2-3.

Paved runways, concrete pads, roads, and non-native grasslands comprise IR Site 1, and the area is mostly flat with slight depressions that sometimes flood during the winter rains. Uninhabited buildings, building foundations, and a former pistol range make up the disturbed areas of the site. Yellow sweet clover, ryegrass, and common plantain are the dominant plant species while feral rabbits are the dominant animal species in the non-disturbed areas of the site.

IR Site 2

IR Site 2 is a 110-acre (approximate) area located on the western coastline of Alameda Point, Alameda, California, and includes the West Beach Landfill (the landfill), the West Beach Landfill Wetland (the wetland), and the associated interior and coastal margins. Figure E.2-1 shows the location of IR Site 2. The landfill is sited on approximately 77 acres in the extreme southwestern end of Alameda Point. It was used as the main disposal area for the former NAS Alameda from approximately 1952 through 1982.

Wetlands cover about 33 acres of the site, and are bounded by upland (former landfill) areas to the north and east and by San Francisco Bay on the south and west. The wetlands contain two perennial ponds. Grasses and thistles are the dominant vegetation of the upland areas while seaside trefoil, brass buttons, and pickleweed inhabit the wetlands.

IR Site 32

IR Site 32 was formerly used as a weapons storage and maintenance facility. There is no history of MPPEH present on the site. IR Site 32 is currently not in use; although, the runways are frequently used by law enforcement for driver training.

2.2 CLIMATE AND PRECIPITATION

The climate in the project area is Mediterranean with moderate summers (average 62.8 degrees Fahrenheit [°F]) and mild winters (average 53.6°F).

The average annual rainfall at Alameda is 24.5 inches per year (Table E.2-1). The majority of the precipitation occurs during the months of November through March, while summers are relatively dry. The SWMP drainage system that will be in place during construction is designed to control a 2-year, 6-hour rainstorm event.

2.3 EXISTING STORMWATER CONVEYANCE SYSTEM

Currently no functional stormwater drainage systems or drainage control features are identified at IR Sites 1, 2, or 32. The existing stormwater conveyance consists of surface sheet-flow drainage from west to east where the water accumulates in low-lying, seasonal wetlands basins.

2.4 CONSTRUCTION ACTIVITIES

Mobilization activities will include site preparation (all sites), moving equipment and materials to the site, establishing laydown areas, and installing stormwater runoff controls. Vegetation on the sites may be cut if its height interferes with excavation and/or anomaly investigation.

2.5 SITE-SPECIFIC SWMP MEASURES

Discrete radiological point sources are the only type of contaminated materials that are expected to be encountered on IR Site 1 during the excavation of debris pits and disposal trenches. Elevated levels of metals are anticipated to be encountered on the eastern side of the former Firing-range Berm. The MPPEH items that are anticipated to be encountered at the former Firing-range Berm and debris pits are expected to be inert and contain no explosives or energetic materials. Within IR Sites 1, 2, and 32, previously identified radiological anomalies will be excavated. Each excavation will be approximately 10 feet in diameter. Radiological anomalies will be excavated to remove all radium-impacted waste above background levels, in accordance with the removal action objectives, or until groundwater is reached, whichever comes first. Barricades and flagging meeting the requirements for Class III perimeter protection established in Engineer Manual (EM) 385-1-1 (United States Army of Engineers [USACE], 2003) will be installed around the excavations. A sandbag barricade and silt fence will be installed upgradient from the excavation(s) to prevent storm water from entering the excavation. A typical BMP configuration for the excavation areas can be found in Figure E.2-3.

2.5.1 IR Site 1

The debris pit(s) and the disposal trench will be excavated in their entirety, that is, debris and material found in those areas will be excavated until native soil is reached or groundwater is encountered. The former Firing-range Berm will also be removed in its entirety. The soil in it will be excavated to ground surface, or when native soil is reached if debris is still present at that elevation. The excavated soil and debris from the former Firing-range Berm and debris pits will be processed through a screening plant to remove MPPEH items and then disposed off site.

Non-MPPEH soil and debris removed during anomaly recovery and excavation of the disposal trench will not be returned to excavation, and will be transported to a landfill after it is characterized for disposal. Imported clean fill will be used, as necessary, to restore each excavation to its original elevation. At least a portion of the debris pits are located on the coastline in elevated portions of the former Firing-range Berm. Silt fences and/or sandbag barriers will be installed to prevent runoff from those excavations into San Francisco Bay. Similarly, when the excavation of the former Firing-range Berm commences, the berm will be considered a stockpile and covered with a 10-mil plastic cover during times of inactivity. The anticipated location of the disposal trench is situated in a very flat portion of the site, about midway between the road that traverses the site and the coastline. Depending on the final excavation depth of the trench, barricades and flagging meeting the requirements for Class II perimeter protection (if the excavation depth is greater than 6 feet) or Class III perimeter protection (if the excavation does not meet the requirements for Class II perimeter protection) as defined in EM 385-1-1 (USACE, 2003) will be installed around the trench site. A sandbag barricade and silt fence will be installed up-gradient from the excavation(s) to prevent stormwater from entering the excavation. Because the site is very flat, no significant run-on or runoff is anticipated during rain events. A map of the site can be found in Figure E.2-3.

2.5.2 Point Source Excavations at IR Sites 1, 2, and 32

As previously discussed in Section 2.5, an excavation that is approximately 10 feet in diameter will be installed around the location of each previously identified discrete radiological point source or anomalous area. Samples from the floors and sidewalls of these excavations will be collected to determine if all radiological materials have been removed. As such, the excavations will not be immediately backfilled and will remain open until the sample results are returned. Appropriate barricades will be erected around the excavated areas and BMPs in the form of sandbag barricades, and silt fences will be installed upgradient to prevent stormwater from entering the excavation.

2.6 SOURCE IDENTIFICATION

Possible sources of contamination are discussed in the following sections.

2.6.1 Potential Pollutants During the Excavation/Investigation Phase

Hazardous materials used during construction will include gasoline, diesel fuel, motor oil, hydraulic fluid, and various lubricants. Acutely hazardous materials will not be used or stored on site during construction. There is only minimal potential for environmental impacts caused by incidents involving hazardous material during construction. Small volumes of hazardous materials will be temporarily stored on site inside fuel and lubrication service trucks. Paints and solvents, if required, will be stored in flammable materials cabinets.

Heavy equipment will be inspected daily for leaks and when not in use (e.g., overnight) parked in a bermed area. The most probable type of incidents caused by hazardous materials are minor spills or dripping of fuels, oil, or grease. Impacts from such incidents will be mitigated by thoroughly cleaning up spills and any dripped material immediately. Tanks or drums containing potentially contaminated water will be stored in a secondary containment area constructed of high-density polyethylene (HDPE) or polyvinyl chloride (PVC) liner.

An incident involving a service vehicle or refueling truck release would present the worst-case scenario for release of hazardous materials. Should this scenario occur, the area will be immediately bermed or otherwise contained. The spill would be reviewed by the Site Superintendent to determine if the DON and regulatory agencies need to be notified. A cleanup of a large spill or release will most likely involve excavation and storage of the impacted soil and/or materials for off-site disposal or recycling, based on waste characterization.

Soil stockpiles will be covered to prevent dispersion of sediment or particulate matter through air or stormwater, and appropriate BMPs will be implemented.

3.0 BMPS TO BE IMPLEMENTED FOR CONSTRUCTION ACTIVITIES

Standard BMPs to be implemented on this project are described in the *Construction Site Best Management Practices (BMPs) Manual* (California Department of Transportation [CalTrans], 2003). This resource handbook provides descriptions of BMPs that can significantly reduce soil erosion and pollutant discharges from construction sites. The BMPs in the following section are designated by a code and number, and are illustrated in Table E.2-2. Additional BMPs may be developed as necessary prior to each construction phase. The BMPs for construction activities that may pollute the stormwater focus on the following potential pollutant sources:

- Contaminated fine-grained soil (silt) from excavation activities suspended in stormwater runoff
- Contamination of stormwater from contact with contaminated soil
- Hazardous waste spills (including fuel, oil, and lubricants)
- Erosion of contaminated soil stockpiles built during construction
- Solid waste from construction activities

Good housekeeping and maintenance practices are key factors in reducing potential off-site migration of pollution. These practices shall include elimination of brush, litter, or other items that may clog drainage pathways or enter the stormwater flow within the excavation areas. Maintaining good housekeeping on the site requires employee participation and specific training on SWMP control systems. The following BMPs that will be implemented at the site are essential to maintaining control of potential pollution sources.

3.1 SCHEDULING (SS-1)

This BMP involves the development of a schedule that includes the sequencing of construction activities with the implementation of construction site BMPs, such as temporary soil stabilization to control erosion, and temporary sediment control measures. The primary purpose of developing a schedule is to reduce the quantity of soil exposed to erosion via wind, rain, or vehicle tracking and minimize the duration of exposure.

3.2 MATERIAL DELIVERY, STORAGE AND USE (WM-1 AND WM-2)

These BMPs outline procedures for the proper handling, storage and use of potentially hazardous materials in a manner that minimizes, or eliminates the discharge of these materials to a storm drain system or to watercourses.

3.3 SPILL PREVENTION AND CONTROL (WM-4)

The following documents will be maintained on site and outline the specific steps the Site Superintendent will follow in the event of a spill or release: the TCRA Work Plan, which includes a Waste Management Plan (WMP) as Section 7.0 and an Environmental Protection Plan (EPP) as Section 9.0, Site Health and Safety Plan (SHSP) (Appendix A), and Transportation and Disposal Plan (Appendix G).

3.4 SOLID WASTE MANAGEMENT (WM-5)

All construction waste shall be disposed in dumpsters, roll-off bins, or other similarly approved containers. MPPEH items will be packaged and stored in on-site magazines. Specific procedures to handle all types of waste expected to be generated during site activities are provided in the WMP (Section 7.0 of the TCRA Work Plan) and Transportation and Disposal Plan (Appendix G).

3.5 HAZARDOUS WASTE MANAGEMENT (WM-6)

The potential hazardous waste at the site includes fuel, oil, and lubricants. Radiological point sources will be placed in metal drums and stored in on-site magazines. Specific procedures to handle all types of waste expected at the site are included in the WMP (Section 7.0 of the TCRA Work Plan).

3.6 CONTAMINATED SOIL MANAGEMENT (WM-7)

Excavation activities may generate contaminated soil and/or debris. All excavated material will be placed in stockpile areas constructed with liners and berms as described in Section 2.5. Samples will be collected from each stockpile to determine if any contaminants are present per the SAP (Appendix B).

3.7 VEHICLE AND HEAVY EQUIPMENT FUELING (NS-9)

During construction activities, diesel fuel will be delivered to the site via fuel truck and pumped directly into on-site machinery. To prevent runoff of spills, fueling will occur in designated areas located away from drainage courses. If a spill occurs during on-site fueling activities, containment with an earth berm and/or excavation retention trap will be constructed. The individual noting the spill will be responsible for contacting the Site Superintendent, who will notify the Project Manager, who in turn is responsible for notifying the DON, regulatory authorities, as necessary, and managing the cleanup and removal of contaminated soils in accordance with regulations.

Gasoline used for passenger vehicles and trucks will be obtained primarily from filling stations off site, but some on-site gasoline fueling may occur. If a spill occurs during on-site fueling activities, the person pumping the fuel will be responsible for contacting the Site Superintendent and for cleanup and removal of contaminated soils. Gasoline used to fuel small project power tools (weed cutters, mowers, etc.) will be stored in flammable storage lockers in areas designated for hazardous material storage. These areas will be equipped (lined, bermed, etc.) so that small fuel spills will not cause environmental impact.

3.8 VEHICLE AND EQUIPMENT MAINTENANCE (NS-10)

Heavy equipment oil changes and maintenance may be performed on site. In the event that a spill associated with the heavy equipment (diesel, hydraulic fluid, or gas leak) occurs, containment will be provided, the Site Superintendent will be notified, soil in the spill area will be excavated, and the material containerized and stored in one of the designated areas until proper off-site disposal can be performed.

All heavy equipment and vehicles will be inspected at the beginning and end of each workday for oil and lubricant leaks. Leaking equipment will be repaired or removed from service and small leaks will be cleaned up immediately. Excessive greasing of components will be avoided, accumulated grease will be wiped off and the contaminated rags properly disposed of off site. All oil and lubricant supplies will be securely stored in drums or appropriate containers to prevent an uncontrolled discharge of spilled materials. Oil changes and maintenance for site vehicles will normally be performed off site.

3.9 EMPLOYEE/SUBCONTRACTOR TRAINING

Tetra Tech EC, Inc. (TtEC) work policies require extensive training for all employees and subcontractors working on TtEC sites. Each employee is required to be current in appropriate federal and state hazardous waste training requirements and other training programs, as defined in the SHSP (Appendix A). Additional training requirements specific to this project are identified in Section 4.1 of the TCRA Work Plan.

TtEC requires all employees and subcontractors to attend daily safety meetings at the worksite, and each work phase is reviewed in project orientation meetings. These meetings discuss potential problems and may include weather conditions, stormwater control, and a review of the response actions that will occur in the event of a spill or contaminant release.

4.0 BMPS TO BE IMPLEMENTED FOR EROSION AND SEDIMENT CONTROL (ESC)

BMPs for ESC can be found in Attachment 2 and will be referenced and implemented (as necessary) during construction activities.

4.1 PRESERVATION OF EXISTING VEGETATION (SS-2)

Vegetation on the sites will be preserved until construction is expected to commence in those areas. The preservation of existing vegetation will be maximized where feasible. During construction, the limits of excavations, grading or other soil disturbances will be clearly marked to segregate those locations from areas of preserved vegetation.

4.2 HYDROSEEDING (SS-4)

Upon completing excavation and/or investigation in a particular area, each site will be restored to its original elevation and hydroseeded (if required) as soon as possible. A temporary irrigation system may be used in localized areas to promote rapid establishment of the vegetation. If hydroseeding is not required, all areas will be allowed to naturally re-vegetate.

4.3 WIND EROSION (WE-1)

Dust control measures will be used to stabilize soil from wind erosion and to reduce dust generated from clearing and grading activities, excavation and screening, backfilling operations, and construction vehicle traffic on unpaved areas. Water trucks will be used for dust control. The source of water for the truck will be the water supply located inside the tarmac fence near the access gate behind the base gym. In addition to wet suppression (watering), preventative measures to be used for dust control include minimizing disturbed surface areas, limiting on-site vehicular traffic and speed, controlling the number and activity of vehicles on the site at a given time, and covering stockpiles when they are not in use.

4.4 SOIL STOCKPILE AREAS

Soil stockpiles will be generated during excavation activities that will be in an uncompacted condition and subject to erosion. BMPs addressing stockpiles will include diversion of drainage from the stockpile areas (WM-3), placement of additional sandbag desilting facilities (SC-8), silt fencing on the downgradient toe of stockpile slopes (SC-1), and dust control (WE-1). In addition, large stockpiles will be sloped to encourage sheet flow and reduce the infiltration of rainwater. A 10-mil plastic cover will be deployed over the stockpiles at the end of each day and during rainy weather and/or windy conditions.

4.5 EARTH DIKES/DRAINAGE SWALES & LINED DITCHES (SS-9)

Swales may need to be installed to divert and control stormwater runoff. They may also be used to divert sheet flow over slopes, prevent run-on into open excavations or active construction zones, and control erosion.

4.6 SILT FENCE AND SANDBAGS (SC-1 AND SC-8)

Silt fencing may be used as a sediment trapping/filtering device downgradient of stockpile areas and all disturbed areas where sheet flow occurs but are not intended to act as a flow diverter. The maximum length of slope draining to any point along the site fence will be less than 200 feet, and the slope of the area draining to the silt fence will be less than 1:1 (horizontal:vertical).

Sandbags will be used as a drainage diversion, sediment trap, and stormwater velocity/erosion control. The sandbags will be installed on level contours receiving drainage areas up to 1 acre and in areas of concentrated flows and drainage courses.

Locations where silt fence and sandbags are to be used on site include:

- Sandbags and silt fencing around and along the downgradient toe of all soil stockpile areas
- Sandbags or silt fencing below active construction areas
- Sandbags in concentrated drainage flow courses and as needed in areas downgradient of active work areas
- Sandbags as an on-flow diversion berm upgradient of active work areas and excavations

4.7 STRAW BALE FILTER BARRIER (SC-9)

Straw bale barriers consist of a series of secured, anchored bales placed to intercept and filter sediment-laden runoff from small areas of disturbed soil. Straw bales may be used onsite in place of sandbags and silt fencing around stockpile areas and downgradient of any active locations where excess sediment may be expected. Straw waddles may be used in lieu of straw bales.

5.0 NON-STORMWATER MANAGEMENT

Management of non-stormwater discharges will be implemented as part of this SWMP. Weekly inspections of the grading, vegetative cover, roads, and stormwater/erosion control structures (including secondary containment structures) will be conducted in addition to wet/dry season observations. Any authorized or unauthorized non-stormwater discharges, if observed, will be documented on the appropriate form, which can be found in Attachment 1 of this SWMP.

6.0 WASTE MANAGEMENT AND DISPOSAL

Residuals and wastes are generated by construction and site operation activities. Waste management involves the following four steps:

1. Handling and storage
2. Characterization
3. Transportation
4. Disposal or recycling as appropriate

The WMP (Section 7.0 of the TCRA Work Plan) and the Transportation and Disposal Plan (Appendix G) provide detailed information on the waste management. Handling and storage are the most important elements required for maintaining compliance with the SWMP. In order to reduce the potential and severity of hazardous material spills, all materials and wastes will be stored in appropriate containers with lined, secondary containment. Pallets will be used for larger containers such as drums.

6.1 SPILL RESPONSE

If a spill is discovered, it must be immediately contained, cleaned up, and the source of the leak repaired. The TtEC Project Manager, DON Remedial Project Manager (RPM), and Resident Officer in Charge of Construction (ROICC) will be notified of all significant spills and releases. DON representatives will be advised to notify the Water Board within 24 hours of the spill or leak, if the size/quantity of the leak reaches reporting-threshold levels. The TtEC Project Manager will determine what additional BMPs will need to be implemented to prevent future spills or releases. If a spill occurs and threatens to contaminate stormwater at the site, monitoring and sampling must be conducted as described in Section 9.0.

7.0 IMPLEMENTATION OF OTHER APPROVED PLANS

Several site-specific management plans have been prepared to provide a framework by which the construction and site operations are executed. These plans describe the methods that will be used to execute, integrate, and coordinate emergency response procedures, control quality, address safety and health, and generally perform the work in a sound manner. These plans include, but are not limited to, the following:

- TCRA Work Plan
- SHSP (Appendix A)
- Sampling and Analysis Plan (Appendix B)
- Site-specific Contractor Quality Control Plan (Appendix C)
- Explosives Safety Submission (Appendix F)
- Transportation and Disposal Plan (Appendix G)

8.0 POST-CONSTRUCTION CONTROLS

When work on the project is complete, all of the sites will be restored to their original elevations and revegetated, as necessary. The original, natural drainage configuration for each site will be recreated to ensure that the original gradient schemes remain intact. This will include the following components:

- General grading with positive slopes
- Drainage pathways with terrace drainage controls (as necessary)
- Vegetative erosion control cover

9.0 SITE INSPECTIONS AND MONITORING

All stormwater pollution prevention measures and BMPs will be inspected prior to the rainy season, prior to forecasted rain events, and following each rain event of 0.25 inches per 24 hours or greater. This inspection will allow the evaluation of the BMPs installed to prevent the release of potential pollutants. Inspections will be performed during construction activities by trained personnel who will complete the appropriate forms. The forms are included in Attachment 1 of this SWMP. Inspections will include the date of the inspection, the individual(s) who performed the inspection, and any observations. Any BMP deficiencies will be documented and corrected as soon as possible. All completed inspection forms will be retained by TtEC for a period of 3 years.

Water sampling may be conducted if visual monitoring indicates a breach, malfunction, leakage, or spill from a BMP used during construction activities on IR Sites 1, 2, or 32 that could result in the discharge of pollutants from the site. Because the site is relatively flat and has no distinguishable discharge point, it may be difficult to designate a discharge monitoring point. If a point discharge were to occur as a result of a breach of a sandbag or straw bale, barricade along a site border during construction activities, a monitoring point will be designated at a location closest to the breach, if water is present at the time of observation.

10.0 RESPONSIBLE PERSONNEL

The individuals who comprise the Pollution Prevention Team and are responsible for implementing and making any necessary revisions to this SWMP are the following personnel:

Name	Title	Responsibility
Ms. Greta Neuman	Environmental Compliance Manager	Preparation of SWMP and selection of BMPs. Revisions to the SWMP.
Mr. Bob Wells	Site Superintendent	Implementation of SWMP, maintaining inspection and monitoring records, reporting, and regulatory notification.
Mr. Vincent Richards	Project Quality Control Manager	Implementation of inspection and monitoring activities of the SWMP and BMPs.

11.0 PERSONNEL TRAINING

All personnel involved with the ongoing monitoring and maintenance of the stormwater management system will attend a training class held by the Site Superintendent, or his designee, before beginning the soil excavation phase of construction. The Site Superintendent will maintain a file of the training documentation. The SWMP will be reviewed as it relates to the various responsibilities for personnel implementation and awareness.

12.0 CERTIFICATION OF COMPLIANCE

TtEC and their subcontractors will implement and comply with the program established in this SWMP. If a major SWMP noncompliant condition is discovered that cannot be immediately rectified, TtEC will notify the Program Manager and submit a schedule for necessary corrections that will be completed within 30 days of the occurrence. The Program Manager will notify the DON, if necessary. Written certification that corrective actions were executed will be issued to the DON, if necessary, upon completion of the activities.

13.0 SWMP REVIEW AND MODIFICATIONS

TtEC will amend the SWMP, as necessary, to address changes in the physical conditions of the sites, or to maintain compliance in areas where the SWMP is inadequate. Changes will be documented in writing and implemented after DON concurrence.

14.0 REFERENCES

California Department of Transportation (CalTrans). 2003. *Construction Site Best Management Practices (BMPs) Manual.* March 1.

U.S. Army Corps of Engineers (USACE). 2003. *Safety – Safety and Health Requirements.* EM 385-1-1. 3 November.

TABLES

TABLE E.2-1

MEAN MONTHLY RAINFALL AMOUNTS AND TEMPERATURES
ALAMEDA POINT, CALIFORNIA
(inches)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Precip.	5.0	3.8	3.7	1.8	0.3	0.3	0.1	0.1	0.4	1.5	3.7	3.8
Mean Temp.	50°	54	54	56	58	61	62	64	64	62	56	50

Notes:

Source: The Weather Underground, 2006 (www.wunderground.com)

Avg. – average
Precip. – precipitation
Temp. – temperature

TABLE E.2-2

BEST MANAGEMENT PRACTICES

Soil Stabilization	Sediment Control	Wind Erosion	Non-stormwater Management	Waste Management
SS-1 Scheduling	SC1 Silt Fence	WE-1 Wind Erosion Control	NS-2 Dewatering Operations	WM-1 Material Delivery and Storage
SS-2 Preservation of Existing Vegetation	SC-8 Sandbag Barrier	N/A	NS-8 Vehicle and Equipment Cleaning	WM-2 Material Use
SS-4 Hydroseeding	SC-9 Straw Bale Barrier	N/A	NS-9 Vehicle and Equipment Fueling	WM-3 Stockpile Management
SS-9 Earth Dikes, Drainage Swales and Lined Ditches	N/A	N/A	NS-10 Vehicle and Equipment Maintenance	WM-4 Spill Prevention and Control
				WM-5 Solid Waste Management
				WM-6 Hazardous Waste Management
				WM-7 Contaminated Soil Management

Notes:

Source: Caltrans, 2003

CalTrans – California Department of Transportation
N/A – not applicable

FIGURES

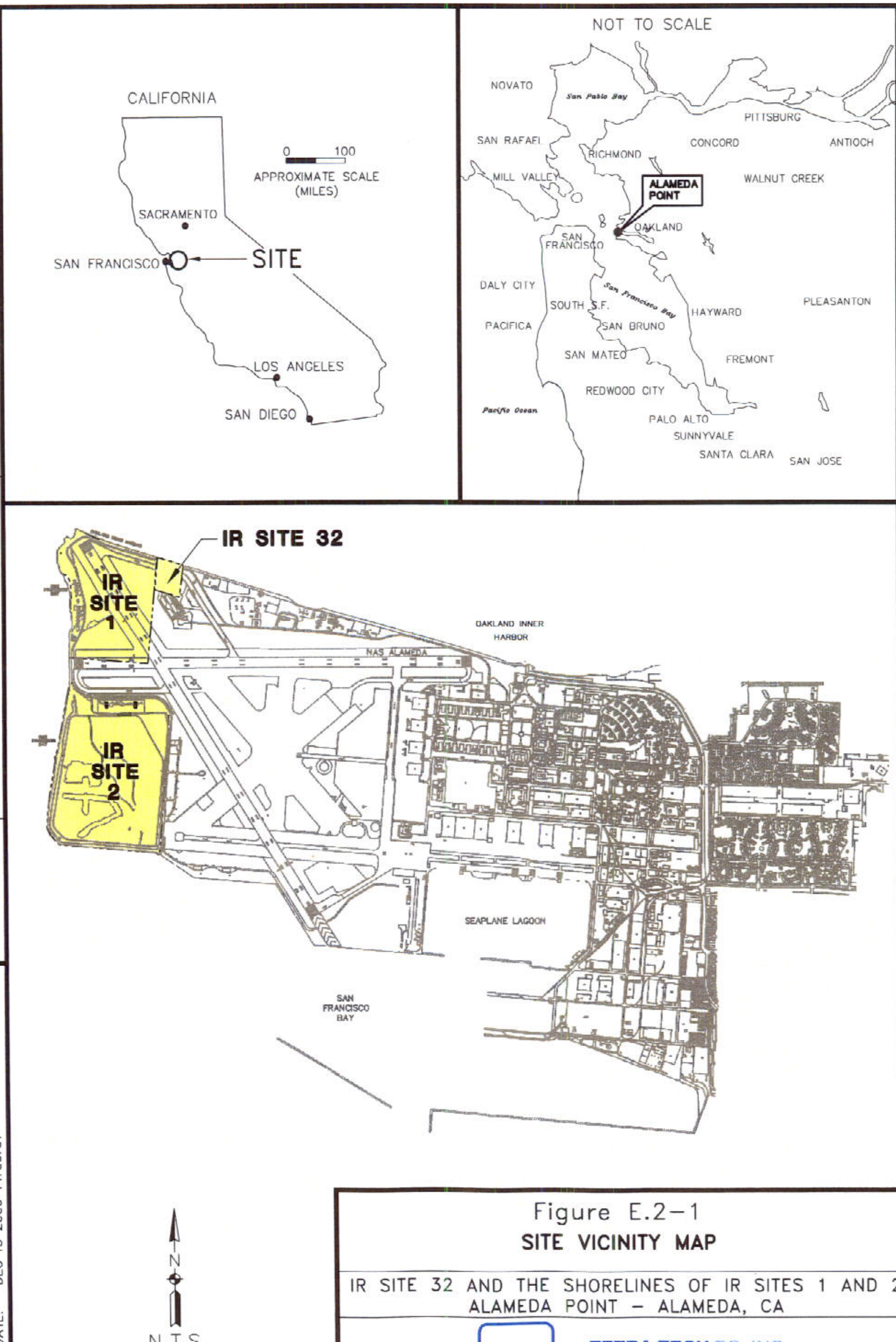

Figure E.2-1
SITE VICINITY MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 07023211.DWG
DCN: ECSD-RACIV-07-0232
CTO: #0015
APPROVED BY: AE
CHECKED BY: JA
REVISION: 0
DRAWN BY: MD
DATE: 01/31/07

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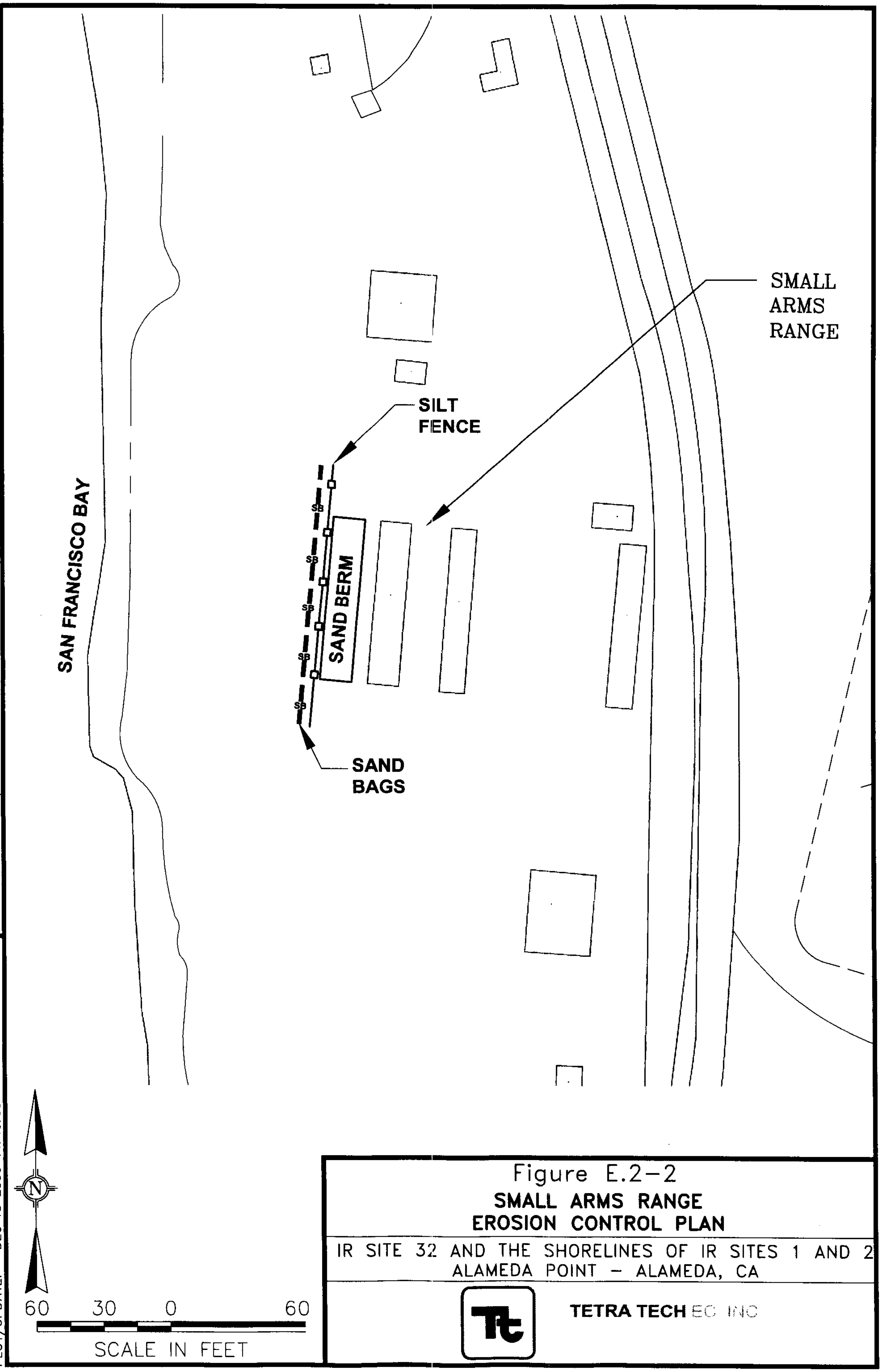

Figure E.2-2

SMALL ARMS RANGE
EROSION CONTROL PLAN

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT - ALAMEDA, CA

TETRA TECH EC INC

DRAWN BY: MD | CHECKED BY: LH | APPROVED BY: AE | DCN: ECSD-RACIV-07-0232 | DRAWING NO:
DATE: 01/31/07 | REVISION: 0 | CTO: #0015 | 070232E22.DWG

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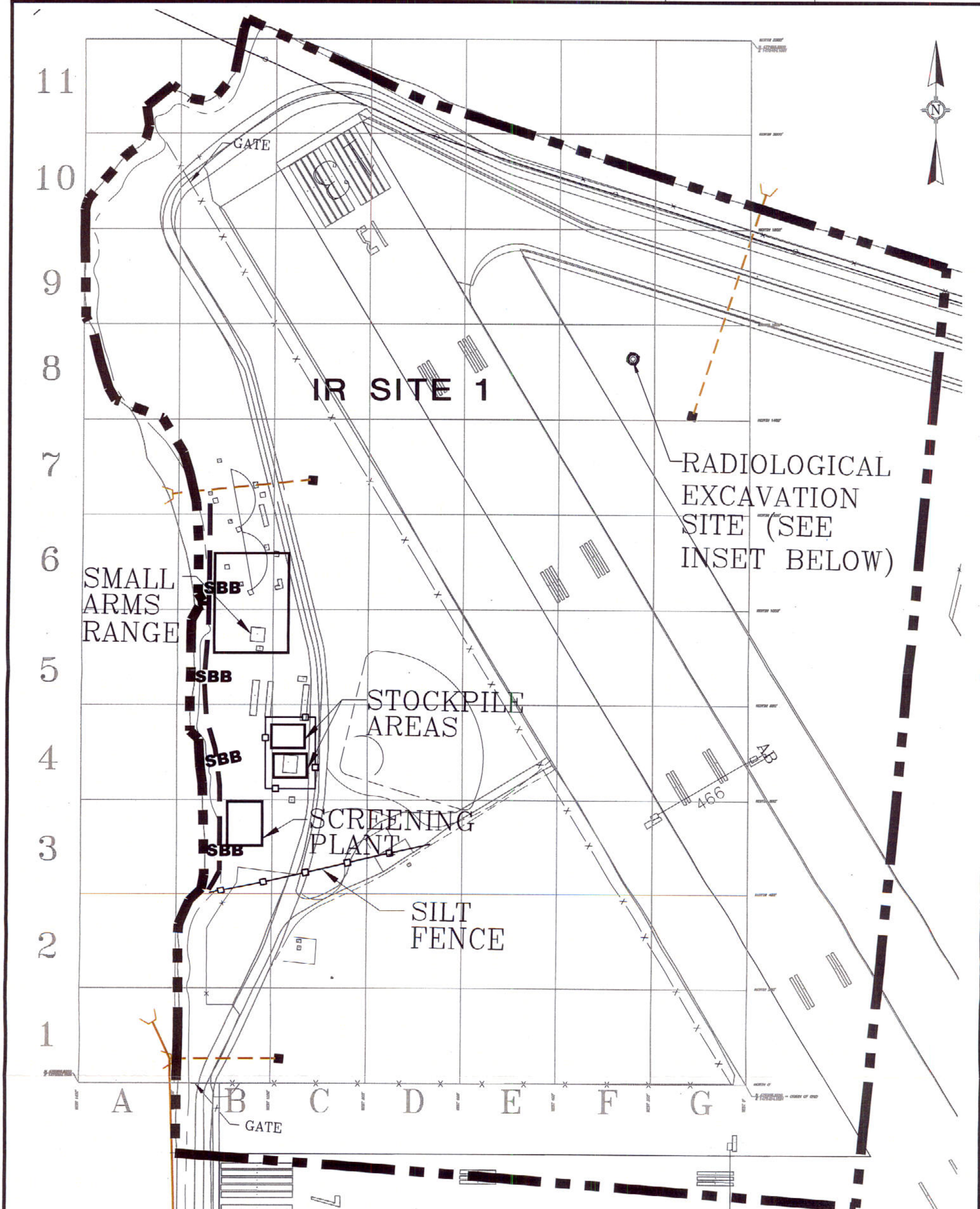
PLOT/UPDATE: DEC 15 2006 14:49:53

P:\3210-RAC IV\CTO-0015\DWG\060442\060442E23.DWG
PLOT/UPDATE: SEP 28 2006 16:03:26

DRAWN BY: MD	CHECKED BY: LH	APPROVED BY: AE	DCN: ECSD-RACIV-07-0232	DRAWING NO:
DATE: 01/31/07	REV: REVISION 0		CTO: #0015	070232E23.DWG

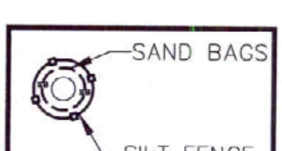


200 100 0 200

SCALE IN FEET

LEGEND

- SITE BOUNDARY
- FENCE LINE
- STRAW BALE BARRIER
- SILT FENCE



RADIOLOGICAL EXCAVATION SITE (TYPICAL) (N.T.S.)

Figure E.2-3

EROSION CONTROL PLAN

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

ATTACHMENT 1

SITE INSPECTION AND MONITORING REPORTING FORMS

STORM WATER MANAGEMENT PLAN INSPECTION CHECKLIST

IR Sites 1, 2, and 32, Alameda Point, Alameda, CA

Name/Title of Inspector: ____________________

Date of Inspection: ______________ **Time of Inspection:** __:__ **AM/PM**

Type of Inspection: Pre-Precipitation/Post-Precipitation

Weather Conditions: ____

Start of Rainfall (Date/Time): __________________________

End of Rainfall (Date/Time): __________________________

Total Recorded Precipitation: ________________ **inches**

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1. Description of Area Under Maintenance/Construction Contributing to Storm water Runoff (include location of maintenance area, BMPs in place, type of maintenance activity, condition of storm water discharge structures):

____

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ATTACHMENT 2

BEST MANAGEMENT PRACTICES

BMPS FOR IR SITES 1, 2, AND 32, ALAMEDA POINT

*Inspected by:*________________ *Y= YES* *N = NO* *Date:*____________

ITEMS	IN PLACE	CLEARED	ADEQUATE	NEEDS IMPROVEMENT
Berm along down gradient side of the former Firing-range Berm.				
Sandbag barrier and silt fence up-gradient from excavated areas				
Proper perimeter protection installed around excavated areas				
Sandbags along base of slopes				
Silt fence/sandbags at downgradient toe of stockpile slopes				
Stockpile and debris pile covered with HDPE or PVC sheeting				
Active construction area silt fence				
Straw waddles acting as sediment collectors throughout site (when necessary)				
Bagged/drummed material and drum storage area				
Off-site mud tracking concerns				
General grading to prevent ponding				
Additional BMPs:				

APPENDIX F

EXPLOSIVES SAFETY SUBMISSION

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0015

FINAL

EXPLOSIVES SAFETY SUBMISSION

Revision 1

March 2, 2007

INSTALLATION RESTORATION SITE 1
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-07-0327

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, CA 92101-8536

Abram S. Eloskof, M.Eng., M.Sc., CIH
Project Manager

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ABBREVIATIONS AND ACRONYMS

C/D	class/division
CQC	Contractor Quality Control
DDESB	Department of Defense Explosives Safety Board
DGPS	Differential Global Positioning System
DoD	Department of Defense
DON	Department of the Navy
ECM	earth-covered magazine
EMM	earth-moving machinery
EOD	Explosive Ordnance Disposal
ERA	Emergency Removal Action
ESS	Explosives Safety Submission
ESQD	explosive safety quantity distance
EZ	exclusion zone
HE	high-explosive
HFD	hazardous fragmentation distance
IBD	inhabited building distance
IL	interline
IR	Installation Restoration
MEC	munitions and explosives of concern
MGFD	munition with the greatest fragmentation distance
mm	millimeter
MPPEH	material potentially presenting an explosive hazard
MRS	Munitions Response Site
MSD	minimum separation distance
NAS	Naval Air Station
NEW	net explosive weight
NOSSA	Naval Ordnance Safety and Security Activity
PjM	Project Manager
PTR	public transportation route
QA	quality assurance
QC	quality control
Q/D	quantity/distance

ABBREVIATIONS AND ACRONYMS
(Continued)

RAB	Restoration Advisory Board
RAO	removal action objective
RCT	Radiological Control Technician
RPM	Remedial Project Manager
SOP	standard operating procedure
SSPORTS	Supervisor of Shipbuilding, Conversion and Repair, Portsmouth
SUXOS	Senior UXO Supervisor
TCRA	time-critical removal action
TP	target practice
TSD	Team Separation Distance
TtEC	Tetra Tech EC, Inc.
UXO	unexploded ordnance

1.0 PROJECT SUMMARY

This Explosives Safety Submission (ESS) is being submitted to support the time-critical removal action (TCRA) of munitions and explosives of concern (MEC) including material potentially presenting an explosive hazard (MPPEH) from Installation Restoration (IR) Site 1 on the former Naval Air Station (NAS) Alameda, Alameda Point, Alameda, California. While the TCRA involves the removal of discrete radiological sources from IR Sites 1, 2, and 32 at the former NAS Alameda, this ESS only addresses munitions response activities that will be conducted at the Munitions Response Site (MRS) located on IR Site 1. The format and informational content of this ESS is compliant with the requirements of Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8020.15.

The removal of MEC/MPPEH from the IR Site 1 MRS will be completed in conjunction with a radiological survey and will include a geophysical survey to identify locations of suspected debris pits and a disposal trench, followed by the excavation of the pits/trench and the removal of the entire former Firing-range Berm located within the former small arms range at IR Site 1. The Department of the Navy (DON), Base Realignment and Closure Program Management Office West directs these actions in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan. Tetra Tech EC, Inc. (TtEC), as the general contractor, is responsible for conducting this work under contract number N62473-06-D-2201. The DON has initiated the planned TCRA to substantially eliminate, prevent, or abate any potential hazards associated with MPPEH and radiological items.

A vicinity map that illustrates the location of Alameda Point, IR Site 1 and its planned usage can be found in Figure 1-1.

1.1 SITE DESCRIPTION

IR Site 1 is relatively remote from occupied buildings and public traffic routes, and access to the site is prevented by a fence line that segregates the western runway and tarmac areas of the former air station from the populated portions of the base to the east. This fence is shown in Figure 1-2.

The site is an area of approximately 78 acres located on the western coastline of Alameda Point, in Alameda, California. The site is rectangular in shape and is bordered on the west by San Francisco Bay and on the north by Oakland Inner Harbor. The former NAS Alameda borders the site on the east and south. IR Site 1 was used as the main disposal area for the former NAS Alameda from approximately 1943 through March 1956. A map showing various aspects of IR Site 1 and the explosive safety quantity distance (ESQD) and exclusion zone (EZ) arcs can be found in Figures 1-1 through 1-4.

The firing range area is located on the coastline in the middle of IR Site 1 and was formerly used for pistol, rifle, and shotgun practice. The southern portion (approximately 70 feet) of the small arms range was designated as the shotgun range, and the center of the range (approximately 80 feet) was designated as the pistol range. The northern section of the small arms range (approximately 45 feet) was designated as a disposal area, and is the general location of debris pits known to contain 20 millimeter (mm) projectiles. The former Firing-range Berm runs along the coastline on the western side of the range.

IR Site 1 is currently not in use, although Alameda law enforcement agencies sometimes use the adjacent runways for high-speed driving maneuver training.

1.2 REASONS FOR SUSPECTED MEC/MPPEH

A radiological survey of IR Site 1 in 1998 resulted in the discovery of 335 live, 20mm high-explosive (HE) projectiles, two small arms rounds, 12,259 – 20mm target practice (TP) projectiles, 1,689 .50 caliber armor-piercing projectiles, and 359 assorted brass casings. The HE-filled projectiles were detonated as a part of an Emergency Removal Action (ERA) completed by Unexploded Ordnance (UXO) technicians from Supervisor of Shipbuilding, Conversion and Repair, Portsmouth (SSPORTS) Environmental Detachment.

A 2001 surface removal action at 5 locations within IR Site 1 resulted in the discovery of 1,079 – 20mm TP projectiles and an empty 40mm grenade casing. Most of these objects were found in large groups in the vicinity of the former pistol range, but some were found in individual units. During activities conducted on IR Site 1 in the years subsequent to the removal action, an additional accumulation of approximately 300 – 20mm projectiles were encountered that appeared to have migrated to the ground surface from debris pits after rain events or heavy surf.

1.3 CONCLUSIONS FROM PREVIOUS STUDIES

The UXO Emergency Removal Action Summary Report for IR Site 1 concluded that *"another apparent ordnance 'burial site' was discovered during the surface sweep but it was not excavated since its boundaries could not be accurately defined, and since it was possible to clear ordnance from the surface with some confidence that radiation survey personnel would not disturb additional items. The site is located on the north side of the small arms range at the toe of the backstop berm."* (SSPORTS, 1998). This report is consistent with the location of the 20mm projectiles that have been found in the years since this removal action.

1.4 SUSPECTED TYPE AND AMOUNT OF MEC AND MPPEH CONTAMINATION

Based on the history of the MRS, including facts obtained from the summary reports of previous actions on the site, both HE-filled and TP 20mm projectiles are likely to be present on site. The expected amount is unknown, and will be determined by the size and contents of the debris pits, the disposal trench, and the former Firing-range Berm.

1.5 PLANNED FUTURE USE OF THE PROPERTY

The TCRA activities will all occur on Alameda Point, which is DON property. IR Site 1 is proposed to be conveyed to the City of Alameda for recreational use. The site will likely be used as a golf course and regional park trail.

1.6 REMEDIATION GOALS

The debris pit(s) and the disposal trench will be excavated in their entirety; that is, debris and material found in those areas will be excavated until native soil that meets removal action objectives (RAOs) as defined in the Action Memorandum (TtEC, 2007) or groundwater is reached. The former Firing-range Berm will also be removed in its entirety. The soil in it will be excavated to ground surface, or when native soil is reached if debris is still present at that elevation. The assessment/removal depth of the debris pits, disposal trench, and the former Firing-range Berm will be the depth where native soil is reached that meets RAOs as defined in the Action Memorandum (TtEC, 2007) or groundwater is encountered, which could be as deep as 8 feet, based on the history of the site.

1.7 TYPE OF MUNITIONS RESPONSE ACTION

The TCRA is being performed in accordance with the Action Memorandum (TtEC, 2007) that addresses MPPEH and radiological point source removal.

2.0 MAPS

A description of each map required by NOSSA is provided below.

2.1 ALAMEDA POINT VICINITY MAP

Figure 1-1 shows the location of Alameda Point relative to the state of California and the locations of IR Site 1 where activities will take place.

2.2 ALAMEDA POINT MUNITIONS RESPONSE SITE MAP

Figure 1-2 better illustrates the location of IR Site 1, and includes the distances to the nearest inhabited building/public traffic route and the Quantity/Distance (Q/D) arc for the magazine planned for use in this project.

2.3 Q/D ARC AND EXCLUSION ZONES

Figures 1-3 and 1-4 show the established Q/D and EZ arcs for the MRS site at IR Site 1, the MPPEH storage and processing magazines, the lay-down pad, and the temporary storage point.

2.4 IR SITE 1 EXCLUSION ZONES

Figure 1-4 illustrates the MRS in relation to IR Site 1 and the EZ associated with it.

2.5 MAGAZINE COMPOUND

Figure 2-1 shows the magazine compound and the distances and EZ/QD arcs associated with them.

2.6 SCREEN PLANT CONFIGURATION

Figure 2-2 is a drawing of the proposed screen plant configuration.

3.0 AMOUNT AND TYPE OF MEC

No live MEC has been found on IR Site 1 since the ERA was performed in 1998, despite over 13,000 inert projectiles having been recovered on different occasions since then. The fact that live projectiles may be encountered cannot be ruled out; therefore, adequate protective precautions will be used in the course of this project to protect project workers and the environment.

3.1 MUNITION WITH THE GREATEST FRAGMENTATON DISTANCE

Based on the results of past characterizations and removal actions, for the purpose of this project, the MEC/MPPEH item selected as the munition with the greatest fragmentation distance (MGFD) is the 20mm HE-filled projectile (M56A4), with a contingency MGFD based on a 40mm M406 grenade.

3.2 ENCOUNTERING MEC OTHER THAN SELECTED MGFD

If MEC is encountered, it will fall into one of three categories:

- MEC item fragment distance less than MGFD
- MEC item fragment distance greater than primary MGFD, but less than contingency MGFD
- MEC item fragment distance greater than primary and all contingency MGFDs

The procedures for each of these situations are found in Section 6.5.1.

4.0 START DATE

Start dates for the activities planned at IR Site 1 are provided as follows:

Activity	Start Date
Mowing/Vegetation removal	February 12, 2007
Surface Sweep	February 20, 2007
Geophysical Survey	February 26, 2007
MPPEH Excavation	March 5, 2007
Radiological Point Source Removal	March 5, 2007
Project end	June 30, 2007

5.0 FROST LINE

There is no frost line in Alameda, California.

6.0 RESPONSE TECHNIQUES

The planned approach for the upcoming MPPEH and radiological source removal is straightforward and uses conventional methodology and technology to achieve the project remediation goals, which is the removal of MPPEH to the best extent possible and radiological sources on the site. Steps to accomplish this include:

- A pre-vegetation cutting surface search of the area(s) around the former Firing-range Berm
- A UXO technician-escorted vegetation cutting of the former Firing-range Berm, disposal trench area, and all areas where radiological point source removal is planned
- A geophysical survey of the former Firing-range Berm, and the area north of the small arms range bordered by San Francisco Bay to the west, the road to the east, and the fence line to the north
- The delineation of boundaries for debris pits and the disposal trench based on the results of the geophysical survey
- The 100 percent mechanized removal of debris and material from the debris pits and disposal trench

- The separation of MEC and MPPEH from the other debris
- The mechanized excavation/removal of the former Firing-range Berm

6.1 CERTIFICATION/VERIFICATION

All MPPEH is considered hazardous and must be managed as class/division (C/D) 1.1 until it is inspected, certified, and verified as safe. At that point it is no longer MPPEH and after demilitarization may be released from Department of Defense (DoD) control.

6.2 VEGETATION CUTTING

A surface search of the MRS will be performed by UXO technicians to determine the limits of surface MEC/MPPEH on site and those boundaries will be marked with surveyor's tape or another suitable method. (UXO avoidance techniques will be used if an intrusive marking method is used.) This portion of IR Site 1 is on the coastline and the vegetation is stunted so the search should be easily accomplished. Because a surface search of IR Site 1 was completed in 2004, mechanized vegetation cutting machinery (brush hog, tractor with cutting deck, etc.) will be used to mow areas outside the perimeter of the MRS. When that has been accomplished, UXO technicians will perform a surface sweep of the MRS and remove all MEC/MPPEH items from the ground surface. They will then escort laborers with portable, powered string trimmers (e.g., weed-whacker) to cut the vegetation on the parts of the MRS that require it (sides and top of berm, area under tree, etc.).

6.3 GEOPHYSICAL SURVEY

Following the surface sweeps and the vegetation cutting, a geophysical survey will be conducted to identify the location and boundaries of the debris pits (both on and off the berm) and the disposal trench. A UXO technician will escort the geophysicist(s) during the survey when near the area suspected to contain the debris pits.

The location of the disposal trench is unknown, but is believed to lie in a location west of the road that traverses the site and north of the small arms range. The geophysical survey will use these boundaries for the initial data collection (road/coastline, small arms range/fence line). If the location of the trench cannot be determined after processing and interpreting the data, the search area will be expanded eastward after consulting with the project geophysicists and DON representatives.

Where accessible, the entire former Firing-range Berm will be surveyed. The steep incline of the western slope may prevent surveying activities on that part of the berm. The geophysical map produced from the trench-location survey and from the berm survey should reveal all potential debris pits where MEC/MPPEH may be concentrated.

Survey control will be established and used to provide precise positional data. To delineate the debris pit(s) and disposal trench boundaries, the geophysical data collection will use a Geonics EM61 time-domain electromagnetic instrument or a Geonics EM-31 MKII ground conductivity meter, or a combination of the two. Both will be supported by the Allegro CX field data logger and a Leica Differential Global Positioning System (DGPS) to provide precise location coordinates, if required, and debris pit/trench boundaries. The systems are certified under the DON's Hazards of Electromagnetic Radiation to Ordnance program.

The geophysical and DGPS data will be concatenated, processed, and a geophysical map will be generated that identifies debris pit/trench boundaries and the position, depth, and estimated size of significant subsurface anomalies. The map and a DGPS receiver will be used to delineate the perimeters of pits/trenches and/or mark any anomalies of interest.

Anomaly discrimination and reacquisition activities are not planned for this project, and due to the nature of the intended geophysical survey, TtEC does not intend to perform a geophysical prove-out to demonstrate the detection capabilities of the geophysical system. The debris pits and disposal trench are expected to contain significant amounts of metal at relatively shallow depths, and the proposed instrumentation should be able to easily detect these anomalous areas. TtEC will perform daily instrument calibration and/or functionality checks to ensure that the instrumentation is operating properly and is within specifications. The geophysical instrument(s) will be run over a known target at the beginning of each file to ensure proper operation.

6.4 MEC/MPPEH REMOVAL

Operators of mechanized equipment will be provided blast overpressure protection of K24 and fragment protection. Q/D and fragment protection materials are discussed in Section 7. EZs applicable to equipment operators, UXO and Radiological Control Technician (RCT) personnel are also found in Section 7.

The excavation of the debris pit(s) and the disposal trench will cease when native soil that meets RAOs as defined in the Action Memorandum (TtEC, 2007) or groundwater is reached, and a hand-held magnetometer (i.e., Vallon, White, etc.) indicates that metallic debris is no longer present in the excavation. The soil in the former Firing-range Berm will also be removed with armored earth-moving machinery (EMM).

6.4.1 Removal Action Methodology

Three distinct areas are planned for excavation within IR Site 1: the disposal trench where radiological sources reportedly have been buried, debris pits where HE and TP 20mm projectiles are known to exist, and the former Firing-range Berm, a part of which is suspected to also contain MEC/MPPEH items. MEC/MPPEH items are not anticipated to be found in the radiological disposal trench. The potential presence of MEC/MPPEH in the disposal pits and former Firing-range Berm will require slightly different processes to protect UXO and RCT personnel.

The first step in the MEC/MPPEH and radiological source removal process is the manual survey of the top 6 inches of soil with hand-held radiological instruments and magnetometers. RCTs will conduct the radiological survey and UXO technicians may assist them with magnetometers (for metal sources), if required. For the areas known and suspected to contain MEC/MPPEH items, a barricade will be installed for UXO and RCT personnel to take shelter behind when the actual excavation of the soil is taking place. The procedures are described below.

6.4.2 Disposal Trench

Prior to the start of excavation, the approximate boundaries of the disposal trench will be delineated and marked with tape, paint, lath, etc. (If an intrusive marking method is used, a UXO technician will perform anomaly avoidance procedures before the markers are installed.) The excavation will begin at a boundary of the trench and proceed inward. The top 6 inches of soil in the excavation area will be surveyed for radiological items, and if any are found, they will be hand excavated and placed in a storage container. When the survey of the first layer is complete, EMM will remove the top 6 inches of soil in the excavation area (this may be accomplished by scraping, excavating, etc.) and place it in a dump truck. When the truck is full, the excavated soil will be transported to a lay-down area that will be installed at a location that exceeds the minimum separation distance for explosives safety, spread in a 6-inch layer, and surveyed a second time for radiological sources. When the entire layer of soil has been surveyed twice for radiological sources, the soil will be removed from the lay-down pad and transported to the stockpile area.

A radiological survey of the next 6 inches of soil in the excavation will then be accomplished; and when complete, EMM will remove the next 6 inches of soil, transport it to the lay-down pad, spread it in another 6-inch layer, and it will be surveyed for radiological anomalies again. This process will be repeated until the trench is completely excavated and native soil that meets RAOs as defined in the Action Memorandum (TtEC, 2007) or groundwater is reached.

If MEC/MPPEH is encountered in the disposal trench, the Senior Unexploded Ordnance Supervisor (SUXOS) will direct that the excavation cease, establish an appropriate EZ as described in Section 6.5 and notify the Project Manager (PjM).

6.4.3 Debris Pits

The process for excavating the burial pits will be nearly identical to that used for the disposal trench, with the addition of a barricade that provides fragment protection for RCT personnel and UXO technicians when the soil is excavated (see Section 7). The process will proceed as follows:

- The boundaries of the pit(s) will be marked and the entire area inside the pit perimeter will be surveyed for radiological sources that will be hand excavated and placed in a container if found. (UXO technicians will use anomaly avoidance techniques during each intrusive dig for marking or hand excavation).
- UXO and RCT personnel will then take shelter behind a barrier located outside the swing radius of the EMM being used for the excavation. The construction of the barrier is discussed in Section 7.
- The equipment operator will remove the top 6 inches of soil within the boundary markers and place it in a dump truck.
- The UXO technician(s) will then return to the excavation and check it to see if MEC/MPPEH was unearthed. If the excavation is clear, the RCT(s) will return, survey the next 6 inches of soil, and all will relocate behind the barricade while the next 6 inches of soil is removed.
- If a radiological source is detected, a UXO technician will survey the location with a metal detector. If metal is detected, the RCT will relocate behind the barricade while the UXO technician hand excavates the anomaly using appropriate procedures (i.e., digging behind the anomaly and gaining access from the side). If the anomaly is not MEC/MPPEH, the RCT will return to the excavation and remove the radiological source. If there is extensive metallic contamination in the excavation to the point that the magnetometer is saturated, the UXO technician and RCT will take station behind the barrier and the EMM operator will remove 6 inches of soil in the location of radiological source and layer it next to the excavation. The RCT will survey the layered soil and debris to locate the radiological source.

This process will be repeated until the burial pit is completely exhumed and the magnetometer indicates that nothing metallic lies beneath the floor of the pit.

6.4.4 Former Firing-range Berm

Only the northern portion of the backstop berm is suspected to contain buried MEC/MPPEH items, and the geophysical survey of the berm should show their precise locations. The area containing buried debris will be marked on the ground surface (lath, stakes, caution tape, etc.), and this area will be excavated last. (Anomaly avoidance procedures will be used if an intrusive marking method is used.)

The excavation of the berm will be conducted in a manner similar to the trench and pit excavation. The vegetation on the berm will be cut as near to the ground as possible. Beginning at the southern end of the berm, RCT personnel will survey the top 6 inches of soil on the top of the berm for radiological sources and hand excavate them if found. EMM will remove the top 6 inches of the berm and place it in a dump truck. The next 6 inches of soil will be surveyed, and that layer of soil removed. This process will be repeated until the southern portion of the berm is removed.

On the portion of the berm suspected to contain buried debris, the procedures used for the disposal pit excavation will be used.

All of the soil will be transported to the lay-down pad, layered, and surveyed again for radiological sources. After the survey on the lay-down pad, the soil will be transported to the screening plant stockpile. This process will be repeated until the berm has been removed.

Recovered MPPEH items will be placed in a container at a temporary collection point awaiting transportation to the magazine. The collection point will be located on the paved area adjacent to the target line near the northern toe of the former Firing-range Berm. The MPPEH items will be stored in wooden boxes (or other suitable containers). Near the end of each work day, the accumulated items will be counted, photographed, entered into the UXO acquisition log, and stored in the magazine until the certification/verification process is completed. These activities will take place in the MPPEH processing area.

6.5 SOIL SCREENING

The soil and debris from the debris pits and the former Firing-range Berm will be processed through a screening plant. The screening plant is anticipated to be a Trommel equipped with a 6-inch grizzly and a rotating drum (approximately 6 feet in diameter and 25 feet long) fitted with ¾-inch screens. (A Trommel screening plant with 2 screen drums may be used if one can be located.) The ¾-inch screen size will prevent 20mm projectiles from passing through it. The excavated soil/debris will be processed as follows:

- Loaders will place the soil atop the feed hopper grizzly. All soil clumps and objects larger than 6 inches will drop off the back of the grizzly, while soil and debris smaller than 6 inches in size will drop into the feed hopper, where it will transported, via a conveyor, to the Trommel.
- Soil and debris larger than ¾-inch will be transported out of one end of the Trommel drum. As shown in Figure 2-2, a conveyor will be placed there, which will move the material to a stockpile. A UXO technician will monitor the oversized materials on the conveyor for MPPEH items.
- Soil and objects smaller than ¾ inches (the "fines") will pass through the Trommel screen and be carried by conveyor to another stockpile.

The UXO technician(s) monitoring the oversized materials from the Trommel as they travel down the conveyor will be stationed on an observation platform equipped with Lexan or plexi-glass shields and a "kill switch" to halt the screen plant if MEC/MPPEH items are observed. A quality control (QC) check of both the >6-inch and >¾-inch stockpiles will be performed and is discussed in Section 6.6. Figure 2-2 provides a drawing of the planned screening plant configuration.

A loader may be used to return soil clumps and other debris that do not break down in the Trommel to the feed hopper for reprocessing. Items that do not break down after several passes through the screen plant will be inspected with radiological instruments and metal detectors to determine if MEC/MPPEH or radiological items might be present inside the clumps. Those clumps that test positive for metal and/or radiation will be disassembled with armored EMM by cutting them into small segments with EMM buckets or crushing them with the tracks and/or buckets.

6.5.1 MEC and MPPEH

EZs will be established prior to operations in areas where an MGFD has been identified and are discussed in Section 7.

MEC Procedures

If UXO technicians encounter a MEC item, excluding those classified as MPPEH during any step of the removal and screening process, they will direct that work be stopped and will notify the SUXOS. The SUXOS will then confirm the item's identity and if the EZ must be expanded, will consult with NOSSA N54, and then direct that the EZ be adjusted accordingly. The SUXOS will also make required notifications (PjM, RPM, Resident Officer in Charge of Construction, Caretaker Site Manager, Alameda Police, etc.), and one of the Bay Area Explosive Ordnance Disposal (EOD) Detachments (U.S. Air Force at Travis, U.S. Army at Moffett) will be requested to respond. The contact information for the EOD Detachments is found in standard operating procedure (SOP)-1 (Attachment 1). While waiting for the EOD response, the SUXOS will supervise the preparation of the site for their arrival by placing barricades on the road at the EZ boundaries, photographing the MEC item, recording pertinent information, etc. When EOD personnel arrive, the project UXO technicians will provide assistance as necessary.

Encountering MEC with a Greater Fragment Distance than the MGFD or Contingency MGFD

If, while executing a munitions response, a MEC item is encountered with a greater fragmentation distance than the selected MGFD or a greater fragmentation distance than the contingency MGFD, the SUXOS will direct the cessation of removal operations and contact the PjM and UXO coordinator. The PjM will notify the DON Remedial Project Manager (RPM) and direct the UXO coordinator to liaise with NOSSA N5 to request permission to proceed after an EZ appropriate to the MEC item found is put in place, and to submit an amended ESS.

Encountering MEC with Approved Contingency MGFDs

If a MEC item with a greater fragmentation distance than the selected MGFD is encountered, the arcs and distances for the contingency MGFD will be installed and the PjM will: (1) select a new MGFD with a fragmentation distance greater than the MEC encountered from the list of contingency MGFDs in the ESS; (2) implement the increased protection required by the new MGFD; and (3) notify NOSSA N54 of the change in MGFD. If the newly encountered MEC has a MGFD less than the contingency MGFD, the PjM may submit a revised ESS to NOSSA N54. NOSSA shall provide the PjM with EZs specific to the new MGFD following guidance found in Department of Defense Explosives Safety board (DDESB) Technical Paper 16 *Methodologies for Calculating Primary Fragment Characteristics* (DDESB, 2003). The change in the MGFD will be documented in the After Action Report.

MEC Processing, Storage and Demilitarization.

The MPPEH Processing and Storage Location (Magazine M354) will be used for the certification and verification process, where each item will receive a dual inspection and receive an explosive safety designation of 5X and safe. Following the inspections, the required documentation will be completed and the items stored in a drum or other suitable container. 5X material will not be commingled with items that have not undergone the certification/verification process. These activities are planned to take place inside Magazine M354.

When the removal action is complete, and all recovered 20mm TP projectiles will be demilitarized by cutting them into pieces. This will be accomplished inside Magazine M353 with a hydraulically operated re-enforcing bar cutter that can cut up to 10 projectiles at once. The cutter will be placed inside the magazine and a metal sheet will be installed between the cutter and the magazine door. The cutter will be remotely operated outside the magazine, behind the magazine wall. Each projectile will be cut into two or three pieces. This procedure is valid for 20mm projectiles only.

6.6 QUALITY ASSURANCE/QUALITY CONTROL

This section provides an overview of significant QC information as it applies to the ESS. Specific and detailed components of the quality assurance (QA)/QC program have been finalized in the Site-specific Contractor Quality Control (CQC) Plan. The information presented below has been approved for contractor MPPEH work at the site under the TCRA.

Contractor Organization

QC is conducted using a three-phase control process that consists of preparatory, initial, and follow-up inspections. These are performed to ensure that processes are in control and opportunities for improving processes are captured and implemented. The three-phase QC program is based on the three phases of contractor QC procedures. Each significant activity identified as a definable feature of work at the site undergoes the three-phase control process.

QC inspectors who have stop-work authority and are organizationally independent from the processes are assigned to conduct QC inspections. The project is supported by a Program QC Manager who will visit the site on a regular basis.

The contractor PjM, Site Superintendent, and SUXOS are all committed to ensuring that the QC process is maintained. This level of commitment is implicit in the job description and the individual qualifications for the position.

Quality Assurance/Quality Control Processes

Each component of site work has a built-in QC function to ensure that safe work practices are followed, the provisions of the established plans are adhered to, and collected data is accurate and defensible. Detailed QA/QC procedures are outlined in the CQC Plan and in SOP-1, MPPEH Removal (Attachment 1) for the phases of the project.

Lot Acceptance and Rejection Criteria

Three debris streams will emerge from the Trommel, specifically:

- Objects larger than 6 inches that will accumulate below the grizzly
- Objects larger than ¾ inches that will leave the Trommel at the end opposite the feed hopper
- Objects smaller than ¾ inches (fines) that will leave the Trommel via a conveyor emerging from the side of the Trommel

The fines should not contain MEC/MPPEH items because of the size of the Trommel screens. The other debris streams ("overs") may contain MEC/MPPEH items of 20mm projectile size and larger. The conveyor carrying the smaller overs stream (>¾ inch) will be monitored by UXO technicians for MEC/MPPEH items. The >¾ inch overs will agglomerate in a stockpile at the end of a conveyor, and the overs stream >6 inches will be form a stockpile at the base of the grizzly.

Both of the overs piles will be sampled for MEC items. Front-end loaders with 2-cubic-yard buckets and dump trucks with 20-cubic-yard boxes (10 buckets per truck) will be used to move the overs stockpiles. The unit of production for this sampling plan will be the bucket, and a number of these will make up a lot. A lot size of 40 buckets (4 dump trucks) is recommended for this project. This will provide a more economical level of rework if a sample fails inspection and the entire lot has to be re-screened.

When the overs stockpiles grow to approximately 20 cubic yards, they will be loaded into dump trucks, transported to the lay-down pad, and deposited there in separate stockpiles (>6 inches and >¾ inches). When four dump truck loads have been added to each of the piles, they will be sampled for MEC/MPPEH. An armored front-end loader will remove 2 buckets (4 cubic yards, 10 percent of the accumulated soil and debris) from random locations in each stockpile and spread it in a 6-inch layer on the lay-down pad. QC inspectors will complete a QC lot inspection of the sample for radiological sources and MEC/MPPEH. If neither are found, the lot is accepted and the entire stockpile may be relocated from the lay-down pad to "clean" stockpiles. If a

MEC/MPPEH item is found, the lot is rejected and the entire stockpile must be re-processed through the Trommel. If a radiological source is found, the lot is also rejected, and the entire stockpile must be placed in a 6-inch layer on the lay-down pad, manually surveyed with radiological instruments, and sampled again.

Instrument Functionality Tests

All-metal detectors will be used on this project. A test plot with both ferrous and non-ferrous items will be installed and will be used to ensure that the instruments are capable of detecting all the surrogate MEC/MPPEH items upon initial receipt of the instruments, and daily, before work activities commence. The results of every functionality test will be recorded in the project QC log.

Demilitarization Inspection

A count of the projectiles will be maintained as they are demilitarized and the UXO QC person will inspect 10 percent of the demilitarized projectiles in each lot. The lot size will be selected based on the cutter used, and will either be numerical (i.e., 500, 1000) or time-driven (i.e., 1 hour, 3 hours, etc.). If a projectile is found in a lot that is not demilitarized, or demilitarized incorrectly, the lot is rejected and will require a 100 percent inspection by the UXO QC.

7.0 QUANTITY/DISTANCE

ESQD arcs and EZs will be established for this project and are explained in the sections that follow. The application of contingency MGFDs are addressed in Sections 3.2 and 6.5.1.

7.1 MPPEH PROCESSING AREAS

Two barricaded undefined earth-covered magazines (ECMs) M353 and M354 are located in the magazine compound situated between IR Sites 1 and 2, and both magazines are currently empty. Previous authorization for use of Magazine M354 for the storage of UXO was granted by the Naval Ordnance Center in a letter (8020, Ser N7112/720) to the SSPORTS on November 6, 1998, (see copy of the letter in Attachment 2) for the storage of 15,000 pounds NEW for C/D 1.1 explosives.

Magazine M354

It is requested that ECM M354 be site approved as a processing facility to manually inspect/ certify and store 100 pounds net explosive weight (NEW) of C/D 1.1 and inert materials based on the following ESQD arcs: interline (IL) K18 distance for front of 84 feet, sides of 74 feet, and rear of 56 feet; public transportation route (PTR) distances for side and rear of 150 feet and front of 300 feet; and inhabited building distance (IBD) for side and rear of 250 feet and front of

500 feet. ESQD is met since M353 is separated from M354 by 522 feet, and meets K18 IL separation with no PTR or IBD encumbrances. The Naval Facilities Engineering Command site approval request forms are provided in Attachment 3.

Magazine M353

It is requested that ECM M353 be site approved as a processing facility to remotely cut up to ten 20mm projectiles at a time using a rebar cutter. The MEC for this operation is based on ten 20mm M456A4 projectiles (0.03 pounds NEW of C/D 1.1 material per item) or 0.3 pounds NEW C/D 1.1 material based on the following ESQD arcs: IL K24 distances of 17 feet; PTR distance of 120 feet based on 60 percent of the hazardous fragment distance (HFD); and IBD of 200 feet based on the HFD. The following engineering designs, based on the fragmentation data review forms provided in Attachment 4, will further mitigate the hazards associated with primary fragments due to an unintentional detonation during the cutting operation:

- The rebar cutter will be located inside ECM M353 with a 0.25-inch by 6-foot by 4-foot sheet of mild steel plate placed 2 feet from the cutter, between the cutter and the ECM door. The ECM and steel plate will contain the primary fragments.

ESQD is met since M353 is separated from M354 by 522 feet and meets K24 IL separation, and there are no PTR or IBD encumbrances. The remote controlled operating station will be located at least 17 feet from the magazine door. To facilitate an efficient operation, a total of 1,000 – 20mm projectiles or NEW of 30 pounds C/D 1.1 may be staged on the walkway between M353 and M354 provided the staging area is at least 17 feet from the entrance to M353. The site approval request is provided in Attachment 3.

Screening Plant

It is requested that a remote-controlled mechanized earth-screening facility, to be located within the footprint of the Munitions Response Site (MRS), be site approved for MEC based on one 20mm M456A4 projectile or 0.03 pounds NEW of C/D 1.1 material based on the following ESQD arcs: IL K24 distances of 8 feet; PTR distance of 120 feet based on 60 percent of the HFD; and IBD of 200 feet based on the HFD. Operators will be located at least 8 feet from the screen plant and be provided with 2.25 inches of Lexan or 1.25 inches plexiglass for protection from hazardous fragments per Attachment 4. ESQD is met since the screening plant is separated from the nearest potential explosion site by 222 feet and meets K24 IL separation, and there are no PTR or IBD encumbrances.

Temporary Collection Point

It is requested that a temporary storage/collection point, to be located within the footprint of the MRS, be site approved for MEC based on an accumulation of 1,000 – 20mm M456A4 projectiles or a NEW of 30 pounds of C/D 1.1 material based on the following ESQD arcs: IL

K18 distances of 56 feet; PTR distance of 120 feet based on 60 percent of the HFD; and IBD of 200 feet based on the HFD.

7.2 MUNITIONS RESPONSE SITE (MRS)

The northern toe area of the former Firing-range Berm, the temporary collection point and the screen plant location is considered the MRS for this project and is shown in Figures 1-4 and 2-2. If needed (i.e., MEC or MPPEH is discovered), EZs will be established for the disposal trench site. Removal and screening actions will involve both manual and mechanized operations, and the EZs are based on the following MGFDs:

TABLE 7-1

MUNITION BLAST AND FRAGMENT DISTANCES

Munitions with Greatest Fragment Distance (MGFD)				Maximum Detonation		
Item	Net Explosive Weight (NEW) (pounds)	Hazardous Fragment Distance (HFD) (feet)	Maximum Fragment Distance (MFD)(feet)	K328 (feet)	K40 (feet)	K24 (feet)
40mm M406	0.071*	200*	345*	136	17	10
20mm M456A4	0.03*	200*	558*	102	13	8

Notes:

* Values from Technical Paper 16 (DDESB Website 1/31/07).

1) Unintentional detonation EZ for Team Separation Distance (TSD) for manual operations is K40 of the MGFD. Use 13 feet for a 20mm and 17 feet for a 40mm projectile.
2) Unintentional detonation EZ for TSD for mechanized operations is the greater of HFD or K24 of the MGFD. Use 200 feet for a 20mm or a 40mm projectile.
3) Unintentional detonation EZ for public and non-essential personnel for manual operations is the greater of K40 or HFD of the MGFD. Use 200 feet for a 20mm or a 40mm projectile.
4) Unintentional detonation EZ for public and non-essential personnel for mechanized operations is identical to the intentional detonation EZ for public and all personnel of the MGFD. Use 558 feet for a 20mm or a 40mm projectile.
5) Intentional detonation EZ for public and all personnel is the greater of K328 or MFD of the MGFD. Use 558 feet for a 20mm or a 40mm projectile.
6) Mechanized equipment operators will be provided both blast overpressure protection separation distance based on K24 and shielding from hazardous fragments. Use 8 feet for a 20mm projectile and 10 feet for a 40mm projectile separation for blast overpressure, ensuring the operator in the cab is at least 8 feet or 10 feet from the point of excavation, or truck tailgate. Use 1.25 inches concrete, 0.25 inch mild steel, 2.25 inches Lexan or 1.25 inches plexiglass for fragment protection for 20mm or 40mm projectiles per Attachment 4.

7.3 PROTECTIVE AND ACCESS CONTROLS

The contractor will provide separation distance and shielding as required, establish EZs based on the process(es) being conducted, and ensure that related personnel, unrelated personnel, and the public are prohibited from entering those EZs. The north-south access gates and eastern fence line of IR Site 1 are all located beyond the EZ perimeter. These gates will remain locked while investigation/excavation work is being performed and a gated fence separates the main air station from the runway and tarmac areas. This gate also remains locked except for entering and exiting the tarmac areas. The EZs do not encumber a navigation channel; however, patrol boats will be deployed to prevent recreational boaters from entering the EZs if required.

8.0 OFF-SITE DISPOSAL

Military EOD personnel will respond for all MEC items encountered and either detonate them on site or transport them to their bases for later treatment. Recovered TP projectiles will be demilitarized by cutting them in half with a remotely operated cutter. Following that operation, the metal fragments will be placed in drums, sealed, and disposed of in an approved landfill. The forms and records used to document the certification/verification process, the demilitarization, and the chain of custody through to the disposal facility will be retained in the project files for no less than 3 years.

The excavated soil and debris from the former Firing-range Berm and debris pits will be processed through a screening plant to remove MPPEH items and then disposed of off-site.

9.0 ENVIRONMENTAL CONSIDERATIONS

The planned work activities on IR Site 1 will not adversely affect wildlife or plant species native to the sites. Critical habitat will not be removed or damaged. A brief description of wildlife and wetlands is provided below for each of the sites.

9.1 WILDLIFE AND PLANT SPECIES

The runway tarmac, located approximately ½ mile southeast of IR Site 1, provides an important nesting habitat for sensitive species such as the California least tern (*Sterna antillarum browni)*. This area falls outside the boundaries established for IR Site 1, and will not be impacted by the any of the work planned for this project.

Grasses are the dominant vegetation for IR Site 1 and feral rabbits, black-tailed jackrabbits, Canada geese, and European starlings are the dominant animal species on these sites. No listed or sensitive species are identified as inhabiting the area within the boundaries of the sites.

Wildlife species that are federally listed as endangered or threatened could potentially occur on any of the sites, based on their presence at similar areas in Alameda County. These species include the winter-run chinook salmon, tidewater goby, California brown pelican, California clapper rail, western snowy plover, California least tern, American peregrine falcon, Steller sea lion, and salt marsh harvest mouse. None of these species are known to currently inhabit the site, and they should not be affected by planned activities. The open water area adjacent to IR Site 2 is a wintering area for migratory birds and provides a resting and feeding habitat for waterfowl during the winter. The work planned for IR Site 1 should not affect any of the migratory waterfowl or water birds found offshore.

9.2 WETLANDS PROTECTION

Seasonal wetlands exist on IR Site 1 but they are all located east of the road that crosses the site, where no work will occur. The Project Biologist will inspect the site prior to beginning vegetation clearance activities to ensure that this status has not changed. Personnel assigned to the project will be directed to remain outside the area east of the road.

9.3 WILDLIFE PROTECTION

Wildlife species most susceptible to project activities include shorebirds and small mammals. These species may be adversely affected by the mowing of existing vegetation to a 4-inch height. To minimize impacts to these species, no cutting will occur during the peak of the nesting season (April 1 – August 31). This project is planned to commence in February 2007, long after the 2006 nesting season has ended, and well before the 2007 season has begun.

To prevent direct impacts to any special-status species, an environmental survey will be conducted by a qualified wildlife biologist not more than 48 hours prior to the start of field activities to confirm that federally listed species are not residing within the limits of the project activity areas.

9.4 PLANT COMMUNITY PROTECTION

None of the plant species found within IR Site 1 are state or federally listed. Some vegetation will be mowed to a maximum height of 4 inches to facilitate the surface sweep, geophysical and radiological surveys, investigations, excavations, and other planned activities.

10.0 TECHNICAL SUPPORT

Two military EOD Detachments in the San Francisco Bay area are responsible for responding to off-base situations involving military munitions. They are the 77th Ordnance Company on the former NAS Moffett Field (650-603-8301) and the 60th Civil Engineering Squadron on Travis Air Force Base (707-424-2040). Both of these units have responded to other Bay Area project sites in the past and both have been contacted and made aware of the work that will take place on the Alameda Site.

MPPEH operations will be conducted by UXO technicians on TtEC's staff. All assigned UXO technicians surpass the minimum qualification standards identified in the DDESB Technical Paper 18 (DDESB, 2004) for personnel performing UXO-related operations (with the exception of DoD EOD personnel). Both the Project and the Site Geophysicists exceed the qualifications required in the U.S. Army Data Item Description OT-025 (U.S. Army Corps of Engineers, 1999).

There are no security forces on the former NAS Alameda. The Alameda Police Department is the primary law enforcement agency for the area and the Alameda Fire Station provides fire support. Both can be reached by calling 9-1-1.

High-security locks will be used to secure both of the magazines that will be used for this project, and the fenced compound the magazines are in will also be kept locked. A fence stretching from the Oakland inner harbor to the Alameda seaplane lagoon restricts access to the former air station and all of the gates along its length remain locked.

11.0 LAND USE RESTRICTIONS

There are no land use restrictions or other institutional controls placed on any of the property within IR Site 1.

12.0 PUBLIC INVOLVEMENT

Activities pertaining to community relations will be conducted to inform the public about the ongoing activities and to encourage involvement in the review of relevant documents and discussions regarding the proposed removal action.

12.1 PUBLIC INFORMATION

The ESS and other documentation associated with these activities will be contained in the administrative records for IR Site 1. The Administrative Record for Alameda Point is located at the Base Realignment and Closure Program Management Office West, 1455 Frazee Road, Suite 900, San Diego, California 92108-4310.

12.2 PUBLIC PARTICIPATION

The DON established a Restoration Advisory Board (RAB) for this base to encourage local participation in the hazardous waste cleanup program at former NAS Alameda. This board is a citizen-based committee representing local community interests. All meetings are advertised locally in an effort to encourage public attendance and participation. RAB meeting agendas, minutes, and presentation materials are included in the administrative record for public review. Attendance at the RAB meetings fluctuates as does their interest in the many projects in progress simultaneously on Alameda Point. There was public interest in the explosives safety aspects of the ERA and TCRA that occurred in 1998 and 2002, but interest has waned since then, the topic is seldom discussed, and has not appeared on a RAB agenda for the past several months.

13.0 REFERENCES

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FIGURES

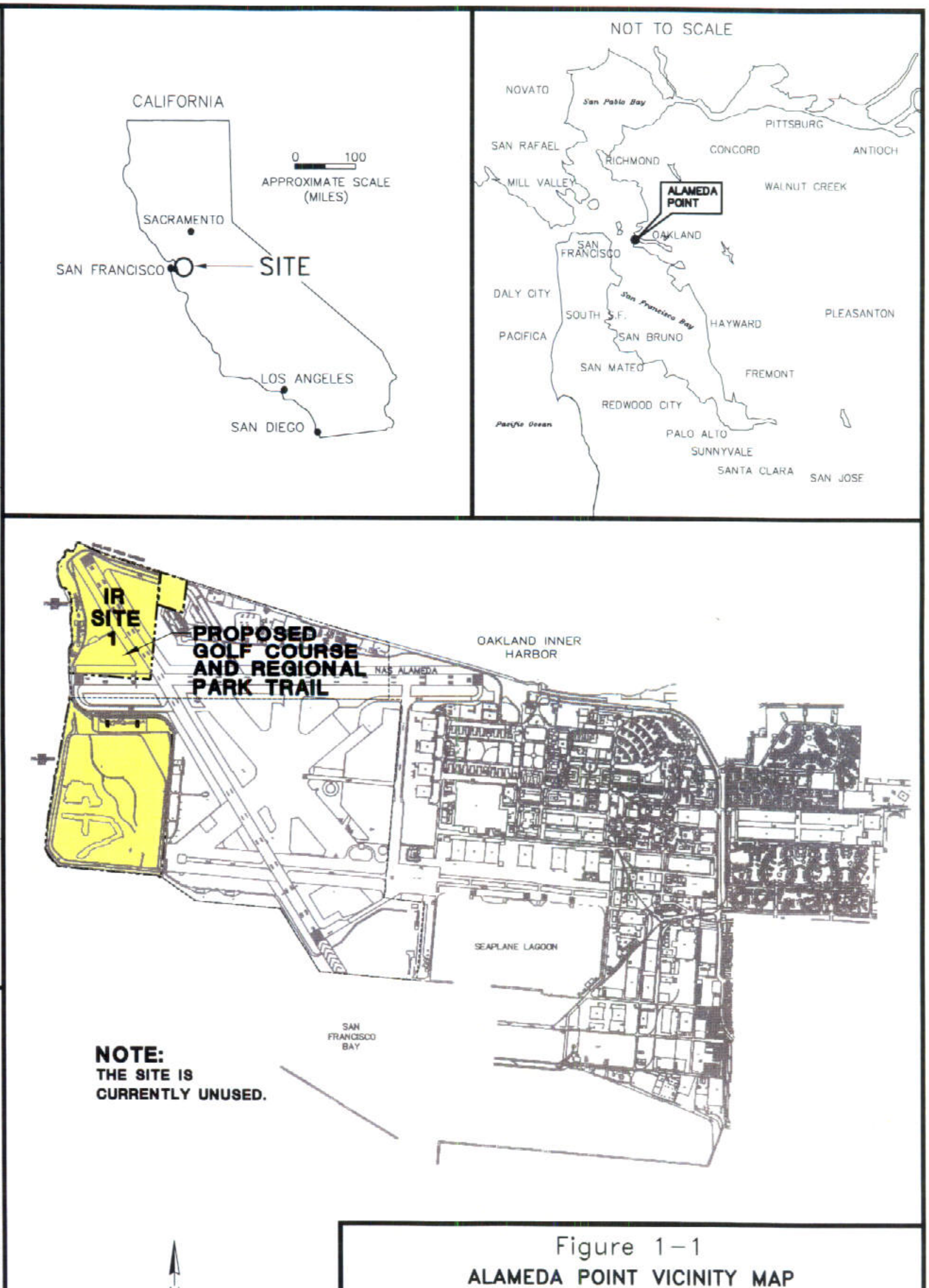

Figure 1-1

ALAMEDA POINT VICINITY MAP

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 07032711.DWG

DCN: ECSD-RACIV-07-0327 | CTO: #0015

APPROVED BY: AE

CHECKED BY: LH | REVISION: 1

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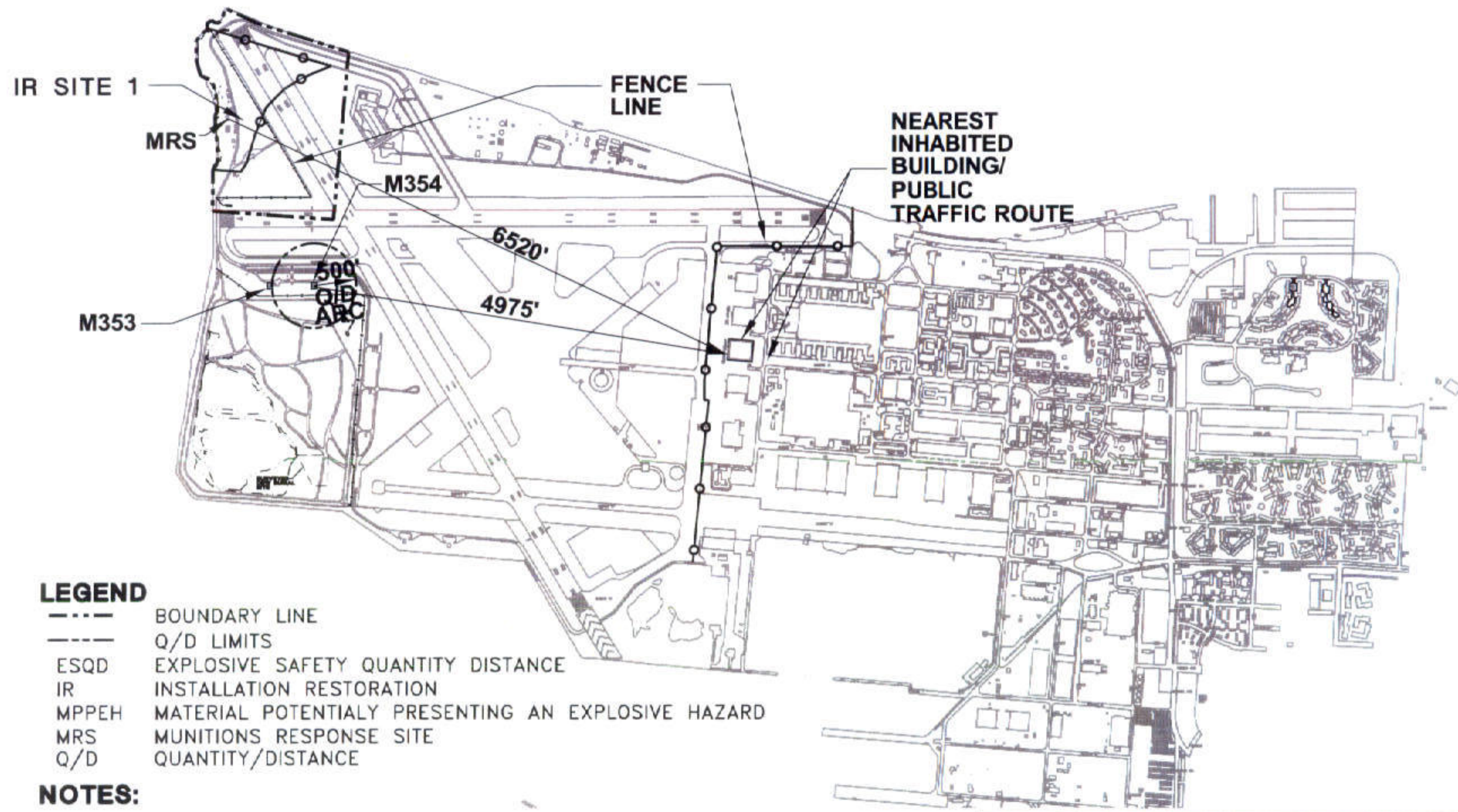

LEGEND

—··—	BOUNDARY LINE
—--—	Q/D LIMITS
ESQD	EXPLOSIVE SAFETY QUANTITY DISTANCE
IR	INSTALLATION RESTORATION
MPPEH	MATERIAL POTENTIALY PRESENTING AN EXPLOSIVE HAZARD
MRS	MUNITIONS RESPONSE SITE
Q/D	QUANTITY/DISTANCE

NOTES:

1. MAGAZINE M354 USED FOR MPPEH STORAGE.
2. MAGAZINE M353 USED FOR MPPEH PROCESSING.
3. MAGAZINE M354 ESQD SHOWN.

NOT TO SCALE

Figure 1-2

ALAMEDA POINT MUNITIONS RESPONSE SITE

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

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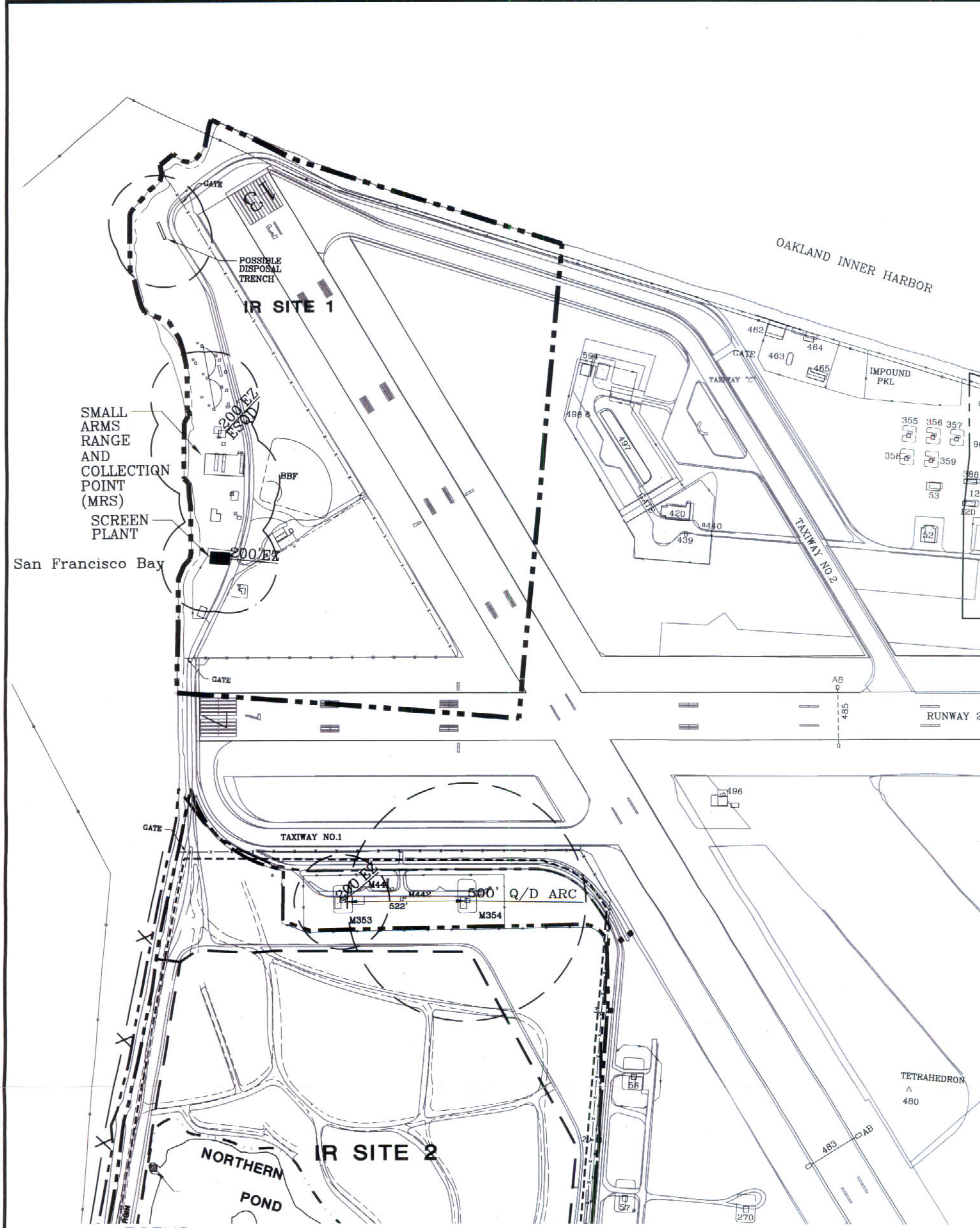


LEGEND

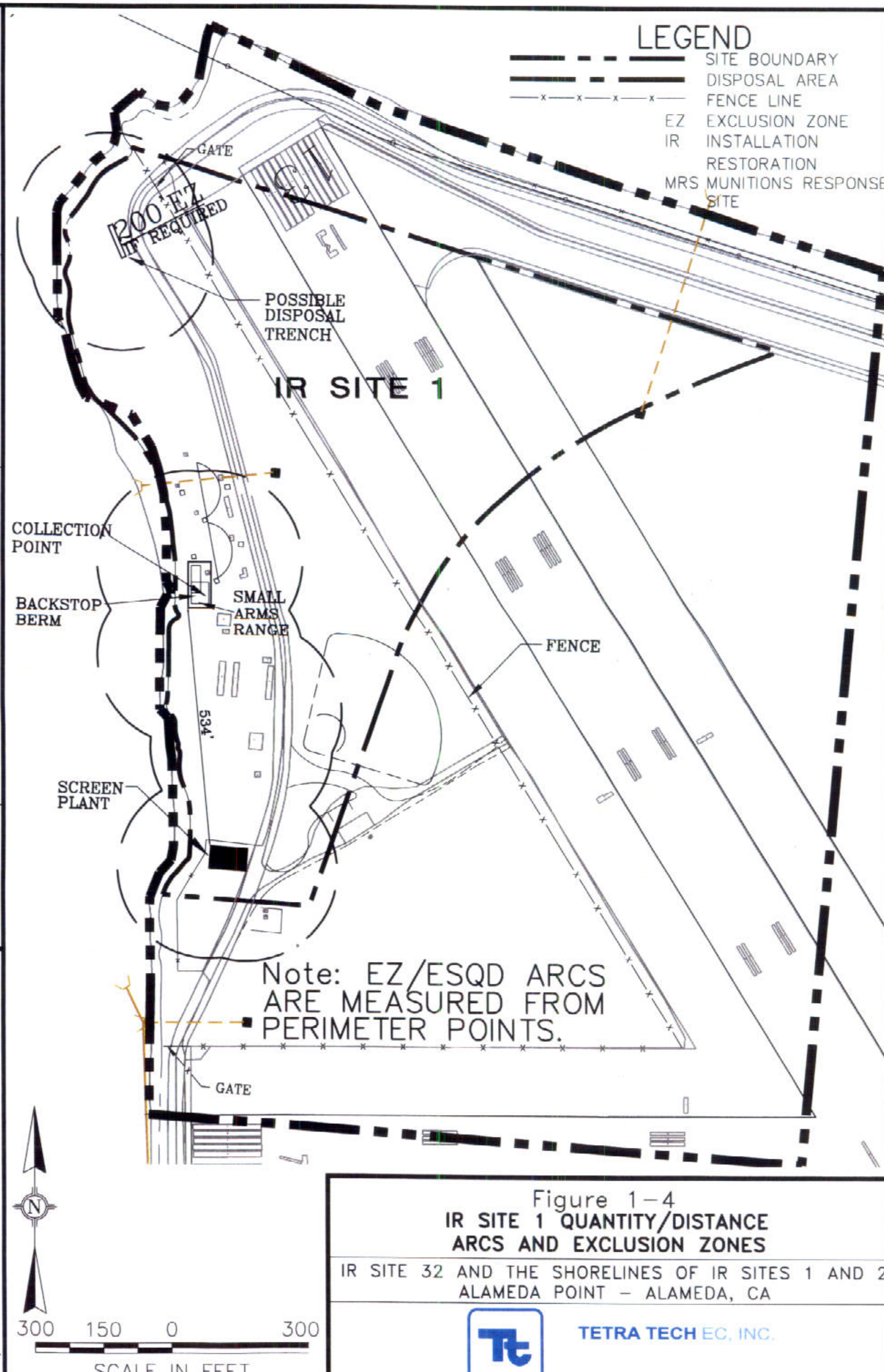
	SITE BOUNDARY
	FENCELINE
	Q/D ARC
EZ	EXCLUSION ZONE
MRS	MUNITIONS RESPONSE SITE
Q/D	QUANTITY/DISTANCE

400 200 0 400
SCALE IN FEET

Figure 1-3
QUANTITY/DISTANCE ARCS

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.



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DATE: 03/02/07

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Figure 1–4
IR SITE 1 QUANTITY/DISTANCE ARCS AND EXCLUSION ZONES

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

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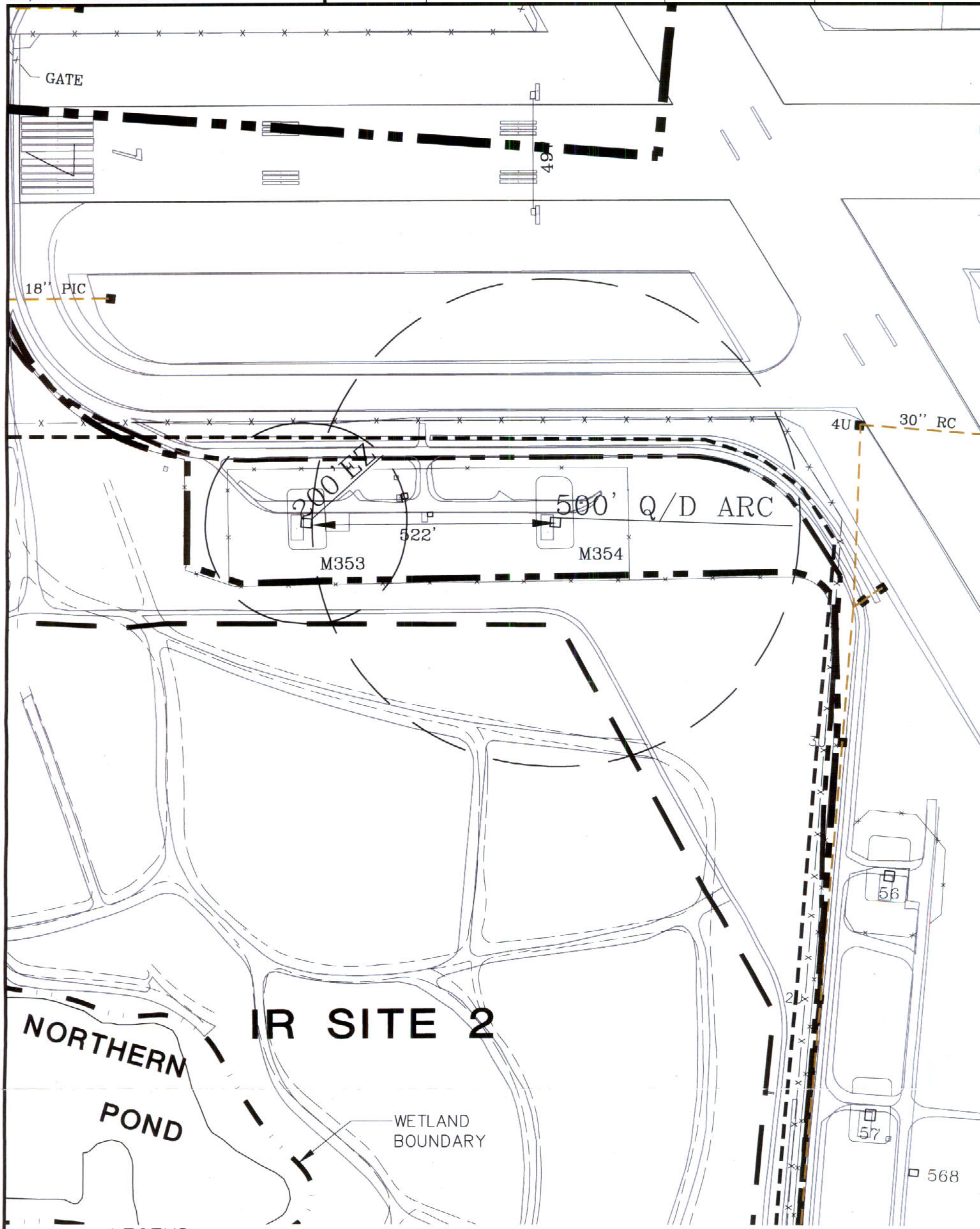

LEGEND

SITE BOUNDARY
FENCELINE
Q/D ARC
EZ EXCLUSION ZONE
Q/D QUANTITY/DISTANCE

200 100 0 200
SCALE IN FEET

N

Figure 2-1
MAGAZINE COMPOUND

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT - ALAMEDA, CA

TETRA TECH EC, INC.

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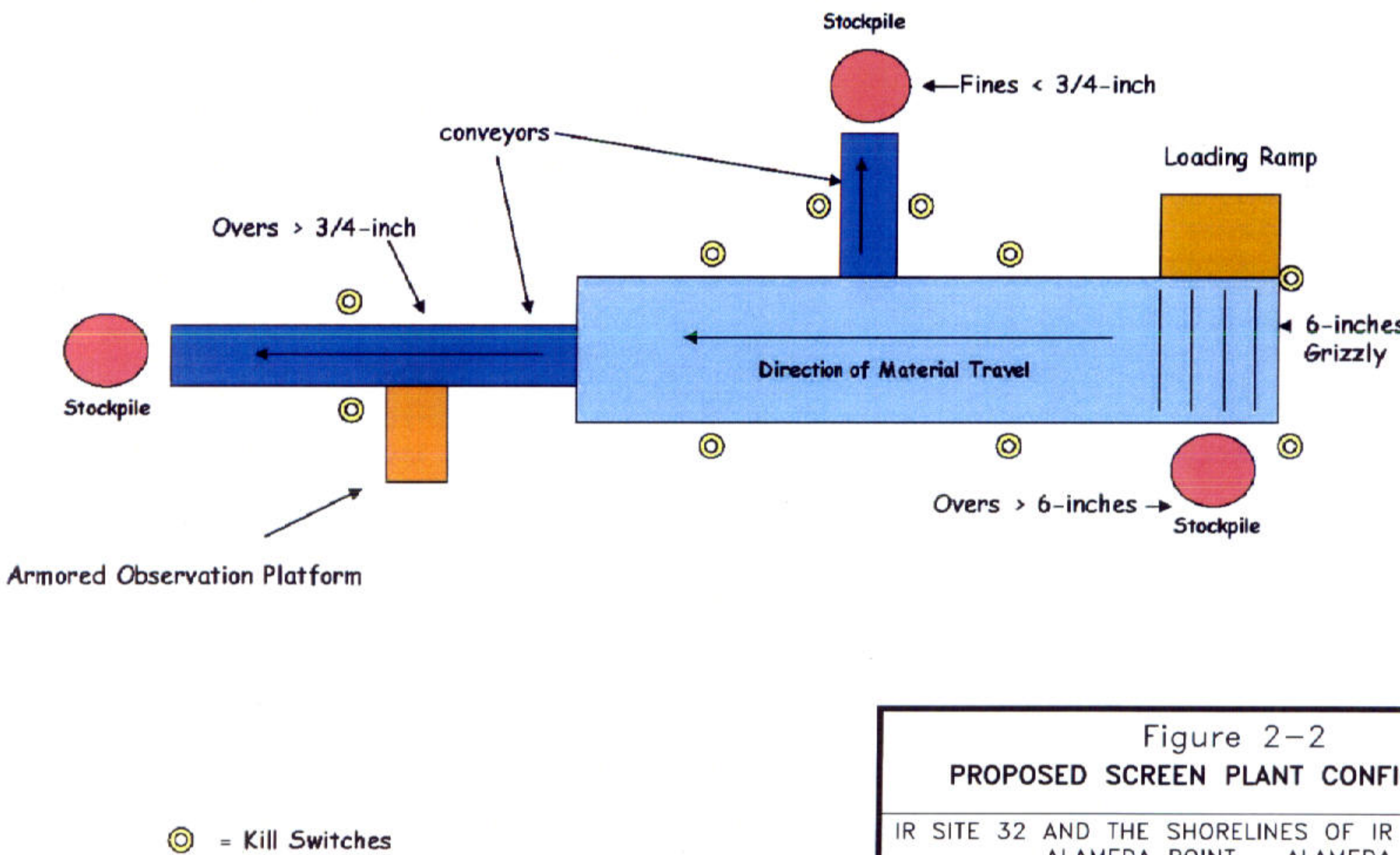
DATE: 03/02/07	REV: REVISION 1		CTO: #0015	



NOT TO SCALE

Figure 2-2
PROPOSED SCREEN PLANT CONFIGURATION

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT – ALAMEDA, CA

TETRA TECH EC, INC.

ATTACHMENT 1

STANDARD OPERATING PROCEDURE

SOP-1 MATERIAL POTENTIALLY PRESENTING AN EXPLOSIVE HAZARD REMOVAL

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

CONTRACT NO. N62473-06-D-2201
CTO NO. 0015

FINAL

STANDARD OPERATING PROCEDURE SOP–1 MATERIAL POTENTIALLY PRESENTING AN EXPLOSIVE HAZARD REMOVAL

Revision 1

March 2, 2007

INSTALLATION RESTORATION SITE 1
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-07-0327

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, CA 92101-8536

Abram Eloskof, P.E.
Project Manager

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(Continued)

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ATTACHMENTS

ABBREVIATIONS AND ACRONYMS

AHA	activity hazard analysis
A&E	ammunition and explosives
AFB	Air Force Base
BIP	blow in place
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CRL	corporate reference library
DDESB	Department of Defense Explosives Safety Board
DGPS	differential global positioning system
DMM	discarded military munitions
DoD	Department of Defense
DON	Department of the Navy
ECM	Environmental Compliance Manager
EMM	earthmoving machinery
EOD	explosive ordnance disposal
ESS	explosives safety submission
EZ	exclusion zone
HE	high explosive
HERO	Hazards of Electromagnetic Radiation to Ordnance
IR	Installation Restoration
MC	munitions constituents
MEC	munitions and explosives of concern
MGFD	munition with the greatest fragmentation distance
MPPEH	material potentially presenting an explosive hazard
MRS	munitions response site
NAS	Naval Air Station
NEW	net explosive weight
NAVSEA	Naval Sea Systems Command
NOSSA	Naval Ordnance Safety and Security Activity
OU	Operable Unit
PES	potential explosion site
PjM	Project Manager

ABBREVIATIONS AND ACRONYMS
(Continued)

PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCT	Radiological Control Technician
RPM	Remedial Project Manager
SHSP	Site Health and Safety Plan
SHSS	Site Health and Safety Specialist
SOP	Standard Operating Procedure
SUXOS	Senior UXO Supervisor
TCRA	Time-Critical Removal Action
TDEM	time domain electromagnetic
TtEC	Tetra Tech EC, Inc.
USAF	United States Air Force
UXO	unexploded ordnance

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish procedures for the recovery, processing, and disposition of recovered munitions and explosives of concern (MEC)/material potentially presenting an explosive hazard (MEC/MPPEH) in support of the Time-Critical Removal Action (TCRA) at Installation Restoration (IR) Site 1, Operable Unit 3 (OU-3) of former Naval Air Station (NAS) Alameda, Alameda Point, Alameda, California, by Tetra Tech EC, Inc (TtEC). Figure 1-1 shows the location of Alameda Point in the State of California, and Figure 1-2 shows the location of IR Site 1 on Alameda Point.

Directives governing the processing of MEC/MPPEH require an approved SOP. This SOP is meant to meet that requirement, and is being submitted as an attachment to the Explosives Safety Submission (ESS) that was developed specifically for this project. All of the figures referenced in this document are found in the ESS.

The MEC/MPPEH recovery will be conducted in conjunction with the removal of radiological point sources. The primary consideration of this SOP is the protection of human health and the environment.

2.0 SCOPE

This procedure will be implemented by TtEC staff and subcontractor personnel when conducting geophysical surveying and MEC/MPPEH recovery activities. The work will consist primarily of the following components:

- Mobilization
- Establishing a 200-foot exclusion zone (EZ)
- Conducting a pre-vegetation cutting surface MEC/MPPEH survey
- Providing Unexploded Ordnance (UXO) support to laborers or equipment operators cutting vegetation
- Completing a post-vegetation cutting surface MEC/MPPEH survey
- Completing a geophysical survey of the northwestern portion of IR Site 1
- Excavating burial pits, debris fields, and disposal trenches suspected to contain MEC/MPPEH or radiological sources
- Removing the former Firing-range Berm
- Completing a geophysical survey of previously identified radiological hot spots
- Restoring the site
- Demobilization

Radiological and general construction procedures are found in the project Work Plan (TtEC, 2007a).

3.0 PERSONNEL REQUIREMENTS

All personnel involved in MEC/MPPEH removal operations will become familiar with, and follow the procedures outlined in this SOP and applicable references.

This project will use a minimum of four UXO technicians; a Senior UXO Supervisor (SUXOS), a Site Health and Safety Specialist/Quality Control Representative (SHSS/QC), and two UXO technicians. The UXO staff may be increased, if required.

3.1 PERSONNEL RESPONSIBILITIES

The personnel that will be assigned to work on this TCRA will each have responsibilities that will contribute to the successful attainment of project goals. The responsibilities of these individuals are discussed as follows:

3.1.1 Site Superintendent

TtEC's Site Superintendent is ultimately responsible for the on-site health and safety of TtEC personnel working on this project. The Site Superintendent, with the support of TtEC's SHSS, is responsible for implementation of the Work Plan, Site Health and Safety Plan (SHSP), and all on-site activities on a daily basis. Other responsibilities include, but are not limited to: (1) project planning, (2) scheduling, (3) site documentation, (4) regulatory compliance, (5) personnel assignments, (6) customer and subcontractor relations, (7) enforcing health and safety rules and SHSP requirements, and (8) conducting routine safety inspections and incident investigations. The Site Superintendent reports directly to the Project Manager (PjM).

3.1.2 Senior UXO Supervisor

For this project, The SUXOS may act as the Site Superintendent. He assists in the development of site-specific work plans, identifies personnel and equipment requirements, and directly supervises all daily activities of the field team. The SUXOS is responsible for the successful performance of the field team, the early detection and identification of potential problem areas, and instituting corrective measures. The SUXOS is also responsible for the execution of instructions received from the TtEC PjM and the Department of the Navy (DON) Remedial Project Manager (RPM), documenting site conditions, photographing MEC/MPPEH, preparing project progress reports, and identifying efforts required to accomplish the scope of work. The SUXOS is responsible for all aspects of explosive safety.

3.1.3 Site Health and Safety Specialist/Quality Control Representative

The SHSS/QC representative is UXO-qualified and is responsible for implementing the SHSP, on-site training requirements, and recommending changes to the level of personal protective equipment (PPE) to the Certified Industrial Hygienist (CIH) as site conditions warrant. The SHSS/QC representative has Stop Work authority for safety conditions. The SHSS/QC representative evaluates and analyzes any potential safety problems, implements safety-related corrective actions, and maintains a daily safety log. The SHSS/QC representative is also responsible for the implementation of the *Project Contractor Quality Control Plan* (TtEC, 2007b).

3.1.4 UXO Technician

The UXO technician performs on-site duties including locating MEC/MPPEH, equipment operation, UXO safety, excavation, and escort duties as required. The UXO technician reports to the SUXOS.

3.2 MINIMUM QUALIFICATION STANDARDS

Department of Defense Explosives Safety Board (DDESB) Technical Paper 18 (DDESB, 2004) provides the minimum qualification standards for personnel conducting UXO-related operations. Such operations include, but are not limited to munitions responses, range clearance activities, and/or the inspection or certification of munitions debris being considered for transfer or release from Department of Defense (DoD) control. The requirements apply to all workers performing DoD operations requiring UXO technicians or UXO-qualified personnel.

The specific UXO-related position titles, tasks, duties, and responsibilities are listed in Technical Paper 18 (DDESB, 2004). The TtEC UXO Operations Manager will ensure that UXO personnel assigned to this project meet the minimum qualification standards for their assigned positions and are capable of performing the duties and responsibilities of those positions as required by Technical Paper 18 (DDESB, 2004). When assigned, the project SUXOS will review the training and qualification records of UXO personnel detailed to support the MEC/MPPEH activities on the site.

3.3 TRAINING REQUIREMENTS

All personnel assigned to the site investigation will attend a site-specific orientation. The purpose of this orientation will be to review site-specific and emergency response procedures. Orientation attendance sheets with an attached training schedule will be used to document completion of each orientation session. The topics to be covered during the orientation are provided as follows:

- Introduction
- Operation overview
- SHSP review
- Work Plan review
- SOP review

- ESS review
- Safety precautions
- Equipment training
- Quality assurance (QA)/QC training
- Emergency procedures
- Emergency response equipment review
- Talk/walk through of emergency procedures
- Emergency drill

All personnel assigned to the project are responsible for reading and understanding the Work Plan. After reading the Work Plan, the Site Supervisor/SUXOS will sign and date the Field Supervisor Review Sheet found in Attachment 1 and all other site personnel will sign and date the Field Team Review Sheet found in Attachment 2. These sheets will be kept in the project files.

4.0 MEC/MPPEH

Relatively new changes to policy governing munitions and munitions-related materials engendered new requirements for handling practice or inert ordnance, as well as scrap or debris generated from the use of munitions. MEC/MPPEH is material either known to present an explosive hazard, or NOT known with certainty to present an explosion hazard, but may contain hidden explosive material, or minor amounts of explosive material. MEC/MPPEH must be assumed to present an explosion hazard until it is visually inspected and/or processed, and certified *safe*.

Live ordnance that has functioned as designed, and unexploded ordnance detonated during clearance or cleanup operations result in a variety of MEC/MPPEH, and require inspection, certification, and disposition. Examples of MEC/MPPEH found on Alameda Point include cartridge casings, small arms rounds, expended shotgun shells, and 20mm projectiles, both live (high explosive [HE]-filled) and inert.

4.1 MEC/MPPEH EXPLOSIVE SAFETY STATUS

Safe means certified as not presenting an explosion hazard and safe for transfer or release pending the completion of demilitarization requirements. *Hazardous* means certified as known or suspected to present an explosion hazard. The term *safe* is not necessarily the same as "safed," "safe to ship," "inert" or "inerted."

4.2 MEC/MPPEH CONTAMINATION

MPPEH explosive contamination falls into one of four categories: 5X, 3X, 1X, and 0X. This terminology is meant to be used in correspondence and documentation to indicate the degree of explosive hazard. Processes and procedures to attain these levels are determined locally. The definitions of these categories are provided as follows:

- ***Category 5X.*** Items have been completely decontaminated, are entirely safe, and may be released for general use when certain provisions (demilitarization) are met. Items can only be classified 5X by visual inspection when every surface is visible and is capable of being inspected. Visual inspection is only applicable to pieces of metal that have no holes, cavities, blind spaces or other obscured features, and probes are NOT used to inspect any blind cavities. The most effective way to ensure that material is 5X is through thermal or chemical processing. Category 5X items are not MPPEH, and have an explosive safety status of *safe*.
- ***Category 3X.*** Items have been visually examined and no contamination can be visually noted on accessible surfaces or in concealed housings. 3X items are expected to be free of explosives/energetic material, but not enough information is available to

certify them as safe because of inaccessible cavities, or because the items have not been 100 percent inspected, or because the certification process is not complete. When there is the slightest doubt concerning the presence of explosive material, the material shall be subjected to whatever treatment is necessary to ensure that it has an explosives safety status as safe before it is released from government control. 3X items may be treated in a variety of methods with written approval of operating procedures. 3X items are MPPEH, and have an explosive safety status of "hazardous."

- ***Category 1X.*** Items are contaminated or partially decontaminated and are likely to present an explosion hazard. 1X items differ from 3X items in that it is thought 1X items are LIKELY to present an explosion hazard, while 3X materials are NOT expected to present an explosion hazard. 1X items are MEC, and have an explosive safety status of *hazardous*. Items that are certified as 1X are designated as MEC in the form of UXO, discarded military munitions (DMM), or munitions constituents (MC).
- ***Category 0X.*** Articles, equipment or buildings were never contaminated and do not pose an explosion hazard. 0X material is not MPPEH, and has an explosive safety status of *safe*.

4.3 MEC/MPPEH PROCESSING

MEC/MPPEH processing includes any action or operation involving MPPEH, including (but not limited to): collecting, consolidating, sorting, segregating, separating (by metal type), inspecting, storing, decontaminating, transferring, demilitarizing, and transporting. MEC/MPPEH processing is considered to be an operation involving ammunition and explosives (A&E) handling until the material is certified as *safe*. Locations used to process MPPEH must be designated as potential explosion sites (PES), they must have site approval, and they must meet established requirements for, and be designated as a "Restricted Area." Processing MPPEH requires an approved SOP. These requirements are addressed in the ESS . The area designated for MPPEH processing is magazine M353.

4.4 MEC/MPPEH STORAGE

Storage of MPPEH is considered A&E storage, until the material is certified *safe* (5X). MEC/MPPEH must be stored in approved storage facilities (magazines) that must have site approval and must be designated as PES and "Restricted Areas", when MPPEH has not been certified, or has been certified *hazardous*. Magazine M354 will be used to store MPPEH.

MPPEH will be stored in suitable containers on pallets in the magazine. The containers will be clearly marked as to their explosive safety status and explosive contamination category.

4.5 CHAIN OF CUSTODY

Documentation is the key to safe management of MPPEH, and allows certification, chain of custody, and explosive safety status to be tracked and known at all times. To maintain the chain of custody, the following categories of materials will not be commingled:

- MPPEH awaiting documentation of its explosive safety status (3X)
- Materials that have been certified *safe*
- Materials that have been certified *hazardous*
- 5X and 3X material

Should commingling occur, the material certified *safe* will lose its *safe* certification. To prevent commingling, a combination of controls, storage locations, gates, barriers, containers or other locally determined methods included in approved, written operating procedures will be used. Materials certified *safe* must be segregated in a location with controlled access, preferably a locked facility. Magazine M354 will be used to store 3X MPPEH while Magazine M353 will be used to process (and demilitarize) MPPEH.

4.6 MEC/MPPEH CERTIFICATION METHODS AND REQUIREMENTS

Certification as *safe* by visual inspection requires a 100 percent examination by one qualified individual, followed by an independent 100 percent re-inspection by another. This will be accomplished during the course of the project by immediately completing the certification/verification process as MEC/MPPEH items are encountered, if that effort is practical. If large quantities of MEC/MPPEH are found, time constraints may prevent the immediate certification/verification.

The SUXOS will delegate a project UXO technician as the MPPEH Certification Inspector. That individual will conduct a 100 percent visual inspection of the item(s), complete the "General" section of the *MPPEH Safe – 5X and Demilitarization Certification/Verification Manifest*, and sign and date the "TtEC UXO Technician Inspector Certification" block on the form. The SUXOS will act as the Verifying Inspector, and will conduct a second, 100 percent visual inspection of the item(s), and sign and date the "Senior UXO Supervisor Verification" portion of the form. Both personnel will also print (or type) their names on the form, and it will be retained in the project files. The item(s) will be tagged, photographed, entered into the MPPEH inventory, and stored in a suitable container (e.g., drum, case) on a pallet in Magazine M353 or M354. The container will be clearly marked as "5X Material – Do Not Commingle" (or a similar statement). An example of *safe* and *hazardous* certification/verification forms can be found in Attachments 3 and 4.

Should MPPEH items be encountered that cannot be certified/verified as 5X, but are thought to be inert with a high degree of confidence, those items will be placed in a separate container on a pallet in Magazine M354. That container will also be suitably marked as to the hazard that maybe present, and be designated as an explosive contamination category 3X. Because the same magazine will be used to store MPPEH (3X) and munitions debris (5X) items, the containers will be clearly marked and segregated in different sections of the magazine with barricades (or other suitable structures or marking devices).

Treatment of MPPEH by technical methods requires Naval Ordnance Safety and Security Activity (NOSSA) approval and will either be thermal or chemical in nature. If MPPEH items are encountered that are 3X, and cannot be 100 percent visually inspected, they will be certified as *hazardous*, and stored in Magazine M354 until the end of the project, at which time a thermal flashing unit or remote cutting tool will be brought in to either thermally treat or gain access to the voids of the items. Certification as *safe* by technical methods (other than 100 percent visual inspection) requires a post-processing sampling inspection with one signature by an authorized person.

Certification as *hazardous* (1X) requires a 100 percent visual inspection by a qualified and authorized person and does not require a second examination. The SUXOS will make this certification. One of the two Bay area explosive ordnance disposal (EOD) Detachments will be requested to respond to items thought to contain high explosives as they are encountered. The *hazardous* certification documentation will be completed while the EOD Detachment is responding.

Documents used to certify material *safe* or *hazardous* may be standard government forms (DoD Forms 1348.1 or 2271) or locally generated. All require the signatures of the individuals performing the certification/verification directly over their typed or printed names. The SUXOS and Certifying Inspector will perform these functions.

The certification documents will accompany certified materials from the time of collection through final disposition and the chain of custody must remain intact to preserve the status of the inspected materials. The chain of custody refers to the activities and procedures taken throughout the inspection, re-inspection, and documentation process to maintain positive control of MPPEH and ensure that the explosion hazard status can be determined at any time.) Documents supporting the safety status of material and any documents associated with the inspection/re-inspection will be retained in the project files for three years, to include the MPPEH inventory and accountability log.

Detailed guidance on the management and disposition of MPPEH can be found in TtEC procedure UXO-8, *Management and Disposition of MPPEH*, which is available in the TtEC Corporate Reference Library (CRL).

4.7 MUNITION WITH THE GREATEST FRAGMENTATION DISTANCE (MGFD)

For the purpose of this project, the MEC item selected as the MGFD is the 20mm HE-filled projectile (MK 3 typical), with a maximum horizontal fragment range (case fragments) of 558 feet (Department of the Army, 2006) with a contingency MGFD based on a 40mm M406 grenade, with a maximum horizontal fragment range of 345 feet. The distance that will be used for the EZ on this project is 200 feet, which is the hazard fragment distance for both projectiles (DDESB, 2003).

5.0 OPERATIONAL CONSIDERATIONS

5.1 NOTIFICATION, SCHEDULING, AND COORDINATION

Coordination of all personnel involved in IR Site 1 MEC/MPPEH removal and the geophysical surveys of the previously identified radiological hot spots will be vital to the safe conduct of site activities. The removal effort by TtEC will help to ensure that IR Site 1 on Alameda Point will be safe for the intended use of the land. Coordination activities will begin with a meeting with all involved parties and agencies to identify shared and individual responsibilities. The community will be informed of the project schedule and the expected impacts. The coordination, notification, and verification activities are outlined below:

- **Coordination Meeting**—Before geophysical survey and MEC/MPPEH-removal operations are scheduled to begin, a coordination meeting will be conducted to address specific elements of planning and will involve representatives from the following organizations:
  - NAS Caretaker/Environmental Compliance Manager (ECM)
  - Resident Officer in Charge of Construction (ROICC)
  - Other DON representatives if necessary
  - TtEC
- **Topics** will include:
  - Explosive handling and transportation
  - Required support services, fire, medical, security, and so forth
  - Notifications
  - Community impact
  - Daily hours of operation
  - Exclusion zone procedures
  - Emergency procedures
- **Notifications**—The TtEC SUXOS will notify the appropriate personnel prior to scheduled removal activities as far in advance as possible to facilitate timely coordination arrangements for establishing the exclusion zone and closing required roads, if necessary. The SUXOS will ensure that the following activities/agencies are informed of the planned field activities:
  - Alameda Hospital (510) 522-3700
  - Concentra Medical Center (510) 465-9565
  - Alameda Fire Department (925) 447-4257
  - Alameda Police Department (510) 522-2423
  - NAS Alameda (ECM) (510) 772-8832

5.2 EQUIPMENT/MATERIAL REQUIREMENTS

The SUXOS will ensure that health and safety equipment is inspected prior to commencing operations. Two equipment checklists are provided in Attachments 5 and 6 that may be used as the basis for tailored checklists that will be developed on site by the SHSS/QC representative and/or SUXOS to ensure that a proper load-out is accomplished before departing for daily activities. It is anticipated that all tasks will be performed in Level D PPE. The following publications are required to be on site in either paper or electronic versions:

- Approved Work Plan with this SOP
- Approved ESS
- Naval Sea Systems Command (NAVSEA) OP 5 Volume 1
- DoD Instruction 6055.9-STD

5.3 MEC EMERGENCY RESPONSE

If an item is encountered that is suspected to be MEC (UXO, DMM, MC), the SUXOS will be notified to positively identify and assess the suspect item(s) to determine its condition and the associated potential hazards. If it is determined that the item encountered is MEC, and poses an immediate threat to human health, public safety, property or the environment, the United States Air Force (USAF) EOD Detachment located on Travis Air Force Base (AFB) or the U.S. Army EOD Detachment located on the former NAS Moffett will be contacted and requested to dispose of the items. The disposal actions will take place in the form of an explosives or munitions emergency response to control, mitigate, or eliminate the threat. [40 Code of Federal Regulations (CFR) 260.10] The following procedures will be used to coordinate the response:

- The SUXOS will establish an EZ of appropriate distance for the type and size of MEC encountered.
- All non-essential personnel will be directed to relocate outside the EZ.
- The site will be clearly marked (stakes, surveyor's tape, etc.).
- Gates to the site will be closed and barriers placed in front of them.
- In addition to the agencies and personnel listed in paragraph 5.1, the SUXOS will contact the following additional personnel/agencies:
  - Moffett EOD Detachment (650) 603-8301 – OR –
  - Travis AFB Command Post (707) 424-5517
  - Travis AFB EOD Detachment (707) 424-2040/3146
  - RPM (Andrew Baughman) (619) 532-0952
  - Project Manager (Abram Eloskof) (949) 756 7521
  - UXO Coordinator (Lance Humphrey) (619) 471-3519

TtEC UXO technicians will assist the Alameda ECM and the USAF EOD Detachment as required.

5.4 ENGINEERING CONTROLS

Engineering controls (tamping, wetting the soil, tarpaulin-tenting, etc.) will be used to limit/control the spread of dust and soil-borne contaminants (if present) during emergency Blow in Place (BIP) operations. TtEC UXO and EOD personnel will determine the type of controls that will be used based on the situation encountered.

5.5 CONTINGENCY PLAN FOR LARGE MEC

Should a large MEC item be encountered, the EZ will be expanded and evacuated prior to conducting BIP procedures. The SUXOS will adjust the EZ based on the size and type of MEC present. If an evacuation of a large exclusion zone (2,500 feet or greater) is required, the Alameda Fire and Police Departments will be notified and their assistance requested in conducting the evacuation. TtEC UXO personnel will assist the responding military EOD unit and the law enforcement agencies in preparing for the BIP operation and evacuating the exclusion zone. The TtEC SUXOS and EOD Commander will brief Police and Fire Department officials on the planned BIP procedures. Activities will not commence until the Alameda Police Department Watch Commander has verified the evacuation of the exclusion zone and given the EOD unit permission to proceed with the operation.

5.6 HANDLING, TRANSPORTATION, AND STORAGE

Requirements for processing (handling, transporting, storing, etc. MEC/MPPEH are derived from federal regulations and military instructions. Certain elements of these processes are discussed in the following sections.

5.6.1 Explosive Transport Vehicle

The Explosive Transport Vehicle will be a pickup truck equipped with sandbags, a non-sparking bed liner or wooden boxes to prevent MEC/MPPEH items from coming into contact with spark-producing materials. The vehicle will be inspected prior to transporting any MEC/MPPEH items to ensure that the following conditions are present during loading or unloading of the items:

- Brakes are set and the wheels chocked (sandbags may be used)
- The vehicle's engine is turned off during the loading or unloading process
- Appropriate Department of Transportation (DOT) warning placards are temporarily attached to the vehicle prior transporting explosive items
- A cellular telephone and a two-way radio are available to the driver

- Emergency warning triangles, barricade tape, a first aid kit, wheel chocks, a general purpose tool kit, and tow chain are readily available
- Two multipurpose, dry-chemical fire extinguishers or two class IA-10BC fire extinguishers are in the vehicle
- Sufficient sandbags are in place to chock the container(s) in the vehicle bed
- A fire-resistant bed cover/tarpaulin is available to cover the explosive item after it has been secured within the truck bed

5.6.2 Packaging for Transport

MEC/MPPEH items will be placed in a suitable container, placed in the truck bed, and chocked with sandbags to prevent movement.

5.6.3 MPPEH Storage and Processing

Magazine M354 was approved for use by the NOSSA and will be used for the storage of recovered MPPEH. Magazine M353 will be used for processing and demilitarizing MPPEH.

The following general magazine practices will be followed:

- All material stored in the magazines will be stowed on pallets.
- All flammable materials and vegetation will be removed from the perimeter of the magazine.
- The magazine door(s) will remain open while personnel are working inside.
- The magazines will be kept neat and orderly at all times.
- A red flag will be flown outside the magazine when personnel are working inside.
- The magazine will be locked with a high-security padlock and the fenced compound that encloses the magazine will also be padlocked. The SUXOS will maintain custody of the keys.

5.6.4 Inventory

An inventory of the recovered MPPEH will be maintained inside the storage magazines and in the project administrative structure. The Ordnance Accountability Inventory found in Attachment 6 may be used for this purpose, or another suitable method as determined by the SUXOS. The inventory will be updated each time an MPPEH item is placed in, or removed from a magazine.

5.7 DEMILITARIZATION

Although certified/verified 5X items are not considered MPPEH, the demilitarization requirements for ordnance-related material (projectiles, casings, etc.) provided in DoD

Instruction 4160.21-M-1 (DoD, 1991) are germane. The NOSSA-approved method for demilitarizing inert 20mm target practice projectiles that has been used in previous projects uses a large, hydraulically operated re-enforcing bar cutter. Each projectile is placed in the cutter jaws and the machine operator controls the function of the machine remotely behind a barricade. The planned procedures for this project will require the cutting machine to be located inside magazine M353, around the corner of the entrance, and the remote foot-switch that operates the machine to be placed outside the magazine, against the magazine wall. A sandbag barrier or suitable steel plate will be placed between the cutter and the magazine portal. The UXO technicians will place a projectile in the jaws of the cutter, relocate outside around the corner, and operate the machine.

Once demilitarized, the metal fragments are placed in a drum and sent to a landfill. An approved SOP and Activity Hazard Analysis (AHA) are available if this type of demilitarization is selected for use.

If MPPEH items other than 20mm projectiles are recovered and can be certified/verified 5X, an alternate method of demilitarization will be employed to render the items indistinguishable as ordnance. The SUXOS, PjM, and UXO Coordinator will collectively select the method to be used and the SHSS/QC representative will prepare an AHA for the operation and submit it to the program CIH for approval. The SUXOS will thoroughly brief the UXO technicians that will be performing the work before the operation begins.

5.8 COMMUNICATIONS

Communication equipment consisting of cellular telephones and hand-held radios will be available to site personnel. The radios will be used for communications on the project site and the cellular telephones will be used for emergency communications with fire and medical support activities. There are no electricity or land-line telephones on the site.

5.9 FIRE FIGHTING AND SUPPORT

No attempt will be made to extinguish a fire involving explosives until the explosives have been consumed. Some general guidelines for fires involving explosives are provided as follows:

- Do not fight any fires that involve explosives.
- Notify the Alameda Fire Department (925) 447-4257 prior to conducting BIP operations and contact them immediately upon the discovery of a fire.
- If a fire develops in the vicinity of the former Firing-range Berm, the area will be evacuated until the fire is out. Fire Department personnel will be briefed on the potential danger that live 20mm projectiles present in the fire before they enter the site.

5.10 EMERGENCY MEDICAL SUPPORT

The ambulances from Alameda Hospital or fire trucks from the Alameda Fire Department (located on the former NAS Alameda) will be the first responders for emergency medical support. They can be contacted by dialing 911. A complete first-aid kit will be maintained on site and at least two UXO technicians will be trained in CPR and first aid procedures.

5.11 PERSONAL PROTECTIVE EQUIPMENT

All TCRA operations are planned to be conducted in Level "D" PPE with safety glasses. The SHSS can direct a modification to this after conferring with the Program CIH. Geoscientists and UXO assisting them in the geophysical survey will not be required to wear hard hats.

5.12 RECORDKEEPING

Attachments 7 and 8 may be used for recordkeeping purposes, or serve as the basis for a tailored accountability/inventory form, as determined by the SUXOS. Maintaining the inventory electronically in a spreadsheet or other form is also acceptable. The type of inventory/accountability tool should contain spaces to identify the MEC/MPPEH item(s), the location found, the storage location, and the disposition. The inventory will form a part of the chain of custody for the MPPEH that will be maintained until the material is demilitarized and disposed of. The inventory must remain in project files for a period of 3 years after disposal. The forms used to certify and verify the MPPEH 5X will be filed with the inventories.

Regardless of the format used for the inventory and accountability of MPPEH, photographs of the materials must accompany the inventory. If a paper document is used for this purpose, paper photographs should be attached to the respective pages of the accountability log/inventory. If an electronic version of the log is maintained, digital photographs of the MPPEH items should be linked to each log entry.

5.13 TWO-MAN RULE

The two-man rule is a concept of fail-safe, where two knowledgeable individuals perform potentially hazardous operations in which each is the safety backup and watch person for the other. The two-man rule shall apply whenever MEC/MPPEH is handled or transported.

6.0 REMOVAL PROCESS

A geophysical survey will be conducted to locate a disposal trench where radiological material might have been buried, and to determine locations and boundaries of debris pits in the vicinity of the former Firing-range berm that are known to contain 20mm projectiles. Prior to conducting the geophysical survey, however, a surface search aided by metals detectors will be completed to remove 20mm projectiles (and other MEC/MPPEH items) on the surface of the former Firing-range Berm and the area immediately to the north of the small arms range

6.1 QUANTITY DISTANCE AND EXCLUSION ZONE

Magazine M354 will be used for storing recovered MEC/MPPEH. Although the magazine was rated for the storage of 15,000 pounds Net Explosive Weight (NEW) for hazard-division category 1.1 explosives, a NEW limit of 100 pounds of hazard-division 1.1 has been requested. (It is not anticipated that any hazard-division 1.1 items will be recovered, and the NEW limit was selected for a worst-case scenario). The quantity/distance arc for Magazine M354 will be 500 feet, as shown in Figures 1-2 and 1-3.

A 200-foot EZ will be established around the former Firing-range Berm (with the northern toe of the former Firing-range Berm as the EZ center) and screen plant, and all non-essential personnel will remain outside the EZ perimeter while the removal activities are taking place. The limits of the EZ will be clearly marked (i.e., traffic cones, caution tape, etc.). Barricades on the northern and southern peripheries of the EZ that intersect the road through IR Site 1 will be established, and the gates on either end of the site will be closed. If visitors or non-essential personnel are required to enter the EZ, the SUXOS or SHSS will order the removal operations to cease until the area is free from non-essential personnel. A 200-foot EZ will also be applied to the MPPEH processing area inside magazine M353, the collection point where MPPEH will be stored until the end of the workday, the lay-down pad where soil/debris will be sampled and the screen plant. The EZ arcs planned for use in this project can be found in Figures1-2 and 1-3.

6.2 MEC/MPPEH SURFACE SEARCH/SURVEY

If vegetation on the site requires cutting (i.e., higher than 4 inches), the SUXOS will direct a pre-vegetation-removal surface sweep of the munitions response site (MRS) to prepare the site for the laborers/equipment operators who will cut the vegetation. The area of the surface search will be bordered by the coastline to the west, and the road to the east. The northern border of the small arms range will act as the center point for the north-south ambits of the search area; a distance of approximately 75 feet to the north and south of the northern small arms range boundary will be searched. (The SUXOS may amend this distance as site requirements dictate.) These boundaries (or amended boundaries, as required) will be marked to delineate the area to be searched.

A line or other suitable marking device will be used to mark the path of advance on the initial sweep of the area along one of the boundaries. UXO technicians will form a line abreast, perpendicular to the path of advance, spaced about 10 feet apart. The UXO technician positioned on the path marker will act as the guide and proceed in a straight line along the initial search boundary. The remaining UXO technicians will maintain spacing and distance off the UXO guide and advance across the search area, using Schonstedt (or other suitable instruments) metal detectors to provide an audible backup to the visual search being conducted. The UXO technician on the outside of the line will mark his/her starting and ending position on the boundaries, and when the sweep line reaches the opposite side of the search area, the marking line will be moved to provide the basis for the ensuing search. This process will be repeated until the entire site has been swept. The SUXOS may amend this process as conditions warrant.

When the actual vegetation cutting takes place, UXO technicians will act as escorts for the persons cutting the vegetation, in case more projectiles percolated to the surface following the surface sweep. Mechanized mowing equipment will be used to cut grass outside the MRS, and stringed trimmers will be used to cut the grass inside the MRS. When the cutting is complete and the vegetation has been removed (as required), the surface sweep will be repeated to ensure that all MEC/MPPEH items on the surface have been removed.

6.3 GEOPHYSICAL SURVEY

Following the surface MEC/MPPEH sweeps and the vegetation removal, a geophysical survey will be conducted to identify the location and boundaries of disposal pits or trenches and debris fields. In addition, geophysical surveys will be conducted at previously identified radiological hot spots prior to excavation.

Survey control will be established and used to provide precise positional data. The geophysical data collection will use a Geonics time-domain electromagnetic (TDEM) instrument (EM61) with an integrated Leica differential global positioning system (DGPS) to provide precise location coordinates for anomaly reacquisition, if required, and trench/pit boundary locations. The system is certified under the DON's Hazards of Electromagnetic Radiation to Ordnance (HERO) program.

The geophysical and DGPS data will be concatenated, processed, and a geophysical map will be generated that identifies pit and trench boundaries. The map and a DGPS receiver will be used to delineate the perimeters of pits and trenches.

The location of the burial trench is unknown, but is believed to lie in a location west of the road that traverses the site, and north of the small arms range. The geophysical survey will use these boundaries for the initial data collection (road/coastline, small arms range/fence line). If the location of the trench cannot be determined after processing and interpreting the data, the search area will be expanded eastward after consulting with the PjM.

Where accessible, the entire former Firing-range Berm will be surveyed (the steep incline of the western slope may prevent surveying activities on that part of the berm). The map produced from the trench-location survey and from the berm survey should reveal all potential burial/disposal pits where MEC/MPPEH may be concentrated.

Due to the nature of the intended geophysical survey, a geophysical prove-out to demonstrate the detection capabilities of the geophysical system will not be performed. The proposed methodology (Geonics EM61 metal detector and Leica DGPS) is historically able to detect a 105mm projectile to a depth of 4 feet. The burial pits and disposal trench are expected to contain significant amounts of metal at relatively shallow depths, and the proposed instrumentation should be able to easily detect these anomalous areas. TtEC will perform daily instrument calibration and/or functionality checks to ensure that the instrumentation is operating properly and is within specifications. The EM 61 will be run over a known target at the beginning of each file to ensure that it is operating properly.

6.4 REMOVAL ACTION/EXCAVATION

To ensure that the removal of MEC/MPPEH items is accomplished, a three-step screening process will be used during the excavation of the former Firing-range Berm, disposal trench, and debris pits. The first step in the process will be accomplished during the excavation activities, which will be effectuated with earthmoving machinery (EMM), i.e., a backhoe, excavator, or bulldozer. The EMM will be equipped with transparent armor to allow non-UXO equipment operators to operate the equipment. The construction type and thickness of the armor authorized by the U.S. Army Engineering and Support Center, Huntsville, (U.S. Army Engineering and Support Center, 2006) for the specific site MGFD will be one of 3 types shown in Table 6-1:

TABLE 6-1

AUTHORIZED BLAST SHIELD CONSTRUCTION MATERIALS AND THICKNESS

Construction Material	Required Thickness	Comments
Plexiglas (cast)	1.13 inches	Most recommended. May be layered. Available commercially off the shelf.
Lexan®	2.16 inches	Single Pane
Bullet-resistant Glass	0.83 inches	Least recommended

6.4.1 Removal Action Methodology

Three distinct areas are planned for excavation: the disposal trench(s) where radiological sources were thought to have been buried, debris pits where 20mm projectiles are known to exist, and the former Firing-range Berm, a part of which is suspected to also contain MEC/MPPEH items. MEC/MPPEH items are not anticipated to be found in the radiological disposal trench. The potential presence of MEC/MPPEH in the disposal pits and former Firing-range Berm will require slightly different processes to protect UXO and Radiological Control Technicians (RCT) personnel.

The first step in the MEC/MPPEH and radiological source screening and removal is the manual survey of the top 6 inches of soil with hand-held radiological instruments and magnetometers. In the excavating of the radiological disposal trench, the Radiological Control Technicians (RCTs) will conduct the radiological survey. RCTs will conduct the radiological survey and UXO technicians may assist them with magnetometers (for metal sources), if required. For the areas known and suspected to contain MEC/MPPEH items, a barricade (either 0.21 inches of mild steel, 0.17 inches of hard steel, 0.47 inches of aluminum, or 1.13 inches of plexi-glass) will be installed for UXO and RCT personnel to take shelter behind when the actual excavation of the soil is taking place. The procedures are described below.

6.4.2 Disposal Trench

Prior to the start of excavation, the approximate boundaries of the trench will be installed and marked with tape, paint, lath, etc. The excavation will begin at a boundary of an excavation area and proceed inward. The top 6 inches of soil in the excavation area will screened for radiological items, and if any are found, they will be hand excavated and placed in a storage container. When the survey of the first layer is complete, EMM will remove the top 6 inches of soil in the excavation area (this may be accomplished by scraping, excavating, etc.) and deposit it in a dump truck. When the truck is full, the excavated soil will be transported to a laydown area, spread in a 6-inch layer, and re-surveyed. When the entire layer of soil has been surveyed for radiological sources twice, the soil will be removed from the laydown pad and transported to a stockpile near a soil screening plant.

A radiological survey of the next 6 inches of soil in the excavation will then be accomplished, and when complete, EMM will remove the next 6 inches of soil, the soil will be taken to the laydown pad, spread it in another 6-inch layer, and again surveyed for radiological anomalies. This process will be repeated until the trench is completely excavated and native soil is reached.

If MEC/MPPEH is encountered during the excavation of the trench, a 200-foot EZ will be established and armored EMM will be brought in to finish the excavation. A USASCE-approved barrier (steel, concrete, etc.) located outside the swing radius of the EMM being used for the excavation will be erected and UXO and RCT personnel will then take shelter behind it during the actual removal of the soil.

6.4.3 Burial Pits

The process for excavating the burial pits will be nearly identical to that used for the disposal trench, with the additional step of the RCT personnel and UXO technicians taking shelter behind a barricade when the soil is excavated. The process will proceed as follows:

- The boundaries of the pit(s) will be marked and the entire area inside the pit perimeters will be surveyed for radiological sources that will be hand excavated and placed in a container if found. (UXO technicians may use magnetometers to assist as needed.)
- UXO and RCT personnel will then take shelter behind a USASCE-approved barrier (steel, concrete, etc.) located outside the swing radius of the EMM being used for the excavation.
- The equipment operator will remove the top 6 inches of soil within the boundary markers and place it in a dump truck.
- The UXO technician(s) will then return to the excavation and check it to see if MEC/MPPEH was unearthed. If the excavation is clear, the RCT person(s) will return, survey the next 6 inches of soil, and all will relocate behind the USASCE-approved barricade while the next 6 inches of soil is removed.

This process will be repeated until the burial pit is completely exhumed and the magnetometer indicates that nothing metallic lies beneath the floor of the pit.

6.4.4 Former Firing-Range Berm

Only the northern portion of the former Firing-range Berm is suspected to contain buried MEC/MPPEH items, and the geophysical survey of the berm should show their precise locations. The area containing buried debris will be marked on the ground surface (lath, stakes, caution tape, etc.) and this area will be excavated last.

The excavation of the berm will be conducted in a manner similar to the trench and pit excavation. The vegetation on the berm will be cut as near to the ground as possible. Beginning at the southern end of the berm, RCT personnel will survey the top 6 inches of soil on the top of the berm for radiological sources and hand excavate them if found. EMM will remove the top 6 inches of the berm and place it in a dump truck. The next six inches of soil will be surveyed, and that layer of soil removed. This process will be repeated until the southern portion of the berm is removed.

On the portion of the berm suspected to contain buried debris, the procedures used for the disposal pit excavation will be used.

All of the soil will be transported to the layd-own pad, layered, and surveyed again for radiological sources. After the screening on the lay-down pad, the soil will be transported to the screening plant stockpile. This process will be repeated until the berm has been removed.

6.4.5 Screening

The soil and debris from the debris fields, disposal trenches, and the former Firing Range Berm will be processed through a screening plant anticipated to be a Trommel fitted with a 6-inch grizzly and a rotating drum (approximately 6 feet in diameter and 25 feet long) fitted with ¾-inch screens. A Trommel screening plant with 2 screen drums may be used if one can be located. The excavated soil/debris will be processed as follows:

- A loader will place the soil atop the feed hopper grizzly. All soil clumps and objects larger than 6 inches will drop off the back of the grizzly, while soil and debris smaller than 6 inches in size will drop into the feed hopper, where it will transported, via a conveyor, to the Trommel.
- Soil and debris larger than ¾-inch will be transported out of one end of the Trommel drum. A conveyor will move the material to a stockpile. A UXO technician will monitor the oversized materials from the Trommel plant for MEC/MPPEH items at a point on the conveyor that is at least 8 feet from the Trommel.
- Soil and objects smaller than ¾ inches (the "fines") will pass through the Trommel screen and be carried by conveyor to another stockpile.

The UXO technician(s) monitoring the oversized materials from the Trommel will be stationed on an observation platform equipped with Lexan®, or Plexi-glass shields, and a "kill switch" to halt the screen plant if MEC/MPPEH items are observed. Figure 2-1 provides a drawing of the screen plant configuration.

A loader may be used to return soil clumps and other debris that do not break down in the Trommel to the feed hopper for re-processing. Items that do not break down after several passes through the screen plant will be inspected with radiological instruments and metal detectors to determine if MEC/MPPEH or radiological items might be present inside the clumps. Those clumps that test positive for metal and/or radiation will be mechanically disassembled with armored EMM by cutting them with the bucket or crushing them with tracks/buckets.

7.0 QUALITY CONTROL

QC is performed to ensure that encountered MEC/MPPEH is recovered, handled, transported, processed, and stored in accordance with applicable regulations and directives. Detailed QC procedures are found in the Project Quality Control Plan (TtEC, 2007b).

7.1 SEARCH EFFECTIVENESS PROBABALITY (SEP) TEST

Prior to beginning the characterization activities, the Surface Characterization Team will be certified in a QC test grid using the Search Effectiveness Probability Test. The test grid will be seeded with 34 target items that are representative of the MGFD. The Surface Characterization Team will form a line abreast and conduct a sweep of the grid following procedures described previously. Each team member will use a Schonstedt GA-52 CX metal locator with an audible detection alarm to aid in the visual search of the grid. To gain certification to conduct characterization operations, the team must demonstrate the ability to achieve an 85 percent Probability of Detection (PD) with a 90 percent Confidence Level (CL) of removal of target items, which will require locating 32 of the 34 seeded targets. If less than 32 items are located, the team must continue training until they can achieve the 85 percent PD at a 90 percent CL. When (if) new team members that have not previously been certified in surface clearance operations are added to a team, the entire team must proceed through the surface clearance test grid and demonstrate the ability to achieve an 85 percent PD at a 90 percent CL before conducting field operations. Establishing the test grid and processing the team through the test grid is a QC function and must remain separate and independent from operations.

7.2 EQUIPMENT FUNCTIONALITY

A magnetometer test grid will be established and seeded with a pre-determined amount of 20mm target practice rounds buried at depths of up to 9 inches. Prior to commencing daily excavation activities, the UXO technicians will pass their magnetometers over the test grid to ensure that the equipment is functional. All of the buried rounds must be detected for the equipment to be used on the project. The project QA/QC representative will record the functionality tests of the magnetometers on a daily basis.

7.3 DAILY QC

The SUXOS and SSHS/QC will ensure that procedures are implemented as listed below:

- Ensure that functionality checks of magnetometers and geophysical instruments are conducted on a daily basis and recorded in the SUXOS log and daily QC report, as described in the CQC Plan.
- Perform follow-up QC for on-site packaging, transportation, processing, and storage.

- Perform the certification, verification, and *safe* or *hazardous* determination. Ensure that the certification/verification form is completely filled out and that the appropriate information is present.
- Complete data entry for the Acquisition/Accountability log and/or Inventory (in the format chosen).
- Ensure that photographs of MEC/MPPEH items accompany the inventory entries.
- Ensure that commingling of the different hazard classes (1X, 3X, and 5X) does not occur.
- Ensure that the chain of custody is maintained from discovery through disposal.

Lot Acceptance and Rejection Criteria

Three debris streams will emerge from the Trommel, specifically:

- Objects larger than 6 inches that will accumulate below the grizzly
- Objects larger than ¾ inches that will leave the Trommel at the end opposite the feed hopper
- Objects smaller than ¾ inches (fines) that will leave the Trommel via a conveyor emerging from the side of the Trommel

The fines should not contain MEC/MPPEH items because of the size of the Trommel screens. The other debris streams ("overs") may contain MEC/MPPEH items of 20mm projectile size and larger. The conveyor carrying the smaller overs stream (>¾ inch) will be monitored by UXO technicians for MEC/MPPEH items. (The observation platform will be at least 8 feet from the screen plant and protected by Lexan 2.25 inches or plexiglass 1.25 inches thick.) The >¾ inch overs will agglomerate in a stockpile at the end of a conveyor, and the overs stream > 6 inches will be form a stockpile at the base of the grizzly.

Both of the overs piles will be sampled for MEC items. Front-end loaders with 2-cubic-yard buckets and dump trucks with 20-cubic-yard boxes (10 buckets per truck) will be used to move the overs stockpiles. The unit of production for this sampling plan will be the bucket, and a number of these will make up a lot. A lot size of 40 buckets (4 dump trucks) is recommended for this project. This will provide a more economical level of rework if a sample fails inspection and the entire lot has to be re-screened.

When the overs stockpiles grow to approximately 20 cubic yards, they will be loaded into dump trucks, transported to the lay-down pad, and deposited there in separate stockpiles (>6 inches and >¾ inches). When four dump truck loads have been added to each of the piles, they will be sampled for MEC/MPPEH. An armored front-end loader will remove 2 buckets (4 cubic yards, 10 percent of the accumulated soil and debris) from random locations in each stockpile and spread it in a 6-inch layer on the lay-down pad. UXO technicians and RCT(s) will manually screen the layer for radiological sources and MEC/MPPEH. If neither are found, the lot is accepted and the entire stockpile may be relocated from the lay-down pad to "clean" stockpiles. If a MEC/MPPEH item is found, the lot is rejected and the entire stockpile must be re-processed through the Trommel. If a radiological source is found, the lot is also rejected, and the entire stockpile must be placed in a 6-inch layer on the lay-down pad, manually surveyed with radiological instruments, and sampled again.

8.0 GENERAL SAFETY PRECAUTIONS

This section provides the following general safety precautions for explosive disposal operations:

- Know and observe federal, state, and local laws and regulations that apply to the transportation, storage, and usage of explosives.
- Do not permit metal (except the approved explosive vehicle) to contact explosive containers.
- Do not transport metal, flammables, or corrosive substances with explosives.
- Do not allow smoking, or the presence of unauthorized or unnecessary persons, in vehicles containing explosives.
- Do not store any sparking metal or sparking metal tools in an explosive magazine.
- Do not permit smoking, matches, or any source of fire or flame in or near an explosive magazine.
- Do not allow leaves, grass, brush, or debris to accumulate within 50 feet of an explosive magazine.
- Do not permit the discharge of firearms in the vicinity of an explosive magazine.
- Do not place MEC/MPPEH where they may be exposed to flame, excessive heat, sparks, or impact.
- Do not expose 3X MEC/MPPEH to the direct rays of the sun. Such exposure increases sensitivity and deterioration.
- Ensure that 3X MEC/MPPEH are stored in proper containers and the containers are closed after use.
- Do not carry MEC/MPPEH items or explosive components in pockets or elsewhere on the body.
- Carefully load and unload MEC/MPPEH from vehicles. Never throw or drop MEC/MPPEH from a vehicle.
- Do not drive vehicles containing MEC/MPPEH through cities, towns, or villages, or park them near such places as restaurants, garages, and filling stations, unless absolutely necessary.
- Store MEC/MPPEH only in a magazine that is clean, dry, well-ventilated, reasonably cool, properly located, substantially constructed, bullet and fire resistant, and securely locked.
- Ensure that the Exclusion Area is clear of any unauthorized personnel before beginning investigative activities.
- Do not handle, use, or remain near MEC/MPPEH during the approach or progress of an electrical storm.

- Do not transmit on a radio within the HERO distance of that radio. If the exact distance for the radio is not known, do not transmit on the radio within 10 feet of MEC or suspected MEC. Additionally, do not turn on the cellular telephone within 10 feet of MEC.

The two-person rule will apply whenever MEC/MPPEH is handled or transported and during disposal operations on or off the range.

9.0 REFERENCES

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ATTACHMENT 1

FIELD SUPERVISOR REVIEW SHEET

ATTACHMENT 1

FIELD SUPERVISOR REVIEW SHEET

I have read the Project Work Plan and the Standard Operating Procedure 1 (SOP-1) for MEC/MPPEH/UXO Disposal Disposition. I understand it. To the best of my knowledge the processes described in the Work Plan and this SOP-1 can be done in a safe, healthful, and environmentally sound manner. I have made sure all persons assigned to this process are qualified, have read and understand the requirements of the Work Plan and SOP-1, and have signed the worker's statement for this process. If necessary, I will conduct an annual review of the Work Plan and SOP-1. If deviations from this SOP-1 are necessary, I will ensure that project activities are stopped until the SOP-1 is revised and approved. If unexpected safety, health, or environmental hazards are found, I will ensure that project activities are stopped until the hazards have been eliminated.

SUPERVISOR'S NAME	SIGNATURE/DATE

ATTACHMENT 2

FIELD TEAM REVIEW SHEET

ATTACHMENT 2

FIELD TEAM REVIEW SHEET

Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

I have read the Project Work Plan and Standard Operating Procedure 1 (SOP-1) for MEC/MPPEH/UXO Disposal Disposition and I have received the hazard control briefing. I understand them. I will follow the Work Plan and SOP-1 unless I identify a hazard not addressed in it or encounter an operation I do not understand. If that occurs, I will stop site activities and notify my immediate supervisor of the problem.

WORKER'S NAME	SIGNATURE/ DATE	SUPERVISOR'S NAME	SIGNATURE/ DATE

ATTACHMENT 3

MPPEH *SAFE* - 5X AND DEMILITARIZATION CERTIFICATION/VERIFICATION MANIFEST

MPPEH *Safe* - 5X and Demilitarization Certification/Verification Manifest

GENERAL

1. Generator's Name and Mailing Address	1.a Generator's Ph # ( )
2. Project Location	2.a Project Ph # ( )
3. MPPEH Contractor Name and Mailing Address	3.a MPPEH Contractor Ph # ( )
4. Government Assigned Verification Name and Mailing Address	4.a Certifier Ph # ( )
5. Transporter 1 Name and Mailing Address	5.a Transporter 1 Ph # ( )
6. Transporter 2 Name and Mailing Address	6.a Transporter 2 Ph # ( )
7. Recycler Name and Mailing Address	7.a Recycler Ph # ( )

MEC Contractors and Government Certifier

8. Security Seal #	9. Gross Wt. (Lbs)	10. Tare Wt (Lbs)	11. Net Wt. (Lbs)	12. Weight Ticket #

13. Description	14. Material	15. Quantity	16. Unit (Wt., Vol)

SAFE - 5X CERTIFICATION

This certifies that the Material Potentially Presenting an Explosive Hazard items listed has been 100 percent inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials.

17. TtEC UXO Technician Inspector Certification		
Signature	Address	Date
Printed/Typed Name		Phone
18. Senior UXO Supervisor Verification		
Signature	Address	Date
Printed/Typed Name		Phone

Transporters

19. Transporter 1 Acknowledgment of Receipt of Materials (Receiving Signature Verifies that Container was Received with Seal Intact)		
Signature	Address	Date
Printed/Typed Name		Phone
20. TtEC Acknowledgment of Receipt of Materials (Signature Verifies that Container was Received with Seal Intact and Contents Loaded to Transporter 1)		
Signature	Address	Date
Printed/Typed Name		Phone
21. Transporter 2 Acknowledgment of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seals Intact)		
Signature	Address	Date
Printed/Typed Name		Phone
22. Discrepancy Indication Space		
Signature	Address	Date
Printed/Typed Name		Phone

Demil / Recycle Facility

23. Recycler Acknowledgment of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seal Intact)		
Signature	Address	Date
Printed/Typed Name		Phone

DEMILITARIZATION CONFIRMATION

This certifies and verifies that each item or items contained have been demilitarized to the minimum requirements of DOD 4160-M-1, Defense Department Demilitarization Trade Security Control Manual.

24. Recycler		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
25. TtEC UXO Technician Inspector Certification		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
26. Senior UXO Supervisor Verification		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
27. Final Disposition		

ATTACHMENT 4

MPPEH *HAZARDOUS*-3X/1X MANIFEST

MPPEH *Hazardous* – 3X/1X Certification Manifest

GENERAL

1. Generator's Name and Mailing Address	1.a Generator's Ph # ( )
2. Project Location	2.a Project Ph # ( )
3. MPPEH Contractor Name and Mailing Address	3.a MPPEH Contractor Ph # ( )
4. Government Assigned Verification Name and Mailing Address	4.a Certifier Ph # ( )
5. Transporter 1 Name and Mailing Address	5.a Transporter 1 Ph # ( )
6. Transporter 2 Name and Mailing Address	6.a Transporter 2 Ph # ( )
7. Recycler Name and Mailing Address	7.a Recycler Ph # ( )

MEC Contractors and Government Certifier

8. Security Seal #	9. Gross Wt. (Lbs)	10. Tare Wt (Lbs)	11. Net Wt. (Lbs)	12. Weight Ticket #

13. Description	14. Material	15. Quantity	16. Unit (Wt., Vol)

HAZARDOUS - 1X/3X CERTIFICATION

This certifies that the Material Potentially Presenting an Explosive Hazard listed has been 100 percent properly inspected and to the best of my knowledge and belief, presents an explosion hazard

17. Senior UXO Supervisor Verification		
Signature	Address	Date
Printed/Typed Name		Phone
18. TtEC UXO Technician Inspector Certification		
Signature	Address	Date
Printed/Typed Name		Phone

Transporters

19. Transporter 1 Acknowledgment of Receipt of Materials (Receiving Signature Verifies that Container was Received with Seal Intact)		
Signature	Address	Date
Printed/Typed Name		Phone
20. TtEC Acknowledgment of Receipt of Materials (Signature Verifies that Container was Received with Seal Intact and Contents Loaded to Transporter 1)		
Signature	Address	Date
Printed/Typed Name		Phone
21. Transporter 2 Acknowledgment of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seals Intact)		
Signature	Address	Date
Printed/Typed Name		Phone
22. Discrepancy Indication Space		
Signature	Address	Date
Printed/Typed Name		Phone

Demil / Recycle Facility

23. Recycler Acknowledgment of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seal Intact)		
Signature	Address	Date
Printed/Typed Name		Phone

DEMILITARIZATION CONFIRMATION

This certifies and verifies that each item or items contained have been demilitarized to the minimum requirements of DOD 4160-M-1, Defense Department Demilitarization Trade Security Control Manual.

24. Recycler		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
25. TtEC UXO Technician Inspector Certification		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
26. Senior UXO Supervisor Verification		
Signature	Signature	Signature
Printed/Typed Name	Printed/Typed Name	Printed/Typed Name
27. Final Disposition		

ATTACHMENT 5

DAILY EQUIPMENT CHECKLIST

ATTACHMENT 5

DAILY EQUIPMENT CHECKLIST

Date: __________ **Disposal Supervisor: ________________________**

Equipment	Quantity	Comments
Explosive vehicle	3	
Personnel vehicle	1	
Camcorder/digital camera	1	
Air horn	4	
Bravo Flag (Red)	2	
Hand-held radios	2	
Ruler, 24-inch	1	
Schonstedt locator	1	
Shovel, round point, long handle	1	
Shovel, round point, short handle	1	
Tape, duct	6	
Tape, measuring, 50- or 100-meter	3	
Tape, plastic	6	
Toolbox, general hand tools	1	
Knife	1	

Note: This list is intended to be revised to reflect on-site requirements

ATTACHMENT 6

DAILY HEALTH AND SAFETY EQUIPMENT CHECKLIST

ATTACHMENT 6

DAILY HEALTH AND SAFETY EQUIPMENT CHECKLIST
(As Required)

Date: ___________ **Disposal Supervisor:** ________________________

Equipment	Quantity	Comments
Air horn, emergency	1	
Booties, rubber slip-on (1 pair per person)	1	
Burn gel	2	
Burn kit	1	
Compress, 18 x 36 inches	2	
Compress, 8 x 10 inches	2	
CPR kit	1	
Decontamination sprayer	2	
Emergency eye wash	1	
Eye wash, 15-minute	1	
Fire blanket	1	
Fire extinguisher, 10-pound	1	
First aid kit, 10-person	1	
Gauze pads, 3 x 3 inches	12	
Gloves, latex	12	
Gloves, leather	12	
Gloves, nitrile	5	
Goggles	5	
Hard hat	5	
Radios, hand held	3	
Rain suit	5	
Safety vest	5	
Stretcher	1	
Tape	6	
Triangular bandages	6	
Voltage detector	1	
Water, 5-gallon bottle (emergency shower)	2	
Water, drinking 1 liter per person	6	

Note: This list is intended to be revised to reflect on-site requirements.

ATTACHMENT 7

UXO ACQUISITION AND ACCOUNTABILITY LOG

ATTACHMENT 7

UXO ACQUISITION AND ACCOUNTABILITY LOG

Delivery Order No.: __________ **Report No.:** ________

UXO TEAM: ______________________ **Date:** ______________

ACQUISITION DATA

Grid Number	
Ordnance length (inches)	
Ordnance diameter (inches)	
Weight (lbs/oz)	
Ordnance type (bomb, rocket, projectile, hand grenade, mortar, rifle grenade, pyrotechnics, small arms, and so forth)	
Photo roll number/disk number	
Photo exposure number/digital file number	
Video marker – Start	
Video marker – Stop	
Ordnance description	

UXO DISPOSITION

SAFE HOLDING AREA	DATE	INITIAL	TRANSFERRED TO	DATE	SIGNATURE

DESTROYED BY	DATE	SIGNATURE

Comments:____

____

____

Senior UXO Supervisor____

ATTACHMENT 8

ORDNANCE ACCOUNTABILITY INVENTORY

ATTACHMENT 8

ORDNANCE ACCOUNTABILITY INVENTORY

Date: ______________

RPT #	Item	Category*	Found	Location	Initial Disposition	Photo #	Final Disposition /Date

Notes:

* Type by category (i.e., projectiles, small arms, etc.).
RPT – Report

ATTACHMENT 2

CORRESPONDENCE

DEPARTMENT OF THE NAVY
NAVAL ORDNANCE CENTER
FARRAGUT HALL BLDG D-323
23 STRAUSS AVENUE
INDIAN HEAD MD 20640-5555

8020
Ser N7112/720
6 NOV 98

From: Commander, Naval Ordnance Center
To: Supervisor of Shipbuilding, Conversion, and Repair, USN, Portsmouth, VA, Director, SSPORTS Environmental Detachment, Vallejo, CA (Code 120UXO)

Subj: TEMPORARY MAGAZINE SITING AT FORMER NAVAL AIR STATION, ALAMEDA, CA

Ref: (a) SSPORTS ENV DET Vallejo ltr 5090 Ser 120/198 of 23 Oct 98
(b) NAVSEA OP 5, Volume 1
(c) NAVSEA OP 2165, Volume 1
(d) OPNAVINST 8027.1D
(e) NAVSEAINST 8023.11
(f) OPNAVINST 8023.2C
(g) NAVSEAINST 8020.9A
(h) Title 49, U. S. Code of Federal Regulations
(i) MIL STD 1320
(j) Title 40, U. S. Code of Federal Regulations

1. In reply to reference (a), temporary storage of recovered unexploded ordnance (UXO) is authorized in Magazine M354 at the former Naval Air Station, Alameda. This magazine must comply with the quantity-distance, fire hazard placard, and other explosives safety requirements of reference (b). Serviceable ordnance must not be stored in the same magazine with recovered UXO. Storage must not exceed the 15,000 pounds Net Explosive Weight (NEW) previously approved for this magazine. Storage of any UXO items must not exceed 90 days unless the rationale for specific circumstances is submitted in writing to Naval Ordnance Center (N71) for review and approval.

2. Current Navy safety regulations and requirements for shore station operations involving on-station transportation of UXO and other ammunition, explosives or other hazardous materials are contained in Chapter 12 of reference (b). Current Navy safety regulations and requirements for off-station transportation of UXO and other ammunition, explosives or other hazardous materials are contained in Chapter 4 of reference (c).

Subj: TEMPORARY MAGAZINE SITING AT FORMER NAVAL AIR STATION, ALAMEDA, CA

3. In accordance with reference (d), the EOD community develops and implements Emergency Response Procedures governing access to, recovery of, rendering safe and final disposal of ordnance under emergency conditions. Emergency conditions are considered terminated when EOD trained personnel have rendered safe the ordnance and the EOD incident response has been terminated with the completion of DA Form 3265-R. Any subsequent operations, involving rendered safe UXO, must be accomplished using Standard Operating Procedures prepared in accordance with references (b) and (e).

4. In accordance with references (f) and (g), all ordnance personnel (including EOD personnel when involved in non-EOD related functions) must be qualified and certified to those tasks.

5. It is Navy policy to comply with federal, state and local environmental regulations for shipment of rendered safe UXO. Emergency EOD operations are exempt from these requirements.

6. Routine UXO transportation requirements include the following:

a. UXO must be stored as unserviceable ammunition and must be examined by EOD qualified personnel before routine transportation from a storage site. The EOD unit must attempt to identify the ordnance and must affirm in writing that the material is safe for transport.

b. All UXO that lack approved hazard classifications or cannot be identified must be transported as Hazard Division 1.1 in accordance with Section 173.56(e) of reference (h).

c. Reference (i) provides technical guidance for truck loading. The local storage activity must support the EOD unit by determining the appropriate packaging, blocking and bracing, marking and labeling, and any special handling requirements for routine shipment of rendered safe UXO over public transportation routes. These procedures will include the amount and compatibility group of the material to be shipped per vehicle. Documentation to this effect and DD Form 836 will accompany each shipment.

Subj: TEMPORARY MAGAZINE SITING AT FORMER NAVAL AIR STATION, ALAMEDA, CA

d. Routine transportation of UXO must be accompanied by EPA Form 8700-22 or 8700-22A, as applicable, prepared in accordance with paragraph 262.20 of reference (j).

e. These requirements do not apply to the emergency response mission of EOD units, or to the handling of nuclear, biological or toxic chemical agents, which are never routine operations.

7. Naval Ordnance Center point of contact is Mr. Edward Klinghoffer, P.E. (N7112), at DSN 354-6081 or commercial 301-743-6081.

Richard T Adams
RICHARD T. ADAMS
By direction

Copy to:
NAVORDCEN ESSOPAC (N712P)
ENGFLDACT West (Code 703)

DEPARTMENT OF THE NAVY
SUPERVISOR OF SHIPBUILDING, CONVERSION AND REPAIR, PORTSMOUTH, VIRGINIA
SSPORTS ENVIRONMENTAL DETACHMENT VALLEJO
PO BOX 2135
VALLEJO, CALIFORNIA 94592-0135

IN REPLY REFER TO:
5090
Ser 120/198
23 Oct 98

From: Supervisor of Shipbuilding, Conversion, and Repair, USN, Portsmouth, VA
Director, SSPORTS Environmental Detachment, Vallejo, CA
To: Commanding Officer, Naval Ordnance Center (N7112)

Subj: REQUEST FOR TEMPORARY MAGAZINE SITING AT FORMER NAVAL AIR STATION, ALAMEDA, CA

Ref: (a) NAVSEA OP-5, Volume 1
(b) Phonecon between NOC N7112 (Mr. E. Klinghoffer) and SSPORTS Env Det (Mr. L. Maggini, Code 120UXO) of 14 Oct 98

1. A number of fired 20mm projectiles were recently discovered while conducting a survey for radium contamination in a landfill area of the former Naval Air Station, Alameda, CA. At least one of the recovered items was confirmed to be a live high explosive projectile.

2. SSPORTS Environmental Detachment, Vallejo, CA, plans to accomplish an ordnance clearance of the landfill area to support the safe completion of the radiological survey and removal operation. The use of an on-site magazine is necessary to safely store recovered hazardous ordnance material pending disposal. Magazine M354 is located near the landfill and was previously sited for the storage of Class 1 Division 1 material prior to base closure.

3. Request concurrence to use Magazine M354 for the temporary storage of recovered UXO material in accordance with the requirements of Section 12.2.2.1 of reference (a). This letter confirms reference (b). SSPORTS Environmental Detachment, Vallejo, CA, point of contract is Mr. John Randell, Code 120UXO, at 707 562-3308.

R. K. PIEPER
By direction

#49

ATTACHMENT 3

SITE APPROVAL REQUEST

REQUEST FOR PROJECT SITE APPROVAL/EXPLOSIVES SAFETY CERTIFICATION NAVFAC 11010/31 (REV. 5-2001)
PART I
INSTRUCTIONS IN NAVFACINST 11010.45

SECTION A – INSTALLATION SUBMISSION

1. To: Naval Ordnance Safety and Security Activity (N54)	2. From: Naval Facility Engineering Command, Southwest

3. Program Year: 2007	4. Cost ($000): 5,000	5. Type Funding: ER,N-MRP	6. Activity UIC: None	7. Date: 08 Dec 06

8. Category Code and Project Title: N/A	9. Project Number: N/A

10. Type of Project:
- [ ] New Construction
- [ ] Change Use
- [ ] Addition to Existing Facility
- [ ] Major Modification to Existing Facility
- [ ] Relocation of Structure
- [ ] Maintenance and/or Repairs
- [ ] Repair by Replacement
- [ ] Demolition
- [X] Other

11. Type of Request:
- [ ] Airfield Safety Site Approval
- [X] Explosives Site/Safety Certification
- [ ] EMR Site Approval
- [ ] Resubmittal or Standard Site Approval (No Safety Criteria Involved)

12. Project Description:
The project is a Time Critical Removal Action (TCRA) to mitigate the potential risk posed by munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) and radioactive contamination at IR Site 1on the former Naval Air Station Alameda, Alameda Point, California. The project is requesting the siting of: Magazine M354 (MPPEH storage), Magazine M353 (MPPEH processing), manual and mechanized MEC/MPPEH removal within IR Site 1, a screening plant, a lay-down pad and a collection point. This request for project site approval is submitted as an attachment to the Explosives Safety Submission (ESS) that was written for the project. One of two Bay area EOD detachments will be called if MEC is encountered so no live ordnance is anticipated, but 3X MPPEH (not processed) must be considered to contain explosives and must be handled, processed, and stored accordingly.

13. 2 Set of Project Maps Attached	14. 2 Sets Part II Division(s) A Attached

SECTION B – EFD REVIEW

1. Name/Code/Phone No. of Reviewer/E-Mail Address:	2. Date Received:

3. Evaluation:

4. Safety Review Requested: (check appropriate box(es))
- [ ] NOSSA
- [X] DDESB
- [ ] SPAWAR
- [ ] NAVAIR
- [ ] CNO
- [ ] OTHER

5. Date Forwarded:

6. Date of Safety Certification: ______ NOSSA ______ DDESB ______ SPAWAR ______ NAVAIR ______ CNO ______ OTHER

SECTION C – FINAL APPROVAL ACTION

1. Approvals:
- [ ] Site Approval
- [ ] Site Disapproval
- [ ] Deffered/Returned
- [ ] Explosive Safety Certification Approved
- [ ] Explosive Safety Certification DISAPPROVAL
- [ ] Interim Construction Wavier Approval

2. Certification Identification:

3. Remarks:

4. Other Approvals Required
- [ ] Airfield Safety Waiver Required
- [ ] Final Explosive Safety Review Required

5. Approving Official:

6. Date:

REQUEST FOR PROJECT SITE APPROVAL/EXPLOSIVES SAFETY CERTIFICATION NAVFAC 11010/31 (REV. 5-2001)

PART II DIVISION A – EXPLOSIVES SAFETY

INSTRUCTIONS IN NAVFACINST 11010.45

1. NEW/Class/Division/ESQD arcs of Project:

Refer to Chapter 7 of Final Explosives Safety Submission (ESS)

2. CNO Waivers and Exemptions:

N/A

3. Personnel: (numbers)

Four contractor personnel will be exposed during storage of MPPEH

Four contractor personnel will be exposed during MPPEH processing and demilitarization

	Proposed	Existing
Military:		
Civilian:	4	
Other:		
Total:	4	

4. Facility Number/Type | Personnel | NEW | Class/Division | Distance* Actual/Required

See Chapter 7 of ESS

5. Siting Rationale:

The DoD requires site approval to remediate sites known or suspected to contain MEC/MPPEH.

See additional sheet for continuation.

*Distance from project. Specify IB, (Inhabited Building); IL, (Intraline); IM, (Intermagazine); PTR, (Public Transportation Route); B (Barricade); UB (Unbarricade)

6. Signature of Public Works/Base Civil Engineer (Name/Code) Incl. E-Mail Address

N/A

9. Signature of Explosive Safety Officer/Installation Safety Officer Incl. E-Mail Address

7. Telephone

( )

DSN

8. Date:

10. Telephone

(650) 450-1969

11. Date:

March 1, 2007

ATTACHMENT 4

FRAGMENTATION DATA REVIEW FORMS

FRAGMENTATION DATA REVIEW FORM

Category:	HE Rounds	DODIC:	A890
Munition:	20 mm M56A4	Date Record Created:	7/30/2004
		Last Date Record Updated:	11/9/2006
Primary Database Category:	projectile	Individual Last Updated Record:	Crull
Secondary Database Category:	20 mm	Date Record Retired:	
Tertiary Database Category:	H761 (RDX)		

Munition Information and Fragmentation Characteristics

Explosive Type:	H-761 (RDX)
Explosive Weight (lb):	0.02640
Diameter (in):	0.7874
Max Fragment Weight (lb):	0.002681
Critical Fragment Velocity (fps):	4941

Theoretical Calculated Fragment Range

Range to No More Than 1 Hazardous Fragment/600 Square FeetA (ft):	200
Vertical Range of Maximum Weight Fragment (ft):	447
Horizontal Range of Maximum Weight Fragment (ft):	558

Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	13
Inhabited Building Distance (09 psi), K50 Distance:	16
Intentional MSD (0065 psi), K328 Distance:	107

Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	1.09
Mild Steel:	0.21
Hard Steel:	0.17
Aluminum:	0.47
LEXAN:	2.16
Plexi-glass:	1.13
Bullet Resist Glass:	0.83

Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.002681
Critical Fragment Velocity (fps)SB:	4941
Kinetic Energy 106 (lb-ft2/s2)SB:	0.0327
Required Wall Roof Sandbag Thickness (in)SB:	12
Expected Maximum Sandbag Throw Distance (ft)SB:	25
Minimum Separation Distance (ft)SB:	200

Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:	0.002681
Critical Fragment Velocity (fps)W:	4941
Kinetic Energy 106 (lb-ft2/s2)W:	0.0327
Water Containment System:	5 gal carboys/ inflatable pool
Minimum Separation Distance (ft)W:	200/200

Print This Form

Close Form

FRAGMENTATION DATA REVIEW FORM

- Category: Grenades & Mines
- Munition: 40 mm M406 (grenade)
- Primary Database Category: projectile
- Secondary Database Category: 40 mm
- Tertiary Database Category: Comp B
- DODIC: B568
- Date Record Created: 7/30/2004
- Last Date Record Updated: 7/30/2004
- Individual Last Updated Record: Crull
- Date Record Retired:

Munition Information and Fragmentation Characteristics

- Explosive Type: Comp B
- Explosive Weight (lb): 0.07050
- Diameter (in): 1.5000
- Max Fragment Weight (lb): 0.000364
- Critical Fragment Velocity (fps): 4508

Theoretical Calculated Fragment Range

- Range to No More Than 1 Hazardous Fragment/600 Square FeetA (ft): NA
- Vertical Range of Maximum Weight Fragment (ft): 242
- Horizontal Range of Maximum Weight Fragment (ft): 345

Overpressure Distances

- Inhabited Building Distance (12 psf), K40 Distance: 19
- Inhabited Building Distance (09 psi), K50 Distance: 23
- Intentional MSD (0065 psi), K328 Distance: 153

Minimum Thickness to Prevent Perforation

- 4000 psi Concrete (Prevent Spall): 0.79
- Mild Steel: 0.15
- Hard Steel: 0.12
- Aluminum: 0.35
- LEXAN: 1.80
- Plexi-glass: 0.88
- Bullet Resist Glass: 0.62

Required Sandbag Thickness

- Max Fragment Weight (lb)SB: 0.000364
- Critical Fragment Velocity (fps)SB: 4508
- Kinetic Energy 106 (lb-ft2/s2)SB: 0.0037
- Required Wall Roof Sandbag Thickness (in)SB: 12
- Expected Maximum Sandbag Throw Distance (ft)SB: 25
- Minimum Separation Distance (ft)SB: 200

Water Containment System and Minimum Separation Distance:

- Max Fragment Weight (lb)W: 0.000364
- Critical Fragment Velocity (fps)W: 4508
- Kinetic Energy 106 (lb-ft2/s2)W: 0.0037
- Water Containment System: 5 gal carboys/ inflatable pool
- Minimum Separation Distance (ft)W: 200/200

Print This Form   Close Form

APPENDIX G

TRANSPORTATION AND DISPOSAL PLAN

Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

Contract No. N62473-06-D-2201
CTO No. 0015

APPENDIX G

FINAL

TRANSPORTATION AND DISPOSAL PLAN

March 2, 2007

INSTALLATION RESTORATION SITES 1, 2, AND 32
FORMER NAVAL AIR STATION ALAMEDA
ALAMEDA POINT, ALAMEDA, CALIFORNIA

DCN: ECSD-RACIV-07-0748

TETRA TECH EC, INC.
1230 Columbia Street, Suite 750
San Diego, CA 92101-8536

Vincent Richards, P.G.

Abram S. Eloskof, M.Eng., M.Sc., CIH
Project Manager

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ATTACHMENTS

ABBREVIATIONS AND ACRONYMS

Caltrans	California Department of Transportation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWM	Chemical Waste Management
DON	Department of Navy
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
IR	Installation Restoration
LDR	land disposal restriction
MPPEH	material potentially presenting an explosive hazard
NAS	Naval Air Station
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer in Charge of Construction
TCRA	time-critical removal action
TtEC	Tetra Tech EC, Inc.
UHC	underlying hazardous constituent

1.0 INTRODUCTION

This Transportation and Disposal Plan addresses project-specific information for vehicular traffic control related to the loading and off-site transportation and disposal of waste materials. Wastes to be disposed off site include contaminated soil, debris, decontamination water, and used personal protective equipment (PPE), generated during the time-critical removal action (TCRA) at Installation Restoration (IR) Sites 1, 2, and 32, located within Alameda Point, Alameda, California. This plan presents environmental mitigation procedures for potentially hazardous soils and non-hazardous soils that will be transported from the site, emergency response procedures, transporter licensing and certification requirements, health and safety compliance, and base regulations. In addition, the locations of major points of ingress and egress at the site and major on-site and off-site roads that will be used by project personnel vehicles and for material transportation from the site will be addressed.

Radioactively impacted material generated during the field activities will be stored on site pending packaging, disposal and transportation by an Army contractor in compliance with the Department of the Navy (DON) Low-Level Radioactive Waste Disposal Program and therefore is not included as a waste stream addressed by this plan.

1.1 SITE DESCRIPTION

Alameda Point is located on the western end of Alameda Island, which lies on the eastern side of San Francisco Bay, adjacent to the city of Oakland. Alameda Point is rectangular in shape, approximately 2 miles long east-to-west, 1 mile wide north-to-south, and was occupied by the 1,734-acre former Naval Air Station (NAS) Alameda until its closure in 1997. IR Sites 1 and 32 are located at the northwestern corner, while IR Site 2 is located at the southwest corner of Alameda Point, Alameda, California.

IR Site 1

IR Site 1 encompasses approximately 78 acres and is bordered on the west by the San Francisco Bay and on the north by the Oakland Inner Harbor. IR Site 2, which consists of a former disposal area and wetlands, and Runway 7 are located to the south. IR Site 32, the remaining section of Runway 13 and a former sewage pump station are located east of the site.

IR Site 1 is relatively flat with slight depressions that sometimes flood during the winter rains. Shoreline slopes exist on the northern and western boundary and are currently stabilized by large boulders (riprap). The site was previously used as a waste disposal site and consisted of several disposal areas. A portion of Runway 13 runs northwest-southeast through the site. There are a few uninhabited buildings and building foundations, a former picnic area, and a basketball court located in the southern portion of the site. The former small arms range is located near the center of the western border. An earthen berm (dike) 10 to 15 feet high is located adjacent to the shoreline near the former small arms range area. There are several paved roads that run through the site. Public access to IR Site 1 is currently restricted and a chain-link fence west of Runway 13 restricts access to the main portion of the site.

IR Site 2

IR Site 2 encompasses approximately 110 acres and is bordered by the San Francisco Bay to the south and west. The disposal area at IR Site 2 covers approximately 77 acres in the most southwestern portion of Alameda Point. A wetland covers approximately 33 acres and the wetland is bounded by the disposal area within IR Site 2 to the north and east and by the coastal margin adjacent to San Francisco Bay on the south and west. The wetland contains two perennial ponds. The northern pond is connected to the bay by a culvert. The southern pond was created by removal of dredged materials for use as landfill cover. Fresh water has since filled the excavation area and created the pond.

The thin strip of land between the disposal area or wetland and the bay is referred to as the coastal margin. It acts as a buffer for the disposal area and the wetland and is composed of the perimeter dike and riprap seawall. Subsurface materials in the coastal margin differ from those in the disposal area and wetland. The interior margin lies outside the disposal area and wetland to the north and east. It also contains part of the perimeter dike and includes all areas outside the dike to the north and east. An earthen berm was constructed around the perimeter of IR Site 2 after landfill operations ceased in 1978.

IR Site 32

IR Site 32 is approximately 5.8 acres in size and includes three environmental baseline survey subparcels (Subparcels 8A, 5E, and a portion of 5D). The site was previously referred to as the Northwestern Ordnance Storage Area. Recently, the DON expanded the boundaries of IR Site 32 north to the Oakland Inner Harbor by annexing the northern portion of Subparcel 5G.

Most of IR Site 32 is open space covered with asphalt, gravel, weeds and brush. Structures on the site include two buildings: Building 594, the Physical Section Reaction Force Facility, and Building 82, a guard shack.

2.0 SCOPE OF WORK

The selected subcontractor will be awarded a contract for loading the solid waste generated from the TCRA for IR Sites 1, 2, and 32, hauling this waste to the appropriate disposal facilities, and importing clean materials. This Transportation and Disposal Plan specifically addresses regulatory requirements for the transportation and disposal of contaminated soil, debris, used PPE, and other wastes associated with the TCRA for IR Sites 1, 2, and 32 to the appropriate disposal facilities and for the import of clean fill.

If it is determined that Department of Transportation (DOT) hazardous materials will be handled during site remediation activities, based on the previous results of waste characterization analysis, Tetra Tech EC, Inc. (TtEC), as well as the subcontracted transporter, will be required to maintain an approved DOT Security Plan that includes in-route security during the transportation of the hazardous waste. TtEC will be responsible for soil excavation, stockpiling, screening, on-site management, waste characterization, and profiling.

The scope of work for this project will include: 1) removal and segregation of material potentially presenting an explosive hazard (MPPEH), (2) removal of previously identified discrete low-level radiation sources, (3) soil sampling, (4) off-site transportation and disposal of Resource Conservation and Recovery Act (RCRA) and non-RCRA waste. TtEC will store demilitarized MPPEH and low-level waste in appropriate containers and at on-site facilities designated by the DON. The DON is responsible for the transportation and disposal of the demilitarized MPPEH and point sources.

TtEC will be responsible for the temporary stockpiling of the excavated soils (pre-screened for MPPEH and radiological anomalies) on site in a dedicated stockpile area, which will be constructed in accordance with the TCRA Work Plan. The material/soil from each excavation will be stockpiled separately. The soil will then be processed using a Trommel-type screen plant. Once the soil is determined to be free of radiological anomalies and MPPEH, it will be placed into another stockpile. Waste characterization sampling of the processed stockpiles will then be performed. Based on the characterization results, the soil will be segregated into non-RCRA hazardous and non-hazardous stockpiles and placed on a lined stockpile area.

Waste profiles will be prepared by the selected subcontractor for the excavated and stockpiled soils. Multiple profiles may be needed, depending on the waste classification (for instance, RCRA-regulated wastes [RCRA hazardous] and/or non-RCRA hazardous and non-hazardous). The waste classification could potentially require the use of several different disposal facilities. Chemical Waste Management (CWM) in Kettleman City, California, and U.S. Ecology in Beatty, Nevada, are authorized to accept RCRA and non-RCRA waste. If the waste is determined to be RCRA-regulated hazardous waste, then the nature of the underlying hazardous constituents (UHCs) may define the disposal facility to be used. For example, CWM cannot treat pesticide UHCs; however, U.S. Ecology can. Waste materials designated as non-hazardous may be hauled to the Altamont or Forward landfills located in the cities of Livermore and Stockton respectively, in California. An estimated 5,500 cubic yards of contaminated soil will require loading and hauling to the appropriate landfills. Clean import materials will be hauled to the main staging area and transported to the appropriate areas at each of the IR sites. Work is anticipated to commence in December 2006 and continue through June 2007.

Adherence to Occupational Safety and Health Administration (OSHA) excavation regulations and permit requirements will be followed at all times. Workers, operators, and drivers will be expected to adhere to site health and safety requirements, as well as to the Site-specific Health and Safety Plan to be prepared upon the DON's award of the contract. PPE, including (at a minimum) hard hats, steel-toed boots, safety glasses, and high-visibility vests with reflective stripes, would be required during transportation and disposal activities.

2.1 SUBCONTRACTOR REQUIREMENTS

The prequalified transportation subcontractor would supply all labor, equipment, and materials necessary to transport all wastes and import materials. TtEC would be required to provide the appropriate means for loading the wastes into the transportation vehicle. Care shall be taken to prevent spillage or leaks during the transfer operation. TtEC and the subcontractor will ensure that sufficient spill equipment is on hand during the transfer process.

The subcontractor shall provide the 24-hour emergency contact number during transportation. TtEC may employ one or more transportation subcontractors, provided that they are approved by the DON, in advance. All drivers must be employees of said subcontractors to ensure hazardous material security. Transportation subcontractors must be approved by the DON, and the DON must be informed that they are being used in advance.

The subcontractor shall have all appropriate licenses, medical certifications, permits, and registrations (including, but not limited to, a Department of Toxic Substances Control [DTSC] hazardous waste transporter registration and a U.S. Environmental Protection Agency [EPA] identification number) for hauling the waste.

The subcontractor shall have a written DOT Hazardous Material Security Plan in effect, and all subcontractor personnel will have been trained as to its requirements. This is in addition to the DOT Hazardous Material Security Plan that TtEC may prepare if it is determined that DOT Hazardous Materials will be shipped.

The subcontractor must provide an on-site truck scale throughout the duration of this project. The truck scale will be located within the vicinity of the temporary waste stockpile and decontamination area. The scale will be used to ensure that DOT weight restrictions are not exceeded and to provide accurate weights for the waste manifests. The scale is to be used by all trucks leaving the site with waste. It will be the dual responsibility of TtEC and its transportation subcontractor(s) to document truck weights prior to trucks exiting Alameda Point.

Drivers will be required to sign a certification (Attachment 1) acknowledging their understanding of certain policies and procedures concerning site logistics and acknowledging that they meet the appropriate qualifications for the transportation of the waste stream.

3.0 TRANSPORTATION/CIRCULATION

This section provides guidelines and addresses measures for vehicular traffic control during the loading and transportation of stockpiled waste materials and importation of materials to and from the IR Site 1, 2, and 32 areas. Included is a discussion of the locations of major ingress and egress at Alameda Point, the effects of construction activities on existing traffic routes, and major on-site and off-site roads that are to be used for waste transporters. This section also discusses major roadways within and outside the vicinity of Alameda Point, circulation patterns, and volume/numbers of various vehicles that are expected during specific project activities.

3.1 ANALYSIS OF POTENTIAL IMPACTS

Traffic associated with waste hauling activities, such as truck queuing, staging, loading, and leaving the site during implementation of the TCRA, will require coordination around other construction-related traffic consisting of trucks delivering equipment and materials, large equipment mobilization, and personnel and support vehicles. The subcontractor will plan and schedule waste and import hauling activities with TtEC and the DON in advance to minimize impacts on traffic in the area. The project team will coordinate all construction activities that may generate traffic with the Resident Officer in Charge of Construction (ROICC) in order to avoid conflicts with other activities being performed concurrently at Alameda Point. A schedule of proposed truck traffic locations and times will be reviewed with the ROICC during weekly quality control meetings, which are typically held in TtEC's trailer.

During the approximately 6-month construction fieldwork period, the site will generate an average of 24 one-way passenger vehicle trips carrying project work force to and from the site each day. Approximately 375 one-way commercial truck trips will be required during the entire project. This number includes mobilization and demobilization of heavy equipment (16 loads), transportation and delivery of soil fill material to the site (20 loads), off-site transportation of contaminated soil (332 loads), off-site transportation of non-hazardous liquids (2 loads), and off site transportation of non-hazardous debris (5 loads).

3.2 TRAFFIC HAUL ROUTE

To reach the site from Interstate 880, vehicles will exit the freeway at Broadway and follow signage directing them to Alameda via the Webster Tube and continue south on Webster Street (CA 260) to Atlantic. Turn right on Atlantic and turn right on Main Street. Vehicles will follow Main Street around and turn left on Navy Way. Vehicles will enter into the Alameda Point facility at the former main gate entrance on Navy Way. Vehicles will veer to the right and turn right on West Red Line Avenue. Vehicles will proceed past the baseball field (on right) and turn right at the access road between the baseball field and gym building. The vehicles will proceed through the gate (baseball field gate), veer left, and proceed west on the former runway where it ends at the work site. If a problem exists at the Webster Tube, the Site Superintendent will inform the DON and use an alternate traffic route, which will require vehicles to proceed from Interstate 880 to the 29th Street exit. Vehicles will head south over the 29th /Park Street Bridge, continue south to Encinal Avenue (CA 61) and turn right (west). Vehicles will continue west on Encinal Avenue (CA 61) as it becomes Central Avenue (CA 61) until they reach Webster Street (CA 260). Vehicles will turn right on Webster Street (CA 260), turn left on Atlantic, turn right on Main Street and then follow the above directions. The trucks will exit the site using the same route (note: the north bound tunnel traffic is via the Posey Tube). Once on Interstate 880, the truck route will depend on the final destination of the waste or product. All weight-restricted highways and city streets will be avoided. Figure G.3-1 illustrates the proposed traffic routes for the project.

Based on data available from the city of Alameda Department of Public Works, Webster Street (a four-lane street, two lanes each way) is designed to handle 1,600 vehicles per lane per hour. Current use of Webster Street is 30,000 total vehicles per day or 625 vehicles per hour per lane.

An average of 27 vehicles per day over the life of the project will be associated with the TCRA activities at the facility. Based on the city of Alameda's traffic data, it is estimated that the project will not negatively impact the existing traffic conditions in the area.

In addition, the schedules for the delivery and transportation of fill and site equipment, as well as off-site transportation of contaminated soils to landfills, will be planned to minimize interference with the normal traffic pattern in the area. The majority of the trucks will have capacities greater than 20 tons. The project will require permitted, oversized vehicles for the transportation of heavy and extra-wide construction equipment.

Due to the limited duration of construction activities (6 months), the impact to transportation or traffic patterns is expected to be insignificant. Heavy construction equipment such as front-end loaders, excavators, backhoes, and other support vehicles will remain at the site for the duration of the field activities after initial mobilization. This equipment will remain on site as long as needed. Vehicles used for commuting workers will be parked in designated areas within the support zone of the lay down area.

3.3 TRAFFIC SAFETY MEASURES

In order to expedite the passage of traffic through the Alameda Point facility and to the work area, TtEC will install and maintain the necessary signs, lights, temporary railings, barricades, and other equipment for the sole convenience and direction of tenant traffic, as well as to prevent potentially hazardous conditions. If necessary, TtEC will furnish competent flagmen whose sole duties will be to direct the movement of construction traffic through the former base area towards the work area and to give adequate warning to nearby personnel and tenants of any dangerous conditions to be encountered.

Convenient access to roadways will be maintained during construction activities. Water and dust abatement measures will be applied as necessary to the on-site roads used by construction vehicles for alleviation or prevention of dust nuisance.

No material or equipment will be stored where it may interfere with the free and safe passage of tenants. In addition, TtEC will adhere to all city of Alameda speed limit requirements.

3.4 TRAFFIC CONTROLS

Traffic controls will be used to provide for the efficient completion of work activities in a safe working environment while minimizing the disruption of normal traffic flow. Traffic controls will be required during removal activities in the excavation and stockpile areas to allow for equipment operation and truck loading for off-site transportation. Traffic controls may include, but will not be limited to, the following:

- Traffic flow will be maintained at all times during construction activities on through roads.
- End dumps and other transportation trucks removing waste/debris from IR Sites 1, 2, and 32 will be scheduled to avoid queuing along major streets. Close coordination between the TtEC Site Superintendent and the transporter dispatcher will be maintained at all times during loading and unloading activities.
- A sufficient area for parking will be provided for passenger vehicles in the support area and all haul trucks in the exclusion zone.
- Cones, flags, signs, and other traffic control measures will be used, as needed, to facilitate loading and unloading.
- A full time flagman will be stationed at the baseball field gate to ensure no unauthorized access to the work site is permitted. The gate will be locked when work activities are either stopped or concentrated at the remediation sites and continuous ingress and egress to the work sites are not required.

In order to prevent congestion of site access roads during loading and hauling operations, all trucks will be queued along the runway area north of the baseball field gate. During non-construction periods, non-applicable signs will be covered with black plastic or temporarily removed.

Other project-specific measures will be used to minimize the effects of the proposed construction activities. These measures include the following:

- Clear access points for trucks will be maintained at the project entrance to allow for efficient movement of construction-related traffic and expedite the entry and exit of construction vehicles in and out of the site.

- An adequate turning radius will be provided in all areas, including loading areas near the stockpiles.
- Sufficient area will be provided for parking all vehicles on site during construction, including space for haul trucks.
- Close coordination will be maintained between the DON and all other facility contractors to ensure safety and to minimize disturbance of other activities within Alameda Point.

All traffic control activities shall conform to the applicable specifications of the *State of California Manual of Traffic Controls for Construction and Maintenance Work Zones* (California Department of Transportation [CalTrans], 1996) and will be approved by the DON.

3.5 WASTE TRANSPORTATION AND DISPOSAL

This section describes the disposal methods for the hazardous and non-hazardous waste materials generated at IR Sites 1, 2, and 32.

3.5.1 Waste Transportation

Based on waste characterization conducted and waste profiles developed by TtEC and approved by the disposal facilities, RCRA hazardous, non-RCRA hazardous and non-hazardous waste soils will be transported by a pre-approved and pre-qualified transporter. The transporter will have all appropriate licenses and registrations, including but not limited, to a DTSC Hazardous Waste Transporter Registration and an EPA identification number. In addition, drivers will be licensed and will possess a current bi-annual medical certification.

Material that does not exhibit one of the nine DOT hazard classes (for example, explosive, flammable, poison, combustible, and so forth) is not regulated under DOT rules for the transportation of hazardous material. The TtEC Compliance Officer or the DOT Coordinator will confirm this description prior to shipment.

In the event that hazardous material shipping is required, the applicable DOT shipping description, EPA hazardous waste number, and the California waste code will be selected based on the results of the waste characterization.

In the event that DOT hazardous materials are encountered, the waste will be properly classified, described, packaged, marked, and labeled for shipment, as required by applicable sections of Title 49 Code of Federal Regulations (CFR), Parts 171, 172, 173, 178, and 179, and Title 22 California Code of Regulations, Sections 66262.10 through 66262.45. Properly DOT-trained personnel will perform DOT functions. For waste shipped interstate, the transporter will also require a DOT registration number.

Marking and Labeling – The shipping name, hazard class, identification number, technical names, EPA waste code numbers, and consignee/consignor designations must be marked on non-bulk containers for shipment in accordance with Title 49 CFR, Part 172. Bulk containers are not required to list the DOT description. Examples of marks required on both bulk and non-bulk containers include polychlorinated biphenyl (PCB) marks, if applicable. PCB marks are required to be posted on two opposing sides of each bulk container. The subcontractor will mark all containers, as required, after consultation with the DON Compliance Officer or DOT Coordinator.

Placarding – Vehicles will be appropriately placarded in accordance with Title 49 CFR, Part 172.

Manifest Requirements – Hazardous and non-hazardous wastes will be shipped off site using the appropriate hazardous or non-hazardous waste manifests. Manifests will be completed by the subcontractor for approval and signature by the DON before the waste leaves the site. TtEC will not sign any copies of manifests for the DON. Copies of all manifests will be retained in the project files and original copies will be sent with the transporter.

The manifest must accompany the waste at all times. When waste is transferred from the custody of the transporter to the designated disposal facility, the new party must sign the manifest and take custody of the waste in accordance with all RCRA, California, and DOT requirements.

Each manifest will list only the transporter(s) and designated disposal/recycling facility that have been prequalified and authorized by the DON. No changes, including additions or subtractions, may be made to the transporter(s) or disposal facility on the manifest without direct authorization from the DON in advance of the change. TtEC must immediately contact the DON regarding any proposed change to the manifest prior to the change occurring.

TtEC must immediately notify the DON Remedial Project Manager and the ROICC if any discrepancies in a waste shipment are discovered. The transporting subcontractor must attempt to resolve any discrepancies causing rejection of waste with the disposal facilities.

The subcontractor must permit the DON reasonable time to respond prior to rejection of waste. Under no circumstances will the transporter leave the waste or turn over custody of the waste to anyone without prior direction and approval from the DON.

TtEC will ensure that a copy of each manifest is returned to the DON Remedial Project Manager within 30 days of receipt of the waste at the designated disposal facility. In addition, Certificates of Treatment/Disposal will be obtained within 30 days from receipt of wastes.

Land Disposal Restriction Certification – Land disposal restriction (LDR) certification will be prepared and will accompany the manifest if applicable. Copies of all LDR certifications will be retained in the project files with the signed manifest received from the disposal facility.

3.5.2 Off-site Disposal

All wastes intended for off-site disposal will be processed according to the final waste classification and approved profile from the intended disposal facility, as coordinated by the ROICC. Disposal may be a combination of options determined by the hazardous classifications as follows:

- Soil, PPE, debris, and decontamination water intended for off-site disposal that is classified as a RCRA hazardous, and/or non-RCRA (California) hazardous waste will be transported to a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Off-site Rule-approved hazardous waste facility for treatment and/or disposal.
- Soil, PPE, debris, and decontamination liquids intended for off-site disposal that is classified as non-hazardous waste will be transported to a CERCLA Off-site Rule-approved waste facility.

Bulk waste intended for off-site disposal will be loaded onto trucks for transportation to the appropriate off-site disposal facilities. Loaded trucks will be weighed with an on-site truck scale or trailer, belonging to the subcontractor, to ensure compliance with DOT regulations. The truck scale will be located in the vicinity of the project's staging area. The trucks will be covered with tarps prior to leaving the site. Appropriate placards will be placed on each transport vehicle, as necessary. In addition, a hazardous waste manifest or non-hazardous waste manifest, as appropriate, will be filled out for each load of bulk and non-bulk waste and submitted to the DON to sign as generator. Original copies of the manifest will be provided to the transporter for shipment.

Waste will be disposed only at an appropriate waste disposal facility approved by the DON permitted for the disposal of the particular type of waste generated. The facilities listed in Table G.3-1 may be considered for waste disposal from this project.

Traffic routes from Alameda Point to CWM Kettleman Hills and Altamont are as follows:

To CWM Kettleman Hills:

- I-880 south to
- Highway 237 west to
- Highway 101 south to
- Highway 152 east to
- I-5 south to Kettleman City

To Altamont:

- I-880 south to
- SR162 east to
- I-680 north to
- SR 84 east to
- I-580 east to Altamont located in Livermore

3.6 WASTE MINIMIZATION

The following waste minimization techniques will be observed during field activities to reduce the volume of waste generated:

- Do not contaminate materials unnecessarily.
- Do not place media of different hazard classification together.
- Use drop cloths or other absorbent material to contain small spills or leaks.
- Use volume reduction techniques when practical.
- Verify that waste containers are solidly packed to minimize the number of containers.

4.0 RELEASE PREVENTION, RESPONSE, AND REPORTING

4.1 SPILL PREVENTION

The primary activities that may result in a spill include vehicle fueling and management of decontamination waste. Spill prevention practices for these activities are as follows:

- **Fueling** – Vehicles will be fueled and serviced prior to moving onto the site. On-site fueling of equipment will be conducted within a designated and controlled area. No bulk quantities of fuel will be stored on site.
- **Wastewater** – Wastewater will be stored in temporary retention basins and aboveground tanks within a secondary containment area. Therefore, any spills from the tanks will be contained and will not be released to the surrounding areas.
- **Material Transfer** – Waste transfer operations will only be conducted in areas pre-designated for these activities. Spill equipment will be available.
- **Waste Hauling** – Waste will be properly containerized for transport. Soil will be placed in roll-off bins or in end-dump trucks and covered securely prior to transport. PPE will be containerized in drums or will be placed in roll-off bins and covered securely prior to transport. Debris will be placed in end-dump trucks and covered securely prior to transport.

4.2 SPILL RESPONSE

In the event of an on-site release of hazardous materials into the environment, TtEC and the subcontractor will contain or control the release or evacuate the area if the spill is significant or represents an immediate health threat. Absorbent pads, shovels, and 55-gallon drums will be kept on site to address the possibility of spills.

In the event of a release or spill of hazardous materials or waste during transport, TtEC will be responsible for arranging emergency response. A 24-hour emergency response organization or company shall be contracted by TtEC in advance and will be prepared to respond to incidents that may occur during transport of site wastes.

4.3 SPILL/RELEASE REPORTING

The steps below outline the chain of communications that will be followed if a significant spill of any hazardous substance occurs on-site or during transport.

1. Site personnel involved in the spill will immediately contact the DON Spill/Release On-site Coordinator. At least one of the following DON individuals will be on site during all remedial activities:

DON Remedial Project Manager:	Mr. Andrew Baughman (619) 532-0903 andrew.baughman@navy.mil
ROICC:	Mr. Gregory Grace (510) 749-5940 gregory.grace@navy.mil
ROICC/Construction Management Technician:	Mr. Robert Perricone (510) 749-5942 robert.perricone@navy.mil

2. If a release of a waste or hazardous substance, regardless of quantity, could threaten human health or the environment outside the facility, the ROICC will verify that the National Response Center [(800) 424-8802] and the local Emergency Response Coordinator (Fire Department, dial 911) have been notified. Additional notifications may apply, depending on the quantity and location of the spill. Releases will be reported, and written follow-up emergency notices will be submitted under the Superfund Amendments Authorization Act, Title II requirements.

4.4 PROJECT AND PERSONNEL REQUIREMENTS

TtEC and subcontractor(s) personnel training requirements and inspection programs applicable to the IR Sites 1, 2, and 32 TCRA are described below.

- All site personnel must have OSHA 40-hour Health and Safety/Emergency Response Hazard Communication and RCRA waste management training.
- Waste hauler drivers must have a current California driver's license and Hazmat Endorsement.
- Site personnel performing DOT functions, such as selecting, packaging, marking, labeling, preparing shipping papers, and loading wastes must be trained in accordance with the requirements of HM-126F. Subcontractor(s) performing DOT functions must supply proof of training.
- Site personnel, specifically those who are responsible for loading or transporting DOT hazardous materials, must have received DOT hazardous material security training.
- All site personnel performing waste management activities will be trained in accordance with Title 40 Code of Federal Regulation, Part 265.16.
- The DON will verify subcontractor(s) training records prior to project activities.

5.0 REFERENCES

California Department of Transportation (Caltrans). 1996. *State of California Manual of Traffic Controls for Construction and Maintenance Work Zones.*

TABLES

TABLE G.3-1

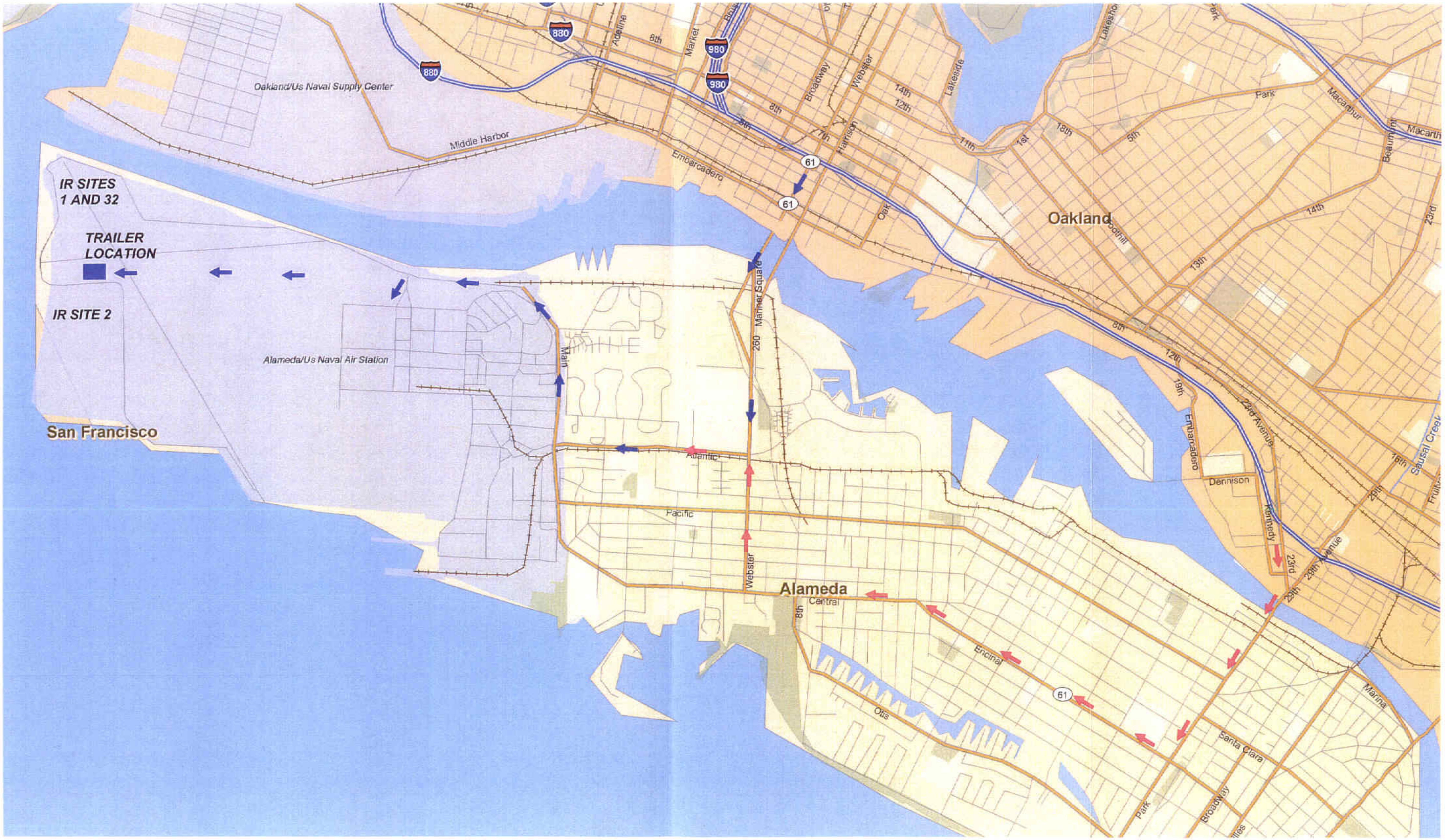
POTENTIAL OFF-SITE DISPOSAL FACILITY OPTIONS

Wastestream	Potential Disposal Facility	Facility Location
Non-RCRA hazardous soil, PPE, and liners	U.S. Ecology Landfill	Beatty, NV
	Chemical Waste Management, Kettleman Hills Landfill	Kettleman City, CA
RCRA hazardous soil, PPE, and liners	Chemical Waste Management, Kettleman Hills Landfill	Kettleman City, CA
Non-contaminated debris, non-hazardous soil, and non-hazardous liquids	Altamont Landfill	Livermore, CA
	Forward Landfill	Stockton, CA

Notes:

PCB – polychlorinated biphenyl
PPE – personal protective equipment
RCRA – Resource Conservation and Recovery Act

FIGURES



LEGEND

TRANSPORTATION ROUTE

ALTERNATE TRANSPORTATION ROUTE

Figure G.3-1

TRANSPORTATION ROUTE

IR SITE 32 AND THE SHORELINES OF IR SITES 1 AND 2
ALAMEDA POINT - ALAMEDA, CA

TETRA TECH EC, INC.

DRAWING NO: 06044281.DWG
DCN: ECSD-RAC-06-0442 CTO: #0015
APPROVED BY: AE
CHECKED BY: JA REV: REVISION 0
DRAWN BY: MD DATE: 01/31/07

P:\3210-RAC IV\CTO-0015\DWG\070232\07023281.DWG
PLOT/UPDATE: JAN 30 2007 16:16:33

ATTACHMENT 1

TRUCKERS' CERTIFICATION

TETRA TECH EC, INC.

TRUCKERS' CERTIFICATION

APPROVAL		
Approved: ☐	**Conditionally Approved:** ☐	**Declined:** ☐

PESM or Designee Signature: ______________ **Date:** ______________

Manager, EHS Services Signature: ______________ **Date:** ______________

Restrictions/Comments: ______________

I. BACKGROUND INFORMATION:

Company Name: ______________

Physical Address: ______________

City/State/Zip: ______________

Business Address: ______________

Contact One:		Parent Company:	
Phone:	( )	EPA ID No (RCRA*):	
Contact Two:		EPA ID No (TSCA)	
Phone:	( )	USDOT ID No (s):	
Fax:	( )	Motor Carrier Safety No(s)/ ICC #:	
Previous Name/Owners of Facility:		** For Transporters, please provide EPA ID No. for each state in which you propose transport in or through or attach list.*	

II. TtEC PROJECT INFORMATION:

TtEC Contact:		Project-Specific waste description/codes:	
Project:			
Project Manager:		Waste contains hazardous substance:	☐ Yes ☐ No
Charge Number:		Project is CERCLA site:	☐ Yes ☐ No

Project Location: ______________

TtEC Subcontract or Solicitation No: ______________

III. ATTACH VENDOR QUALIFICATION AND DATA QUESTIONNAIRE TO THIS APPROVAL

A completed Vendor Qualification and Data Questionnaire, demonstrating facility's/transporter's service capabilities and waste acceptance criteria should be attached to this approval. This information will be entered into the TtEC National TSDF Database.

TETRA TECH EC, INC.

TRUCKERS' CERTIFICATION

IV. HAZARDOUS OR SPECIAL WASTE **Not Applicable:** ☐

EPA Region: __________ Date Contacted: __________

Contact and Title: __________ Most Recent Inspection Date: __________

Phone Number: (   ) __________

Known Releases: __________

Enforcement Status/Comments: __________

State Agency/Department: __________ Date Contacted: __________

Contact and Title: __________ Most Recent Inspection Date: __________

Phone Number: (   ) __________

Known Releases: __________

Enforcement Status/Comments: __________

V. TSCA/PCB WASTES **Not Applicable:** ☐

EPA Region: __________ Date Contacted: __________

Contact and Title: __________ Most Recent Inspection Date: __________

Phone Number: (   ) __________

Known Releases: __________

Enforcement Status/Comments: __________

TRUCKERS' CERTIFICATION

VI. SOLID/NON-HAZARDOUS WASTES **Not Applicable:** ☐

State Agency/Department: ______________________ Date Contacted: ______________

Contact and Title: ______________________ Most Recent Inspection Date: ______________

Phone Number: ( ) ______________________

Known Releases: ______________________

Enforcement Status/Comments: ______________________

VII. STATE/REGIONAL/LOCAL REQUIREMENTS **Not Applicable:** ☐

(Contact Agencies regarding wastewater discharges, air emissions, soil/groundwater contamination, remediation activities and local land use planning approvals, etc.)

Agency/Department: ______________________ Date Contacted: ______________

Contact and Title: ______________________ Most Recent Inspection Date: ______________

Phone Number: ( ) ______________________

Known Releases: ______________________

Enforcement Status/Comments: ______________________

Agency/Department: ______________________ Date Contacted: ______________

Contact and Title: ______________________ Most Recent Inspection Date: ______________

Phone Number: ( ) ______________________

Known Releases: ______________________

Enforcement Status/Comments: ______________________

TETRA TECH EC, INC.

TRUCKERS' CERTIFICATION

VII. STATE/REGIONAL/LOCAL REQUIREMENTS (Continued)

Agency/Department: ______________________ Date Contacted: ____________

Contact and Title: ______________________ Most Recent Inspection Date: ____________

Phone Number: (   ) ______________________

Known Releases: ______________________

Enforcement Status/Comments: ______________________

VIII. TRANSPORTATION **Not Applicable:** ☐

A. USDOT (www.safersys.org)

USDOT: ______________________ Date Contacted: ____________

Contact and Title: ______________________ Most Recent Inspection Date: ____________

Phone Number: (   ) ______________________

Insurance Verified and Up To Date ______________________

DOT Motor Carrier Rating: ______________________

Enforcement Status/Comments: ______________________

B. STATE MOTOR CARRIER

Agency/Department: ______________________ Date Contacted: ____________

Contact and Title: ______________________ Most Recent Inspection Date: ____________

Phone Number: (   ) ______________________

Insurance Verified and Up To Date ______________________

Motor Carrier Rating: ______________________

Enforcement Status/Comments: ______________________

TETRA TECH EC, INC.

TRUCKERS' CERTIFICATION

IX. CERCLA OFF-SITE STATUS – Complete for all facilities		**Not Applicable: ☐ (For transporters only)**	
CERCLA Off-Site Coordinator:		Approved to Accept CERCLA waste?	☐ Yes ☐ No
Phone Number:	( )	Date of CERCLA Approval:	
Date Contacted:			
Comments:			

X. TECHNOLOGY – Complete for all facilities			**Not Applicable: ☐ (For transporters only)**
Is Technology Review Required?	☐ Yes	☐ No	
If Yes, Is Technology Review Completed?	☐ Yes	☐ No	Date Completed:

TETRA TECH EC, INC.

TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N62473-06-D-2201 (RAC IV)

Document Control No. 07-0748

File Code: 5.0

TO: Contracting Officer
Naval Facilities Engineering Command SW
Ms. Beatrice Appling, AQE.BA
Building 127, Room 108
1220 Pacific Highway
San Diego, CA 92132-5190

DATE: 03/06/07
CTO: 0015
LOCATION: Alameda, CA

FROM: [signature]
A. N. Bolt, Program Manager

DESCRIPTION: Final Time-Critical Removal Action Work Plan, March 02, 2007 Installation Restoration Sites 1, 2, and 32 (Went from Draft Final to Final no changes replacing Cover Pages only) Appendix F, Final Explosives Safety Submission, Rev. 1, 07-0327-1, will be sent out separately for official submittal.

TYPE: ☐ Contract/Deliverable ☒ CTO Deliverable ☐ Notification ☐ Other

VERSION: Final (e.g. Draft, Draft Final, Final, etc.)

REVISION #: N/A

ADMIN RECORD: (PM to Identify) Yes ☒ No ☐ Category ☐ Confidential ☐

SCHEDULED DELIVERY DATE: 03/02/07 ACTUAL DELIVERY DATE: 03/06/07

NUMBER OF COPIES SUBMITTED: O/7C/7E Copy of SAP to N. Ancog ☒

COPIES TO: (Include Name, Navy Mail Code, and Number of Copies)

NAVY:	TtEC:	OTHER: (Distributed by TtEC)
A. Baughman - BRAC - O/1E	A. Eloskof	M. Slack - RASO
D. Silva (EVR.DS) 3C/3E	R. Margotto	*See Attached Cover Letter for
*BPMOW	M. Schneider	Additional Distribution
*T. Macchiarella 1C/1E		
*G. Lorton 1C/1E		
*F. Fadullon 1C/1E		Date/Time Received
N. Ancog (EVR.NA) CD		
Basic Contract Files (AQE)		
1C		

1230 Columbia Street, Suite 750, San Diego, CA 92101

TETRA TECH

TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N62473-06-D-2201 (RAC IV)

Document Control No. 07-0232

File Code: 5.0

TO: Contracting Officer
Naval Facilities Engineering Command SW
Ms. Beatrice Appling, AQE.BA
Building 127, Room 108
1220 Pacific Highway
San Diego, CA 92132-5190

DATE: 02/22/07
CTO: 0015
LOCATION: Alameda, CA

FROM: A. N. Bolt
A. N. Bolt, Program Manager

DESCRIPTION: Replacement Pages only for Draft Final Time-Critical Removal Action Work Plan, January 31, 2007

*CD enclosed

TYPE: ☐ Contract/Deliverable ☒ CTO Deliverable ☐ Notification ☐ Other

VERSION: Draft Final
(e.g. Draft, Draft Final, Final, etc.)

REVISION #: N/A

ADMIN RECORD: Yes ☒ No ☐ Category ☐ Confidential ☐
(PM to Identify)

SCHEDULED DELIVERY DATE: 02/13/07 ACTUAL DELIVERY DATE: 02/22/07

NUMBER OF COPIES SUBMITTED: O/4C/5E Copy of SAP to N. Ancog ☒

COPIES TO: (Include Name, Navy Mail Code, and Number of Copies)

NAVY:	TtEC:	OTHER: (Distributed by TtEC)
A. Baughman - BRAC - O/2E	A. Eloskof	M. Slack - RASO
D. Silva (EVR.DS) 3C/3E	N. Bollo	*See Attached Cover Letter for
N. Ancog (EVR.NA) 1 CD	M. Schneider	Additional Distribution
Basic Contract Files (AQE) 1C		

Date/Time Received

1230 Columbia Street, Suite 750, San Diego, CA 92101

TETRA TECH EC, INC.

February 13, 2007

Ms. Anna-Marie Cook
U.S. EPA
Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Ms. Dot Lofstrom
Department of Toxic Substances Control
8800 California Center Drive
Sacramento, CA 95826-3200

Mr. Erich Simon
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Dear Federal Facility Agreement Members:

Subj: DRAFT FINAL TIME-CRITICAL REMOVAL ACTION WORK PLAN FOR INSTALLATION RESTORATION SITES 1, 2, AND 32; ALAMEDA POINT, CALIFORNIA

Please find enclosed a CD of the Draft Final Time-Critical Removal Action Work Plan, Installation Restoration Sites 1, 2, and 32; Alameda Point, California, and replacement pages for the hard copy document recently issued on January 31, 2007.

If you have any questions or comments, please call Mr. Andrew L. Baughman at (619) 562-0902, Mr. Thomas L. Macchiarella at (619) 532-0907, or myself at (949) 756-7521.

Sincerely,

Tetra Tech EC, Inc.

Abram S. Eloskof, M. Eng, M.Sc., CIH
Project Manager

Encl: (1) CD of Draft Final Time-Critical Removal Action (TCRA) Work Plan, Installation Restoration Site 1, 2, and 32; Alameda Point, California (January 31, 2007)

(2) Replacement pages

SGS

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www.tteci.com