N60028_002222
TREASURE_ISLAND_NS
SSIC 5000-33a

FINAL NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN FOR SITE 12 HOT SPOTS AND BUILDINGS 1121 AND 1323, NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION SITE 12

04/01/2013

TETRA TECH EC, INC.

NOTIFICATION: This Record Contains Sensitive But Unclassified Information Which is Protected by A Freedom of Information Act Exemption

FOIA EXEMPTION 4. (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information
Pages: 763-799, 847-878, 941-955, 971-984, 1005-1067, 1077-1094, 1119-1131, 1136-1149, 1157-1176, 1187-1199

FOIA EXEMPTION 6. (5 USC 552(b)(6))
Personal information affecting an individual's privacy
Pages: 1307, 1311, 1314, 1317

Distribution authorized to U.S. Government Agencies only.

N60028_002222
TREASURE ISLAND
SSIC NO. 5090.3.A

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

CONTRACT NO. N62473-10-D-0809
CTO NO. 0013

FINAL

NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN FOR IR SITE 12 HOT SPOTS AND BUILDINGS 1121 AND 1323

April 2013

DCN: RMAC-0809-0013-0007

NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA
RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

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

CONTRACT NO. N62473-10-D-0809
CTO NO. 0013

FINAL

NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN FOR IR SITE 12 HOT SPOTS AND BUILDINGS 1121 AND 1323

April 2013

NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

DCN: RMAC-0809-0013-0007

Prepared by:

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

Prepared by: _____
Shanti Montgomery
Technical Lead

Reviewed by: _____
Sam Ho, PE
Project Engineer

Approved by: _____
Bill Dougherty
Project Manager

TABLE OF CONTENTS

PAGE

ABBREVIATIONS AND ACRONYMS v

1.0 INTRODUCTION 1-1
1.1 SITE CONDITIONS AND BACKGROUND 1-2
1.2 REGULATORY FRAMEWORK 1-3
1.3 REMOVAL ACTION OBJECTIVES 1-3
1.4 RELEASE CRITERIA 1-4
1.5 AS LOW AS REASONABLY ACHIEVABLE 1-4
1.6 DATA QUALITY OBJECTIVES 1-4
1.7 PROJECT POINTS OF CONTACT 1-4
1.8 PROJECT SCHEDULE 1-4
1.9 WORK PLAN ORGANIZATION 1-5

2.0 SITE WORK AND FIELD IMPLEMENTATION 2-1
2.1 PRECONSTRUCTION ACTIVITIES 2-1
2.1.1 Community Relations and Regulatory Interaction 2-1
2.1.2 Preconstruction Meeting 2-2
2.1.3 Mobilization 2-2
2.1.4 Permitting and Notification 2-2
2.1.5 Utility Clearance 2-2
2.1.6 Utility Protection 2-3
2.1.7 Site Survey/Environmental Conditions Report 2-3
2.1.8 Preparation of Residential Buildings 2-4
2.2 RADIOLOGICAL STRUCTURE SURVEYS 2-4
2.3 HOT SPOT EXCAVATION NON-TIME-CRITICAL REMOVAL ACTION 2-4
2.3.1 Hot Spot Excavations 2-5
2.3.2 Final Status Survey 2-6
2.3.3 Site Restoration 2-7
2.4 SOIL SCREENING OPERATIONS 2-9
2.4.1 Screening Pad Construction 2-9
2.4.2 Radiological Clearing of the Pad Material 2-9
2.4.3 Pad Deconstruction and Site Restoration 2-11
2.5 DEMOBILIZATION 2-11

3.0 ENVIRONMENTAL PROTECTION PLAN 3-1
3.1 STORMWATER MANAGEMENT MEASURES 3-1
3.1.1 Best Management Practices for Construction Activities 3-1
3.1.2 Best Management Practices for Erosion and Sediment Control 3-3
3.1.3 Best Management Practices for Soil Stockpile Areas 3-4
3.1.4 Postconstruction Best Management Practices 3-5
3.2 FUGITIVE DUST CONTROL MEASURES 3-5

TABLE OF CONTENTS
(Continued)

PAGE

3.2.1 Construction Traffic 3-5
3.2.2 Site Preparation and Remediation Activities 3-6
3.2.3 Building Demolition 3-7
3.2.4 Bulk Soil Transport 3-7
3.2.5 Postconstruction Stabilization of Disturbed Areas 3-8
3.3 AIR MONITORING 3-8
3.3.1 Air Quality Monitoring 3-8
3.3.2 Monitoring Site Locations 3-9
3.3.3 Personnel Monitoring 3-10
3.4 SPILL/RELEASE PREVENTION, RESPONSE, AND REPORTING 3-11
3.4.1 Spill/Release Prevention 3-11
3.4.2 Spill/Release Response 3-11
3.4.3 Spill/Release Reporting 3-11
3.5 WASTE MANAGEMENT PRACTICES 3-12

4.0 TRAFFIC CONTROL 4-1
4.1 REVISED SITE TRAFFIC ROUTES 4-1
4.2 TRAFFIC CONTROLS 4-1

5.0 DATA AND INFORMATION MANAGEMENT 5-1

6.0 REPORTING 6-1
6.1 FINAL STATUS SURVEY REPORTS 6-1
6.2 REMOVAL ACTION COMPLETION REPORT 6-1

7.0 REFERENCES 7-1

TABLES

Table 3-1 Sampling Frequency and Monitoring Methods

TABLE OF CONTENTS
(Continued)

FIGURES

Figure 1-1 Regional Location Map

Figure 1-2 Site Location Map

Figure 1-3 Project Organization Chart

Figure 1-4 Project Schedule

Figure 2-1 Air Monitoring Station Locations

Figure 3-1 Track-Out Control Points and Traffic Routes

APPENDICES

Appendix A BMP Fact Sheets (on CD ~~only)~~

Appendix B Response to Comments

ATTACHMENTS

Attachment 1 Sampling and Analysis Plan

Attachment 2 Project Contractor Quality Control Plan

Attachment 3 Radiation Protection Plan

Attachment 4 Radiological Management Plan

Attachment 5 Waste Management Plan

This page intentionally left blank.

ABBREVIATIONS AND ACRONYMS

$\mu g/m^3$	micrograms per cubic meter
ACM	asbestos-containing materials
ALARA	as low as reasonably achievable
AM	Action Memorandum
ASTM	American Society for Testing and Materials
BAAQMD	Bay Area Air Quality Management District
BCT	Base Realignment and Closure Cleanup Team
BMP	best management practice
BRAC	Base Realignment and Closure
Caltrans	California Department of Transportation
CCR	*California Code of Regulations*
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
cm^2	square centimeter
COPC	chemical of potential concern
CSO	Caretaker Site Office
CTO	Contract Task Order
DON	Department of the Navy
dpm	disintegrations per minute
DQO	data quality objective
EMS	Environmental Management Services, Inc.
EPA	U.S. Environmental Protection Agency
FSS	Final Status Survey
ft^3/min	cubic feet per minute
HRA	Historical Radiological Assessment
IR	Installation Restoration (Program)
LLRW	low-level radioactive waste

ABBREVIATIONS AND ACRONYMS
(Continued)

L/min	liters per minute
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mg/m^3	milligrams per cubic meter
mph	miles per hour
MUTCD	Manual on Uniform Traffic Control Devices
NAD	North American Datum
NaI	sodium iodide
NAVD	North American Vertical Datum
NAVSTA TI	Naval Station Treasure Island
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NIOSH	National Institute for Occupational Safety and Health
NTCRA	non-time-critical removal action
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCQC	Project Contractor Quality Control
PESM	Project Environmental Safety Manager
PjM	Project Manager
PM_{10}	particulate matter, less than 10 micrometers in diameter
Ra-226	radium-226
RACR	Removal Action Completion Report
RASO	Radiological Affairs Support Office
RCA	radiologically controlled area
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RSO	Radiation Safety Officer
SAP	Sampling and Analysis Plan
SFPUC	San Francisco Public Utilities Commission
SOP	Standard Operating Procedure
SSHO	Site Safety and Health Officer

ABBREVIATIONS AND ACRONYMS
(Continued)

SWDA	solid waste disposal area
TSP	total suspended particulates
TtEC	Tetra Tech EC, Inc.
USA	Underground Services Alert

This page intentionally left blank.

1.0 INTRODUCTION

The Department of the Navy (DON) contracted with Tetra Tech EC, Inc. (TtEC) to conduct a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Non-Time-Critical Removal Action (NTCRA) within the Westside Drive Solid Waste Disposal Area (SWDA) A & B at Installation Restoration (IR) Site 12 located at Naval Station Treasure Island (NAVSTA TI), San Francisco, California. This work will be executed under Contract No. N62473-10-D-0809, Contract Task Order (CTO) No. 0013. TtEC will perform the IR Site 12 NTCRA using their State of California Agreement State Radioactive Materials License No. 7909-01. The field activities to be performed under this CTO will be performed under the second phase of the NTCRA at IR Site 12 SWDA A & B.

The scope of this NTCRA will be to:

- Remove two hot spots identified in the California Department of Public Health (CDPH) Site 12 Gamma Survey Report (CDPH 2011).
- Perform a radiological survey and demolish Buildings 1121 and 1323.

To perform this work, the following plans will be used in conjunction with the site-specific information provided in this NTCRA Work Plan:

- **Health and Safety Plan**: Accident Prevention Plan/Site Safety and Health Plan, NAVSTA TI (TtEC 2012)
- **Task-specific Plan**: Task-specific Plan for the Buildings 1121 and 1323 Characterization Survey, NAVSTA TI (TtEC 2013a)
- **Buildings 1121 and 1323 Demolition Work Procedure**: Buildings 1121 and 1323 Demolition Work Procedure, NAVSTA TI (TtEC 2013b)

This NTCRA Work Plan provides site-specific information not included in the above-referenced plans or attachments listed below. The site-specific information addresses the following:

- Dust control and air monitoring requirements specific to the work locations
- Stormwater management requirements and Best Management Practices (BMPs) to be implemented during construction activities
- Traffic routes and measures for maintaining access for site tenants, residents, and other DON contractors during construction activities
- Data management requirements and procedures

The following five additional documents have been developed and are presented as attachments to this NTCRA Work Plan:

- Sampling and Analysis Plan (SAP) (Attachment 1)
- Project Contractor Quality Control (PCQC) Plan (Attachment 2)
- Radiation Protection Plan (Attachment 3)
- Radiological Management Plan (Attachment 4)
- Waste Management Plan (Attachment 5)

1.1 SITE CONDITIONS AND BACKGROUND

NAVSTA TI is located in San Francisco Bay, midway between San Francisco and Oakland, California (Figure 1-1). The former naval station consists of two contiguous islands: Treasure Island, which is approximately 403 acres, and Yerba Buena Island, which is approximately 147 acres. Treasure Island is a manmade island constructed of materials dredged from the bay. Military activities at the former NAVSTA TI date back to 1866, before the construction of Treasure Island, when the U.S. government took possession of Yerba Buena Island for defensive fortifications. In 1993, NAVSTA TI was designated for closure under the Base Closure and Realignment Act of 1990. The naval station was closed on September 30, 1997, and is currently in the transfer process.

IR Site 12 is located on the northwest portion of NAVSTA TI on a relatively flat 93-acre area (Figure 1-2). The site consists of multiplex housing units with private backyards and common area front yards, side yards, and surrounding greenbelts. The area was originally used as a parking lot during the 1939–1940 Golden Gate International Exposition. After Navy occupation of the island in 1940, the area was developed for bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields, and disposal or burning of solid waste. Beginning in the1960s, areas of IR Site 12 were incrementally developed into housing for Navy personnel and their dependents. Former residential Buildings 1121 and 1323 are located within IR Site 12 near Westside Drive.

An NTCRA was implemented in May 2006 to remediate chemicals in soil associated with chemical/fuel storage and disposal or burning of solid waste in four SWDAs (SWDA A & B, SWDA 1231/1233, SWDA 1207/1209, and SWDA Bigelow Court) located within IR Site 12 (Figure 1-2). A Historical Radiological Assessment (HRA) (Weston 2006) identified the radiological contamination potential for the SWDAs as “unlikely” and recommended radiation monitoring during excavation of identified SWDAs. During the initial stages of this NTCRA, a radiation survey and sample analysis identified radium-226 (Ra-226)-impacted debris and soil in some of the SWDAs. Subsequently, an Action Memorandum (DON 2007) summarizing the site characteristics identified the chemicals of potential concern (COPCs) and the horizontal extent of the SWDAs. Generally, the radiological contamination in IR Site 12 SWDAs is colocated with chemical contaminants. The NTCRAs at IR Site 12 determined that some of the SWDAs were contaminated with radiological items or soil containing Ra-226. Elevated gamma readings were

also detected along the northern and southern fence lines (two areas) of SWDA A & B by the CDPH Radiologic Health Branch during a gamma survey conducted in April 2011. The current scope of work is to investigate and remediate these two areas with elevated gamma readings.

The Westside Drive SWDA, also known as SWDA A & B, is an approximately 4.5-acre area on the west side of IR Site 12 abutting Perimeter Road (Figure 1-2). Two radiological hot spots were identified near the Westside Drive SWDA along the northern and southern fence lines during the 2011 CDPH survey of this area. The source of radioactivity is believed to be near-surface radiological commodities containing Ra-226 (deck markers, foils containing radium powder, instrument gauges) but may include limited pockets of soil contamination. Based on CDPH's report, there is one area of elevated activity north of the currently established Radiologically Controlled Area (RCA) (Northern Hot Spot) and four locations of elevated activity south of the RCA (Southern Hot Spot) (Figure 1-2). This NTCRA focuses only on radiological contamination in the two radiological hot spots. The ongoing NTCRA activities in the center of SWDA A & B are currently being performed by another contractor under a separate contract.

1.2 REGULATORY FRAMEWORK

Environmental investigation and remediation activities at NAVSTA TI are being conducted under the Department of Defense IR Program in accordance with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Under Executive Order 12580, the DON is the lead agency responsible for implementation of the IR Program and any removal actions. The California Department of Toxic Substances Control is the lead regulatory agency. The CDPH and Regional Water Quality Control Board San Francisco Bay Region will provide additional state regulatory oversight.

1.3 REMOVAL ACTION OBJECTIVES

Based on past site history and results from ongoing NTCRAs, the DON has determined that chemical contamination present in soil and debris at the four SWDAs at IR Site 12 requires a response action. This decision was documented in the final Action Memorandum (AM) (DON 2007) and is consistent with the NCP requirements in Title 40 *Code of Federal Regulations* (CFR), Part 300.415(b)(2). The removal action objectives for remediation activities are to implement the AM Alternative 3 and protect public health and welfare and the environment by physically removing and disposing of contaminated soil and debris that exceed the criteria for the COPCs presented in Section 2.1.4 of the AM (DON 2007). This work is being performed by another contractor under a separate contract.

The removal action objectives for this NTCRA are to address radiological contamination in SWDA A & B, which includes 1) performing hot spot removal in two areas until the release criterion for Ra-226 is achieved and then performing an FSS for free release of these two hot spots; and 2) demolishing Buildings 1121 and 1323. Prior to demolition of the buildings,

radiological surveys of the interiors and exteriors will be performed to determine whether radiologically impacted soil has been tracked into the buildings or whether the wind has deposited radiologically impacted soil onto the exterior surfaces.

1.4 RELEASE CRITERIA

Residual levels of radioactive material that correspond to allowable radiation dose standards are derived by analysis of various pathways and scenarios such as direct exposure, inhalation, and ingestion. Release limits are presented in terms of activity concentration and usually refer to average levels of radiation or radioactivity above appropriate background levels. Based on existing data, only one radionuclide of concern was identified for this site, Ra-226, and the release criterion for this isotope is 1 picocurie per gram above background for soil. The release criteria for building surfaces are 20 disintegrations per minute (dpm)/100 square centimeters (cm^2) alpha or 200 dpm/100 cm^2 beta removable contamination, or 100 dpm/100 cm^2 alpha or 1,000 dpm/100 cm^2 beta fixed contamination.

1.5 AS LOW AS REASONABLY ACHIEVABLE

A basic concept in radiation protection specifies that exposure to ionizing radiation and releases of radioactive material should be managed to reduce collective dose to workers and the public and ensure that exposure is as low as reasonably achievable (ALARA). The ALARA principle will be considered during the course of the radiological work carried out under this NTCRA Work Plan.

1.6 DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) specify project objectives, data collection boundaries and limitations, the most appropriate type of data to collect, and the level of acceptable decision error. In addition, the quality and quantity of data required to implement environmental removal actions are defined. The DQOs for the IR Site 12 NTCRA are identified and described in Worksheet #11 of the SAP (Attachment 1).

1.7 PROJECT POINTS OF CONTACT

Figure 1-3 presents the key individuals who are responsible for the oversight and/or implementation of the site activities. Section 2.0 of the PCQC Plan describes the organizational structure, functional responsibilities, levels of authority, and lines of communication within the organization to ensure high-quality work. A listing of the points of contact for the project is also provided in the PCQC Plan.

1.8 PROJECT SCHEDULE

Figure 1-4 presents the overall project schedule for completing the planning, hot spot removal, building survey and demolition, and reporting activities for this CTO.

1.9 WORK PLAN ORGANIZATION

This NTCRA Work Plan is organized as follows:

- **Section 1.0** provides the introduction, site conditions and background, regulatory framework, removal action objectives, release criteria, ALARA concept, DQOs, project points of contact, and report organization.
- **Section 2.0** describes the site work and field implementation for the hot spot removals and demolition of Buildings 1121 and 1323.
- **Section 3.0** describes stormwater management measures, site-specific requirements for dust control during implementation of the site work, and spill/release prevention, response, and reporting.
- **Section 4.0** provides traffic control measures to be implemented during construction activities.
- **Section 5.0** provides detail on the types of data to be collected over the course of the CTO and the procedures for the management of the data.
- **Section 6.0** presents details for project reporting.
- **Section 7.0** lists the references cited in the text.
- **Tables and figures** are included after the text.
- **Appendix A** provides the BMP Fact Sheets.
- **Appendix B** includes the responses to comments on the draft version of this NTCRA Work Plan.
- **Attachment 1** presents the SAP. This plan details laboratory operations that will support the survey activities. Included are procedures for swipe sample analysis, soil sample preparation, gamma spectroscopy analysis, and quality checks.
- **Attachment 2** presents the PCQC Plan. This plan establishes specific procedures and methods for field inspections, and provides an effective quality control system to ensure the quality of all work performed by TtEC and its subcontractor personnel during the implementation of the hot spot removal and building demolition.
- **Attachment 3** presents the Radiation Protection Plan. This plan identifies the day-to-day management of radiologically impacted sites, remediation, surveys, training requirements, health and safety concerns, and material handling requirements for this project.
- **Attachment 4** presents the Radiological Management Plan. This plan presents the survey and decontamination procedures and methodologies that will be implemented in support of radiological release of buildings, sites, structures, areas, materials and equipment, and personnel at NAVSTA TI.
- **Attachment 5** presents the Waste Management Plan. This plan presents the waste management practices and procedures to be followed, and identifies the types of waste expected to be generated.

This page intentionally left blank.

2.0 SITE WORK AND FIELD IMPLEMENTATION

The following sections discuss the preconstruction activities, guidance documents and procedures for performing the radiological structure surveys, hot spot removals, site restoration activities, and soil screening operations.

2.1 PRECONSTRUCTION ACTIVITIES

The following subsections describe activities to be initiated prior to beginning the field activities.

2.1.1 Community Relations and Regulatory Interaction

Under this CTO, TtEC will provide support to the DON for the tasks as described below.

2.1.1.1 Community Relations

TtEC will assist the DON in the preparation of various informative presentations for public meetings. This will include:

- Providing updates of CTO activities at Restoration Advisory Board meetings. This will include presentations covering this NTCRA Work Plan, updates on field activities, and the Removal Action Completion Report (RACR).
- Providing 24-hour work notice fliers to residents adjacent to work areas prior to the start of fieldwork. This flier will include start date, scope/location of removal activities, expected duration of work, and contact information.
- Assisting in the review of meeting minutes, fact sheets, newsletters, and other public information developed for the public covering the NTCRA at IR Site 12.
- Providing monthly updates to the Base Realignment and Closure (BRAC) Cleanup Team (BCT) Community Relations Activities tracking spreadsheet.

2.1.1.2 Regulatory Interaction

In addition to providing the community relations assistance described above, TtEC will assist the DON in its interactions with the local, state, and federal regulatory agencies. This will include:

- Providing updates of field activities at the BCT meetings.
- Attending Work Plan scoping BCT technical meetings to discuss DQOs, field screening values, confirmation sampling strategy, health and safety, schedule, and response to comments.
- Attending the BCT technical meeting on response to comments on the RACR.
- Attending other BCT technical meetings to support discussion of project-specific issues.
- Compiling and drafting responses to regulatory inquiries and correspondence for DON review and approval.

2.1.2 Preconstruction Meeting

A preconstruction meeting will be scheduled prior to mobilization of construction equipment and personnel. The purpose of the meeting will be to discuss project-specific issues, roles of all project personnel, project schedule, health and safety concerns, and other issues that require discussion before field mobilization. The preconstruction meeting will be attended by representatives of the DON, including the Navy Caretaker Site Office (CSO) and Resident Officer in Charge of Construction (ROICC), San Francisco Public Utilities Commission (SFPUC), San Francisco Fire and Police Departments, and subcontractors as appropriate.

2.1.3 Mobilization

Mobilization for this project will begin upon receipt of notice to proceed from the DON. It will take an estimated 2 days to set up temporary facilities and receive equipment and supplies needed to execute the activities described in this NTCRA Work Plan. All trucks, machinery, and equipment will be decontaminated in advance according to DON standard operational procedures before arrival at NAVSTA TI. Mobilization also includes performing preconstruction, site, and geophysical surveys, as well as installing environmental protection measures.

2.1.4 Permitting and Notification

Permits and notifications (non-environmental permits not limited to substantive compliance applicable or relevant and appropriate requirements) are required prior to initiating various phases of removal action activities. Permits may include the following:

- A Treasure Island Dig Permit will be submitted by TtEC and approved by both the DON and SFPUC before starting excavation activities.
- The use of a fire hydrant to obtain water for dust suppression will be coordinated and permitted with the SFPUC.

As necessary, the following notifications will be made:

- Underground Services Alert (USA) buried utility clearance
- A notification of excavation activities to the Occupational Safety and Health Administration
- A notification of intent to demolish Buildings 1121 and 1323 submitted to the Bay Area Air Quality Management District (BAAQMD) at least 10 working days prior to commencement of the demolition

2.1.5 Utility Clearance

Prior to beginning hot spot removals/excavations, buried utilities will be identified and, to the extent possible, located. Geophysical equipment, review of Navy utility drawings, field observations, and notification to USA will be performed to locate buried utilities. Prior to

beginning excavation, proposed excavation areas will be marked in the field using white paint. The marked area will be larger than the proposed excavation to ensure adequate coverage of utility clearance. Utility line locations identified during review of Navy utility drawings will be marked using color-coded surveyor paint and American Public Works Association-approved colors. Field observations of surface expressions (cleanouts, risers, manholes) will be used as guides during the utility marking work. Additionally, local utility providers will be notified through USA (at a minimum of 48 hours prior to beginning fieldwork) to field locate their buried utilities within the proposed excavation boundaries. A meeting or conference call may be scheduled with all interested parties that may potentially be affected by the excavation activities.

2.1.6 Utility Protection

Prior to beginning excavations, the SFPUC manager at NAVSTA TI will be notified through the excavation permitting process. TtEC will coordinate all fieldwork activities closely with the SFPUC and the CSO. During excavation activities in the vicinity of identified utilities, a construction laborer (spotter) may be used to guide excavation equipment and view excavations for buried utilities as soil is removed.

In the event an active utility line is broken or damaged, the NAVSTA TI utility manager will be contacted and, as appropriate, affected people will be notified. Broken or damaged utilities will be replaced in-kind or with other materials that meet current industry standards in consultation with the DON.

Three groundwater monitoring wells (1325-A3, 1323-F3, and 12-SG090) are located in the vicinity of planned excavation areas. Excavations will be performed in a manner to ensure these monitoring wells are not damaged.

TtEC does not anticipate any planned interruptions to utilities during excavation of the hot spots. However, in the event of an unexpected interruption, TtEC will work with the SFPUC and the CSO to remedy the outage so disruption to site residents is minimal. If interruptions are required based on field conditions, the interruptions will be made during normal working hours and according to the general requirements described in Section 2.4.1.4 of the CTO statement of work.

2.1.7 Site Survey/Environmental Conditions Report

Prior to starting work, an environmental preconstruction survey will be performed with the BRAC Remedial Project Manager (RPM), CSO, and ROICC. Photographs of the existing environmental conditions on and adjacent to the site will be taken to document preconstruction conditions. Additionally, a California-registered land surveyor will be used to document site conditions prior to excavation and demolition activities. The survey will be accurate to 0.1 foot vertically and will be surveyed to the State Plane Coordinate System, North American Vertical Datum (NAVD 88) relative to mean sea level, and 0.1 foot horizontally and will be referenced to the California State Plane Coordinate System Zone 3, North American Datum (NAD 83).

2.1.8 Preparation of Residential Buildings

TtEC will perform measures to limit and suppress dust in the air to "zero visible dust" to limit the impact of fugitive dust to the occupied residential buildings adjacent to the hot spots and Buildings 1121 and 1323. Measures may include taping and sealing windows and doors with plastic sheeting or covering parts of the building with tarps. Tarps will be installed so that emergency egress is not restricted. As an additional dust control measure, mesh screens may also be installed on fencing adjacent to Buildings 1121 and 1323.

2.2 RADIOLOGICAL STRUCTURE SURVEYS

One Task-specific Plan will be developed for the radiological clearing of Buildings 1121 and 1323 prior to demolition. These buildings will be surveyed, remediated (if required), and resurveyed until the radiological remedial objectives for materials and equipment, based on Atomic Energy Commission Regulatory Guide 1.86 established in the IR Site 12 NTCRA Work Plan (Shaw 2007), are achieved. Surveys will be performed in accordance with the Task-specific Plan and the Standard Operating Procedures (SOPs) presented in the SAP (Attachment 1). Any areas exceeding the surface release criteria of 20 dpm/100 cm^2 alpha or 200 dpm/100 cm^2 beta removable contamination, or 100 dpm/100 cm^2 alpha or 1,000 dpm/100 cm^2 beta fixed contamination will be remediated and transferred to the DON's low-level radioactive waste (LLRW) contractor for disposal. Once survey and remediation activities are complete, the buildings' survey data will be submitted to the DON for transmittal to the CDPH. All building materials will be thoroughly characterized for release and disposal.

Once written concurrence is received from the DON to proceed and CDPH concurs that the building materials are not radiologically contaminated, the buildings will be demolished up to the concrete foundations. The removal of the concrete foundations will be performed by others during the third phase of the NTCRA for IR Site 12 SWDA A & B. Demolition activities will be conducted in accordance with the methods outlined in the Demolition Safety Manual (National Demolition Association 2004), Safety and Health Program Requirements for Demolition Operations (American National Standards Institute A10.6-2006) (ANSI 2006), Safety and Health Requirements Manual (EM 385-1-1) (USACE 2008), and the Occupational Safety and Health Administration Technical Manual section on demolition, as detailed in the Buildings 1121 and 1323 Demolition Work Procedure (TtEC 2013b).

Prior to initiating demolition activities, a California licensed asbestos abatement contractor will be mobilized to remove the asbestos-containing material (ACM) currently present in the buildings.

2.3 HOT SPOT EXCAVATION NON-TIME-CRITICAL REMOVAL ACTION

During the gamma scan survey of IR Site 12 conducted by the CDPH in April 2011, two localized hot spots were identified. The site conceptual model indicates that the elevated

readings identified in the CDPH IR Site 12 Gamma Survey Report are most likely the result of near-surface, gamma-emitting radioluminescent devices. The focus of the hot spot NTCRA will be the in situ identification and removal of discrete sources/commodities and/or localized soil contamination.

2.3.1 Hot Spot Excavations

The hot spot removal activities are described below:

1. An RCA will be established as detailed in the Radiation Protection Plan (Attachment 3) around the excavation site. During excavation activities, the site will be secured daily at the end of each shift.
2. Any surface asphalt covering the identified hot spot location will be removed and staged on plastic pending radiological scanning activities.
3. Prior to excavation, a 100 percent gamma scan on the exposed surface will be conducted using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 2-inch by 2-inch sodium iodide (NaI) scintillation detector (or equivalent) to identify and mark the location of any discrete near-surface radioluminescent commodities and contaminated soil greater than 3 sigma above the mean background area level. (An average background level will be determined by taking measurements at systematic or random locations within the designated reference area and collecting and analyzing soil samples through gamma spectroscopy).
4. The TtEC RSO (or designee) will be present to review the survey data, direct device or contaminated soil removal, ensure radiological procedures are followed, and maintain a log of activities performed. Any discrete sources/commodities identified during the scanning activities will be removed and placed in a secure locker for transfer to the DON's LLRW disposal contractor, Environmental Management Services, Inc. (EMS).
5. For each hot spot, a 12-inch lift of soil will then be excavated. The excavated material and exposed surface will undergo a 100 percent gamma scan using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent). The scan data will be used to identify and mark the location of any discrete commodities and any in situ contaminated soil with measurements above 3 sigma of the mean background area level.
    - Any discrete sources/commodities identified during the scanning activities will be removed and placed in a secure locker for transfer to the LLRW disposal contractor, EMS.
    - In situ soil above 3 sigma of the mean background area level will be segregated and placed into a soil hopper for transfer to the soil screening pad (see Section 2.4).
    - The scanning and excavation activities will continue in 12-inch lifts until all gamma scan readings are less than 3 sigma of the mean background area level or based on TtEC RSO's (or designee's) professional judgment. Because of the low release criterion for Ra-226 in soil, combined with the limitations of field survey

instruments to identify contamination at the activity concentration, the TtEC RSO (or designee) will review the data and determine when gamma scan readings indicate that no further contamination is likely present and excavation should cease.

6. An Excavation Competent Person will determine the appropriate method of excavation sloping to allow limited entry into the excavation by the survey crew.
7. To confirm the effectiveness of the gamma scans and remediation actions, a minimum of one soil sample will be collected on each side of the sidewalls and the bottom of the excavated area for gamma spectroscopy analysis by Curtis and Tompkins, Ltd. as detailed in the SAP (Attachment 1). The five locations will be selected based on the highest gamma scan readings of each surface.
8. If the release criterion of Ra-226 is exceeded in any of the soil samples, the iterative process of remediation followed by collection of a minimum of one postremediation verification sample will continue until the release criterion has been achieved.

2.3.2 Final Status Survey

Once no further contamination is identified in the hot spots excavations, FSS activities will be conducted using Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) guidance (DoD et al. 2000). Because of their close proximity and the expectation that together they will be less than 1,000 square meters in size, the excavations will be combined into a single MARSSIM Class 1 survey unit. The objective of the FSS will be to demonstrate that residual radioactivity levels within the excavations and backfill material meet the release criteria.

The FSS will comprise the following components:

- Eighteen randomly selected sample (systematic) locations will be generated using Visual Sample Plan software with a random start point on a triangular grid (or other number of sample locations and distribution with Radiological Affairs Support Office [RASO] concurrence).
- Based on review of the last gamma scan performed for each hot spot excavation, the RSO (or designee) will review the data and select a minimum of two additional biased sample locations (or other number of sample locations and distribution per RASO concurrence).
- Gamma direct static measurements will be collected from each discrete systematic and biased soil sample collection location using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 NaI scintillation detector (or equivalent).
- Biased and systematic soil samples will be collected from each of the discrete locations and submitted to Curtis and Tompkins, Ltd. for gamma spectroscopy as detailed in the SAP (Attachment 1).
- If radioactive contamination is identified, remediation will be performed and postremediation verification soil samples will be collected and analyzed as described in Section 2.3.1. This iterative process of remediation followed by postremediation

verification samples and systematic and biased sampling will continue until no further contamination is identified, and the systematic sample results meet the release criteria.

Dose and risk modeling will be performed using the most current version of RESRAD modeling software to document that the residual activity following the remedial actions meets the acceptable U.S. Environmental Protection Agency (EPA) excess lifetime cancer risk criterion. The modeling will be performed for the Class 1 survey unit excavations and imported fill materials using the larger of the method detection limit or reported activity concentrations from the gamma spectroscopy reports. The results of the modeling exercise will be included in the FSS report.

2.3.3 Site Restoration

Once the FSS is complete and prior to backfilling, a California-registered land surveyor will survey the horizontal and vertical extents of the excavations. The survey will be accurate to 0.1 foot vertically and will be surveyed to NAVD 88 relative to mean sea level, and 0.1 foot horizontally and will be referenced to NAD 83. The excavation will then be lined with a visible barrier marker and backfilled with clean imported fill material meeting California Department of Toxic Substances Control requirements as specified in the SAP (Attachment 1). Following backfill, the site will be restored to pre-excavation conditions.

2.3.3.1 Visible Barrier

Material that is permeable and will resist deterioration, such as snow fencing, geotextile, or a comparable material, will be placed in the excavation bottom. This will serve as a marker to differentiate overlying non-chemically impacted import material from the underlying, potentially chemically impacted soil.

2.3.3.2 Backfill

Imported soil shall be “clean” (chemical and radiological levels shall meet the requirements specified in the SAP [Attachment 1]). Soil particles shall be less than 2 inches in diameter. Soil shall preferably be well-graded (GW or SW), but other types of soil might be acceptable after further evaluation of its gradation, sand equivalent value, expansive characteristics, and plasticity. All new import materials shall be evaluated and approved by the Project Engineer. The soil shall at least conform to the grading in the table below for consideration for use as backfill material (Caltrans 2010a):

Sieve Sizes	Percentage Passing
3 inches	100
No. 4	35–100
No. 30	20–100

Backfill will be placed in 1-foot-thick (loose) lifts until within the final 3 feet of final grade. Compaction will be achieved by pressing the soil down using heavy equipment such as an excavator or dozer (2 to 3 passes). Soil used in the final 3 feet shall be placed in maximum 6-to-8-inch lifts. Procedures from the Navy Design Manual (DM 7.01 [September 1986, Table 5, p. 7.2–48 and 49]) shall be followed to provide for compaction of a minimum of 95 percent Standard Proctor Maximum Density (NAVFAC 1986). Other equipment such as a sheepsfoot or vibratory roller may be used as long as it is compatible with the type of backfill compacted and procedures (lift size/compaction effort) from the Navy Design Manual are followed.

Compaction testing will be performed on each of the final four lifts at a minimum rate of one sample per 50 linear feet per excavation in accordance with American Society for Testing and Materials (ASTM) Standard D6938-10. Laboratory tests for maximum dry density and optimum moisture content are required for each batch/source of backfill material in accordance with ASTM D422-63 and ASTM D1557. A relative compaction of not less than 95 percent is required throughout each lift of backfill within 3 feet of final grade. A minimum of one sample for every 5,000 cubic yards is required. The compaction test results will be provided in the FSS report.

2.3.3.3 Restoration of Grassy Areas

Excavations in grassy areas will be restored with sod (or equivalent). Prior to placing the sod, approximately 2 inches of topsoil will be placed on the compacted imported fill and raked smooth. Sod (or equivalent) will be brought on-site, carefully placed over the topsoil, and thoroughly watered.

Before its placement, the topsoil will be visually inspected to ensure it contains a relatively even mix of clay, silt, and sand, and is free of gravel and large pieces of organic matter (sticks and leaves). Material for use as topsoil will be certified clean by the supplier.

2.3.3.4 Restoration of Gravel Areas

Excavations in gravel areas will be backfilled to within 4 inches of the ground surface, and similar gravel material will be placed over the compacted imported fill to levels consistent with pre-excavation and surrounding unexcavated conditions.

Before its placement, the gravel material will be visually inspected to ensure it is clean and free of organic matter. The supplier will certify that the gravel material conforms to California Department of Transportation (Caltrans) specifications.

2.3.3.5 Restoration of Asphalt Pavement

Areas requiring restoration of asphalt will be backfilled to within 10 inches of the ground surface. A 6-inch layer of Class II road base material will be placed followed by 4 inches of asphalt to restore the paved areas to levels consistent with pre-excavation and surrounding

unexcavated conditions. Pavement bases will be restored in accordance with City of San Francisco Standard Specifications Section 11.

Before their placement, the Class II road base material and the asphalt will be visually inspected to ensure they are clean and free of organic matter. The road base supplier will certify that the material conforms to Caltrans specifications. The supplier of the asphalt will be required to certify that the material does not contain recycled materials, is clean, and also conforms to Caltrans specifications.

2.4 SOIL SCREENING OPERATIONS

The excavated hot spot soil will be placed on the screening pad to facilitate the radiological clearing of the excavated material for disposal as non-LLRW. The clearing process will involve scanning, surveying, and remediation, as necessary, until all the soil sample results indicate that no material exceeds the release criterion for Ra-226.

2.4.1 Screening Pad Construction

One single soil screening pad (approximately 10,000 square feet in size) will be constructed in the large open space between Buildings 1119 and 1391 (Figure 2-1) or in another location as agreed upon with the DON. The pad will be constructed to minimize interference with the entry/egress pathway into this area and minimize interference with other contractors who may be working in the vicinity of these buildings. The location and size of the pad (or pads if required due to space limitations) will be determined in the field based on the quantity of soil ultimately excavated and site conditions. The pad(s) will be constructed of 20 mil polyvinyl chloride sheeting (or equivalent), straw waddles, and geotextile fabric as follows:

- The area proposed for pad construction will be cleared of all debris and rocks.
- Before the soil screening pad is constructed, a gamma survey of the proposed location will be performed to ensure no elevated radioactivity is present. A 100 percent gamma scan of the proposed location will be conducted using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent). The gamma scan survey data will be submitted to the DON for review. Construction of the pad will not start until the DON has reviewed the survey data and has concurred that the proposed location is acceptable.
- The extents of the screening pad will be defined using straw wattles or similar materials to establish a bermed area. The geotextile fabric and 20-mil polyvinyl chloride sheeting will be spread over the entire area and secured with sandbags along the edges.

2.4.2 Radiological Clearing of the Pad Material

Once construction of the screening pad is complete, the soil from the hot spots will be placed on the screening pads to be radiologically cleared for off-site disposal as non-LLRW as follows:

- Excavated soil from the hot spots will be spread on the screening pad to a depth of approximately 6 inches (or thicker if approved by RASO).
- The excavated soil from each hot spot will be separated from each other. Based on the small area of soil anticipated to be excavated, a 100 percent gamma scan using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent) will be performed to identify and mark the location of any measurements that are above 3 sigma of the mean background area level. Survey data analysis will be performed as the data are received, and questionable areas will be flagged for resurvey or verification. If the excavated soil approaches 1,000 square meters in size, this surface may be scanned with a towed array system as discussed in Worksheet #17 provided in the SAP (Attachment 1).
- Radioactive materials or devices identified during the screening activities will be marked, collected, segregated, and stored in an appropriate secured locker provided by the DON's LLRW contractor, EMS.
- Based on the small area of soil anticipated to be excavated and with RASO concurrence, a minimum of one direct static measurement will be collected for every 10 cubic yards of soil at locations exhibiting the highest gamma scan readings, if no gamma scan measurements exceed 3 sigma of the mean background area level.
- Additional gamma static measurements will be collected to define potential areas of contaminated soils.
- The logged data will be uploaded to the TtEC data management system, which will produce data reports/figures for evaluation by the TtEC RSO (or designee). The TtEC RSO (or designee) will identify any areas of elevated measurements requiring further evaluation.
- One discrete soil sample will be collected from each of the static measurement locations. The soil samples will be analyzed for gamma spectroscopy by Curtis and Tompkins, Ltd. in accordance with the SAP (Attachment 1). Based on the gamma spectroscopy results, soil with results exceeding the release criterion for Ra-226 will be remediated and placed directly into LLRW bins.
- If any soil sample result exceeds the release criterion for Ra-226, additional characterization samples in the surrounding area will be collected for analysis to minimize the generation of LLRW. The contaminated soil will be removed from the pad and placed in appropriate containers for subsequent transport and disposal by the DON's LLRW contractor, EMS. This process of evaluating results, collecting biased or characterization samples, and removing contaminated material will continue as an iterative process until results of the soil left on that pad are below the release criterion.
- Once the DON concurs that results for the remaining soil meet the release criterion and the soil can be staged pending off-site disposal, soil samples will be collected for waste characterization purposes in accordance with the SAP (Attachment 1) and Waste Management Plan (Attachment 5) for subsequent transport and disposal to an off-site landfill permitted to accept this material. Depending on the amount of soil excavated and weather conditions, the soil will be either placed in Department of Transportation-

approved containers or staged on the pad and treated with soil tackifier (or equivalent) pending the waste characterization sample results.

2.4.3 Pad Deconstruction and Site Restoration

Once the remaining soil has been removed from the screening pad, the pad will be deconstructed and the site restored to pre-existing conditions as follows:

- The plastic sheeting will be transferred to the LLRW disposal contractor, EMS.
- The geotextile fabric and wattles will be staged pending the results of the following gamma scan survey of the ground surface.
- Following removal of the screening pad, a 100 percent gamma survey of the former screening pad location will be performed to ensure the soil screening operations have not impacted the ground surface. The 100 percent gamma scan will be conducted using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent). The gamma scan survey data will be submitted to the DON for review. Site restoration at this location will not start until the DON has reviewed the survey data and has concurred that the location has not been radiologically impacted.
- Upon DON concurrence, the site will be restored to pre-existing conditions.

2.5 DEMOBILIZATION

Following completion of the construction activities and DON's acceptance of the final inspection (see Section 7.6.3 of the PCQC Plan), the construction equipment will be decontaminated as specified in the Accident Prevention Plan/Site Safety and Health Plan (TtEC 2012) and demobilized. All temporary facilities, materials, and supplies brought to the site will be demobilized.

This page intentionally left blank.

3.0 ENVIRONMENTAL PROTECTION PLAN

The following sections discuss stormwater management measures, fugitive dust control measures, air monitoring, and spill/release prevention, response, and reporting practices.

3.1 STORMWATER MANAGEMENT MEASURES

The ground surface disturbed as a result of the hot spot excavations will be significantly less than 1 acre; therefore, this project does not fall under General Permit requirements of Water Quality Order 2009-0009-DWQ. However, BMPs will be implemented to ensure that construction activities will not negatively impact stormwater discharges from the work site.

The BMPs for construction activities that may pollute stormwater focus on the following potential pollutant sources:

- Contaminated fine-grained soil (silt) from the excavation that can be suspended in stormwater runoff
- Contamination of stormwater with radionuclides, metals, or other chemicals of concern
- Trackout of soil and sediment from trucks leaving the sites
- Hazardous materials, including spills of fuel, oil, and lubricant
- Wind erosion of stockpiled soil and backfill material
- Solid waste (asphalt, concrete, material from demolished buildings, etc.) from construction activities

This section identifies the materials and activities that may contaminate stormwater and discusses implementation of BMPs for stormwater, where applicable, during and after construction. Fact sheets for BMPs that may be used at the site are provided in Appendix A.

3.1.1 Best Management Practices for 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, including solid waste that may clog drainage pathways or enter the stormwater flow within the excavation areas. The achievement of good housekeeping and maintenance also requires employee participation, specific training, and control systems. The following BMPs that will be implemented are essential to maintaining control of potential pollution sources.

3.1.1.1 Spill Prevention and Control

The removal actions under this CTO will be conducted in accordance with this NTCRA Work Plan, the Radiation Protection Plan (Attachment 3), Radiological Management Plan (Attachment 4), Waste Management Plan (Attachment 5), and the project-specific Accident Prevention

Plan/Site Safety and Health Plan (TtEC 2012). These documents, which will be maintained on-site, outline the specific steps to be followed if a spill or release occurs. If changes or revisions to these documents are made, the most recent version will supersede the previous iteration.

3.1.1.2 Management of Solid Waste

All construction waste shall be disposed of in dumpsters, roll-off bins, or other similarly approved containers in designated areas located throughout the site. Specific procedures to handle all types of waste expected within TtEC's work areas at NAVSTA TI are included in the Waste Management Plan (Attachment 5). This plan will be maintained at the site.

3.1.1.3 Management of Contaminated Soil

Radiologically contaminated soil will be placed directly in lined and covered bins (or other container provided by the DON's LLRW contractor, EMS. Chemically contaminated soil will be maintained on the screening pad until transported off-site to an approved landfill or will be directed loaded into covered bins or other Department of Transportation-approved container while awaiting off-site disposal.

3.1.1.4 Track-out of Material

Track-out prevention control points will be established at the primary site haul road access point on Perimeter Road at the western edge of the site as shown on Figure 3-1. To ensure that the tires are free from mud or loose soils prior to leaving the site, the bulk loaded trucks will be inspected and any loose soil will be removed before the trucks exit the site.

Any visible track-out onto a paved road where vehicles exit the work site will be removed by wet sweeping at the end of the work day or at least once per day.

3.1.1.5 Diesel Fuel

During construction, diesel fuel will be delivered and pumped directly into various equipment. Fueling will be located away from drainage courses to prevent run-on of stormwater and runoff of spills. If a spill occurs as equipment is fueled, the spill will be immediately contained with an earthen berm, and an excavation retention trap will be provided. The individual noting the spill will be responsible for contacting the Project Superintendent, who will notify the DON, who in turn is responsible for notifying the regulatory agencies, as necessary, and managing cleanup and removal of contaminated soils in accordance with regulations.

3.1.1.6 Fuels for Passenger Vehicles and Trucks

Fueling of passenger vehicles and trucks on-site will take place in designated areas located away from drainage courses to prevent the run-on of stormwater and the runoff of spills. If a spill occurs as equipment is fueled, the spill will be immediately contained with an earthen berm and an excavation retention trap will be provided. The individual noting the spill will be responsible

for contacting the Project Superintendent, who will notify the DON, who in turn is responsible for notifying the regulatory agencies, as necessary, and managing cleanup and removal of contaminated soils in accordance with regulations.

3.1.1.7 Heavy Equipment and Vehicle-Related Lubricants

All heavy equipment and vehicles will be inspected prior to use on-site and at the beginning of each workday for oil, lubricant, and hydraulic 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, and accumulated grease will be wiped off and contaminated rags properly disposed of off-site. All oil and lubricant supplies will be securely stored in drums or bins to prevent an uncontrolled discharge of spilled materials.

Heavy equipment oil changes and maintenance may be performed on-site. If a spill associated with heavy equipment/vehicles (e.g., diesel, gasoline, hydraulic fluid, or lubricant leak) occurs, containment will be provided, the Project Superintendent will be notified, the spill area will be excavated, and the material will be containerized and stored in accordance with the Waste Management Plan (Attachment 5) until proper off-site disposal.

3.1.1.8 Passenger Vehicles and Trucks

Passenger vehicles and trucks will be inspected daily for possible leaks, but any service will be performed off-site at commercial facilities.

3.1.1.9 Employee and Subcontractor Training

Primary work policies will be centered on requiring extensive training for employees and any subcontractor working on-site. Each employee is required to be current with appropriate federal hazardous waste training requirements and other training programs, as defined in the Accident Prevention Plan/Site Safety and Health Plan (TtEC 2012). Each subcontractor will be required to attend daily safety meetings at the work site, and each work phase is reviewed during project orientation meetings. During the meetings, potential problems, including weather conditions and stormwater control, will be discussed, and the response actions that will be implemented if a particular spill or pollution situation occurs will be reviewed.

3.1.2 Best Management Practices for Erosion and Sediment Control

BMPs for erosion and sediment control will be implemented, as necessary, during construction activities. Erosion and sediment control structures will be inspected weekly and at least once each 24-hour period during extended storm events.

3.1.2.1 Construction Sequence and Scheduling

Ground disturbing construction will be sequenced to minimize the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

3.1.3 Best Management Practices for Soil Stockpile Areas

During backfilling and grading, soils may be stockpiled in areas adjacent to that activity. Because the soil will be stockpiled in a generally uncompacted condition, it is subject to erosion. In addressing stockpiling, BMPs may include diversion of drainage from the stockpiles, installation of silt fencing/filter barriers on the downgradient toe of stockpile slope, and dust control measures. A soil tackifier will also be applied, as needed, to the stockpiles to prevent erosion.

3.1.3.1 Temporary Swales or Berms

Swales and berms may need to be cut to divert and control stormwater runoff during the excavation of hot spots. They can be used to divert sheet flow over slopes, prevent run-on into open excavations or active construction zones, and control erosion along with transport of sediment.

3.1.3.2 Silt Fence and Sandbags

Silt fencing may be used as a temporary sediment trapping and filtering device downgradient of all disturbed areas where sheet flow might occur. Alternatively, filter barriers, described in Section 3.1.3.3, may be used to perform the same function. Silt fences will be installed on a level contour receiving no more than 1 acre of runoff per 100 linear feet or 0.5 cubic foot per second of concentrated flow draining to any point along the silt fence.

Sandbags will be used as a drainage diversion and for sediment trapping and stormwater velocity and erosion control. The sandbags will be installed on level contours up to 1 acre and in areas of concentrated flows and drainage courses.

Silt fences and sandbags will be used at the following locations at the site:

- Silt fencing or sandbags around and along the downgradient toe of all soil stockpiles
- Silt fencing or sandbags below active construction areas
- Silt fencing along the downgradient toe of any work performed on the shoreline or adjacent a steeply sloping bank
- Sandbags in concentrated drainage flow course and in areas downgradient of active work areas, as needed
- Sandbags as a diversion berm to stormwater run-on upgradient of active work areas and excavations

3.1.3.3 Filter Barrier

Filter barriers consist of a series of secured, anchored wattles placed to intercept and filter sediment-laden runoff from small areas of disturbed soil. Filter barriers may be used on-site in place of silt fencing around stockpile areas and downgradient of any active areas where excess

sediment or soil may be expected. Filter barriers may be required along the shoreline if the silt fencing does not provide adequate sediment filtration as determined by the Qualified Stormwater Pollution Prevention Plan Developer.

3.1.4 Postconstruction Best Management Practices

At the completion of the project, the final grade of excavated locations will return to the pre-construction conditions. Once soil stockpiles have been removed, stockpile areas will be swept clean. No permanent postconstruction BMPs will be required.

3.2 FUGITIVE DUST CONTROL MEASURES

The project areas are located within the jurisdiction of the BAAQMD. However, as an NTCRA under CERCLA, this project is not required to have permits from the BAAQMD. Nevertheless, the project will meet the substantive aspects of BAAQMD air quality requirements.

This section specifically identifies the steps that will be taken to reduce fugitive dust emissions during excavation/hot spot removal, transportation of soil and debris, and demolition of structures. This section describes measures to address the substantive requirements of the following applicable regulations:

- *California Code of Regulations* (CCR) Title 17, Section 93105, ATCM for Construction Grading, Quarrying, and Surface Mining Operations – Requirements for Construction and Grading Operation.
- BAAQMD Regulation 6, Particulate Matter and Visible Emissions, 6-301 Ringelmann No. 1 Limitation, 6-302 Opacity Limitation, and 6-305 Visible Particles

Control methods for fugitive dust are described for the following emissions generated from the construction activities at the project sites:

- Dust entrained during on-site travel on paved and unpaved surfaces
- Dust entrained during vegetation removal, excavation, soil screening, backfill, and final grading at the construction site
- Dust entrained during soil stockpiling, and loading and unloading operations
- Wind erosion of areas disturbed during construction activities
- Vehicle emissions associated with construction equipment

3.2.1 Construction Traffic

3.2.1.1 Track-out Prevention

Track-out prevention control points will be established at the primary site haul road access point on Perimeter Road at the western edge of the site as shown on Figure 3-1. To ensure that the

tires are free from mud or loose soils prior to leaving the site, the bulk loaded trucks will be inspected and any loose soil will be removed before the trucks exit the site.

Any visible track-out onto a paved road where vehicles exit the work site will be removed by wet sweeping at the end of the work day or at least once per day.

3.2.1.2 Roadway Fugitive Dust Control

Fugitive dust emissions from construction traffic traveling on unpaved surfaces will be controlled through the following mitigation methods:

- Unpaved roads that are actively used in the project construction sites will be watered every 2 hours or frequently enough to maintain adequate wetness. The frequency of watering may be reduced or eliminated during periods of precipitation. Watering frequency may be increased during hot periods or windy conditions.
- No vehicle will exceed 15 miles per hour (mph) within the construction site and 5 mph in work areas.

The following mitigation measures will be followed for fugitive dust emissions from construction traffic traveling on paved streets:

- Bulk loaded trucks used for transportation of soil and other heavy earth-moving equipment will not be allowed to exit the construction sites except through one of the track-out prevention control points.
- Construction areas adjacent to any paved roadway will be treated with BMPs, as specified above.
- As needed, roadways within the site will be swept with a wet sweeper or washed down to remove soils.

If any of the preceding mitigation methods fails to properly control fugitive dust emissions, one or more of the following reasonably available control measures will be applied:

- Unpaved active portions of the construction sites will be watered or treated with dust control solutions to minimize windblown dust and dust generated by vehicle traffic.
- Paved portions of the construction sites will be cleaned more frequently to control windblown dust and dust generated by vehicle traffic. Water may also be applied to the paved roads if necessary.
- Vehicle trips will be reduced if necessary.

3.2.2 Site Preparation and Remediation Activities

Fugitive dust emissions from site preparation, excavation, loading, spreading, stockpiling, backfill, and compaction activities will be controlled using the following methods:

- During excavation, surface soils will be pre-wetted in the area to be removed prior to commencing the activity. Soil moisture content will be sufficiently maintained to minimize fugitive dust creation.
- All excavation work areas that are inactive for more than 7 days will be watered or treated with dust control solutions to minimize fugitive dust creation.
- The height from which excavated soil is dropped either to trucks, stockpiles, or screening pads will be minimized.
- Trucks moving potentially radiologically impacted soils will be loaded over a plastic liner to assist in the cleanup of any soil from the loading process.
- Trucks shall be equipped with tarping systems to cover loads during soil transport.
- Truck traffic shall be minimized to the shortest haul routes from the excavations and screening pad.
- Soil tackifier will be applied in sufficient quantities to disturbed areas so as to create a stabilized surface.
- Backfill materials will be wetted on an as-needed basis to maintain moisture. Loader buckets will be emptied slowly and drop height from loader bucket minimized. A water truck or water buffalo will be dedicated to backfilling operations.

3.2.3 Building Demolition

Structures have previously been evaluated and found to contain lead-based paint and ACM. Prior to demolition of Buildings 1121 and 1323, the ACM will be abated, as necessary, by a California-certified contractor. Water will be used to wet down any loose paint chips from the buildings prior to demolition and any loose material will be collected for proper disposal. A site-specific Demolition Work Procedure (TtEC 2013b) has been developed that describes the controls necessary to minimize fugitive dust.

3.2.4 Bulk Soil Transport

Bulk soil transport will be as follows:

- All trucks used to transport solid bulk material will be covered (tarped) prior to leaving the site.
- Vehicles will be checked to ensure that they are tarped to prevent any spillage, and any spillage material on the shelf, on exterior surfaces of the cargo compartment, or on wheels will be removed before the vehicles leave the site.
- Trucks used for bulk soil transport will be inspected to ensure that no spillage can occur from holes or other openings in the cargo compartment.
- Bulk loaded trucks will exit the work site via an established track-out control point.

3.2.5 Postconstruction Stabilization of Disturbed Areas

Areas disturbed during excavation, grading, and/or demolition activities will be covered with one of the following to reduce dust generation on the site:

- An approved vegetative or gravel cover
- Hard surface paving

3.3 AIR MONITORING

Air monitoring will be performed to ensure worker and community safety in accordance with the National Institute for Occupational Safety and Health (NIOSH)-approved air sampling methodology. Three types of air monitoring will be conducted during construction activities:

- Air quality monitoring (total suspended particulates [TSP], lead, polychlorinated biphenyls [PCBs], polynuclear aromatic hydrocarbons [PAHs], particulate matter smaller than 10 microns in diameter [PM_{10}], and asbestos)
- Radionuclide of concern air monitoring (Ra-226)
- Personnel monitoring

The following describes the types of air quality monitoring to be performed.

3.3.1 Air Quality Monitoring

The air monitoring for NAVSTA TI includes ambient air quality monitoring stations that will be established to perform monitoring during field activities. Air samples will be collected at the monitoring stations and will be analyzed for the airborne chemicals of concern, which include TSP, lead, PM_{10}, asbestos, PAHs, and PCBs. Since PAHs and PCBs are associated with the soils at the site, the sampling for these compounds will be conducted only during excavation. The air quality sampling will be used to assess the status of air quality compliance and to evaluate modifications to site activities in the event of compliance concerns. The meteorological data for the general work areas, specifically wind speed and direction, will be used to identify the most appropriate locations for the air monitoring stations. Air samplers and monitoring stations will be located upwind and downwind of work areas, using wind direction data, and in the most practical locations.

Analytical results for TSP will be compared with a standard of 0.5 milligram per cubic meter (mg/m^3) (level chosen to minimize overall permissible dust release from site), 1.5 mg/m^3 averaged over 1 month for lead, 50 mg/m^3 for PM_{10}, 0.1 fiber/cubic centimeter for asbestos, and 0.5 mg/m^3 for both PAHs and PCBs. If NAVSTA TI activities are the cause of exceedances, additional control measures may be considered.

During prolonged precipitation events (greater than 8 hours of precipitation in a 24-hour period), the air monitoring units will not be operated. An air monitoring station or individual units being inoperable shall not preclude construction activities at the associated work site.

3.3.2 Monitoring Site Locations

Two air monitoring stations will be installed to collect air samples upwind and downwind of each work area for the duration of the activities. As work progresses, the stations will be moved to ensure adequate air monitoring site coverage of the field activities. The proposed locations of air monitoring stations based on the predominant prevailing wind direction at NAVSTA TI (west) are shown on Figure 2-1. Air monitoring is performed to estimate and assess the impact of the field activities. The locations of the air monitoring stations will be determined based on the actual prevailing wind direction and may be modified as needed. At the start of field activities, an additional monitoring station will be established downwind to allow flexibility of changing which downwind air monitoring station will be used based on the actual prevailing wind direction. Monitoring stations will not be moved while they are sampling. Radiological air monitoring will be conducted both upwind and downwind of the excavations and in the immediate vicinity of each excavation site in accordance with the applicable radiation work permit requirements and SOP 009, Air Sampling and Sample Analysis. In addition, a windsock will be set up to show wind direction.

Each monitoring station will include the following different monitoring systems: TSP (that will be analyzed for lead), PM_{10}, chemicals of concern (PAHs and PCBs during excavations), and asbestos. Descriptions of these samplers are provided below. Sampling frequency and monitoring methods are listed in Table 3-1.

3.3.2.1 Total Suspended Particulates and Lead

TSP will be sampled with a high-volume (39 to 60 cubic feet per minute [ft^3/min]) air sampler in accordance with EPA's reference sampling method for TSP, described in 40 CFR, Part 50, Subpart B. Each sample will be collected on a filter over the course of a period not to exceed 54 hours; the filter is then weighed to determine the amount of TSP collected. Once the filter weight has been determined, the sample will be analyzed for lead in accordance with a modified EPA Method 12. The equipment specifications and sampling procedures will comply with the specifications provided in the regulations for the sampler, filter, accuracy, calibration, and quality assurances.

The flow of the high-volume air sampler will be properly calibrated to establish traceability of the field measurement. Calibrations shall follow the guidelines specified in 40 CFR, Part 50, Section 9.3, and Section 2.6 of the EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Ambient Air Specific Methods (EPA 1998).

Field logs should be used to properly record information after collecting the samples. Appropriate field data, such as date, time, sample identification, calibration data, sample location, ambient temperature and pressure, and any additional information or observations that could influence analyses of the results, will be entered on the field logs.

3.3.2.2 PM_{10}

PM_{10} will be sampled in accordance with EPA's reference sampling method for PM_{10}, described in 40 CFR 50, Subpart J. Each sample be collected on a filter over a period not to exceed 54 hours; the filter is then weighed to determine the amount of PM_{10} collected.

3.3.2.3 Asbestos

Asbestos will be sampled and analyzed in accordance with NIOSH Method 7400, from the NIOSH Manual of Analytical Methods (NIOSH 1994). Method 7400 requires that samples be collected on three-piece cellulose ester filters fitted with conductive cowlings at a sampling rate of between 0.5 liter per minute (L/min) and 16 L/min. Each sample will be collected over a period not to exceed 54 hours.

3.3.2.4 PAHs and PCBs

PAHs and PCBs will be sampled and analyzed in accordance with the EPA Method TO-13A and TO-04A, respectively, from EPA's Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA 1999). These samplers are designed to draw air at a rate of approximately 8 feet/minute across the sampling cartridge. Each sample will be collected over a period not to exceed 54 hours.

3.3.2.5 Air Sampling for Radionuclide of Concern

Airborne radioactivity monitoring (continuous or grab samples) will be conducted while activities are being conducted inside an RCA. To control occupational exposures, establish personal protective equipment, and determine respiratory protection requirements, monitoring and trending for airborne radioactive material will be performed, as necessary.

3.3.3 Personnel Monitoring

The Site Safety and Health Officer (SSHO) will conduct monitoring to ensure that each site worker is adequately protected. Site monitoring and sampling include real-time air monitoring and perimeter monitoring. In consultation with the Project Environmental Safety Manager (PESM), the SSHO will determine if personal or additional perimeter monitoring is required to evaluate the potential for personnel exposure. All air quality monitoring results that exceed the California Occupational Safety and Health Administration permissible exposure limits (asbestos – 0.1 fiber/cubic centimeter, PM_{10} – 5,000 micrograms per cubic meter ($\mu g/m^3$), TSP – 10 mg/m^3, lead – 50 $\mu g/m^3$, PAHs – 0.5 mg/m^3, and PCBs – 0.5 mg/m^3) will be immediately reported to the PESM, who will evaluate the results. If the evaluation finds

elevated results, personnel monitoring may be required. Depending on the elevated results, addition sampling may be conducted for asbestos, particulate matter, or lead.

3.4 SPILL/RELEASE PREVENTION, RESPONSE, AND REPORTING

The following sections describe spill/release prevention, response, and reporting associated with the work activities.

3.4.1 Spill/Release Prevention

The primary activities that may result in a spill or release include vehicle fueling and management of decontamination waste. Spill/release prevention practices for these activities are as follows:

- **Fueling** – All vehicles will be fueled and serviced prior to moving onto the site. Any on-site fueling of vehicles will be conducted away from drainage areas. Bulk quantities of fuel exceeding 1,320 gallons will not be stored on-site. Absorbent pads or drip pans will be placed on the ground at the fueling point to catch any spills. Fueling operations will be attended and observed at all times. No latch-on fueling will be performed.
- **Decontamination Wastewater** – Wastewater will be stored in double-walled temporary tanks or 55-gallon drums within a secondary containment area. Therefore, any spills from the containers or tanks will be contained and will not be released into the surrounding areas.

3.4.2 Spill/Release Response

In the event of a release of hazardous material into the environment, per the Accident Prevention Plan/Site Safety and Health Plan (TtEC 2012), TtEC will contain or control the release or evacuate the area if the spill is significant or represents an immediate health threat. Spills, leaks, and fires at NAVSTA TI must be reported to the RPM and CSO. In addition, all spills involving radioactive material must be reported to the Radiation Safety Officer (RSO) and the RASO. Absorbent pads, shovels, and U.S. Department of Transportation-approved containers will be kept on-site to address the possibility of spills.

Spill cleanup materials and waste will be containerized, managed, and disposed of as described in the Waste Management Plan (Attachment 5).

3.4.3 Spill/Release Reporting

The steps below outline the chain of communication that will be followed should a significant spill of any hazardous substance occur. Any spill over the reportable quantity as determined by federal and/or state regulations will be considered a significant spill, as will any spill below the reportable quantity not properly contained and released into the environment.

1. Site personnel involved in the spill will immediately contact the Project Superintendent, who will notify the Project Manager (PjM), PESM, and RSO (if radioactive material is

involved). The TtEC Project Superintendent or PjM will contact the RPM and CSO. The RSO will contact the RASO.

2. If a release of a waste or hazardous substance, regardless of quantity, could threaten human health or the environment outside the facility, the PjM will verify that the National Response Center (800-424-8802) and the local Fire Department have been notified by the DON. Releases will be reported, and written follow-up emergency notices will be submitted under the Superfund Amendments and Reauthorization Act, Title II requirements.
3. Any release of fuels or other products that causes sheen on water at the site or any release into the surrounding waters of San Francisco Bay must be reported to the DON immediately, which will then contact the National Response Center.

3.5 WASTE MANAGEMENT PRACTICES

Waste management will follow the procedures presented in the Waste Management Plan (Attachment 5). The Waste Management Plan presents the waste management practices for the types of waste expected to be generated, waste minimization approach, disposal options, and general management practices associated with this task.

4.0 TRAFFIC CONTROL

This section details traffic control measures to minimize impacts on normal traffic flow during performance of the NTCRA.

4.1 REVISED SITE TRAFFIC ROUTES

This work will be conducted in a manner to minimize and avoid conflicts with residents, tenants, and other contractors performing work at NAVSTA TI and maintain uninterrupted traffic flow.

Access/egress to and from the hot spots will be via the Perimeter Road located along the western side of the project site. This will allow all trucks loaded with soil to exit the site without having to travel through the residential neighborhoods. A track-out point will be located at the western edge of the site as described in Section 3.1.1.4. The traffic route and location of the track-out point are shown on Figure 3-1.

Access/egress to and from Buildings 1121 and 1323 during building survey and demolition activities will be via Westside Drive to Gateview Drive as shown on Figure 3-1. Truck traffic associated with the off-haul of the demolition debris will be of a limited duration, anticipated to not exceed 5 days, thus minimizing impacts to the surrounding residential neighborhoods. Track-out points for the demolition activities will be established adjacent to each entrance onto Westside Drive as shown on Figure 3-1.

During the performance of the work on this CTO, if it becomes necessary to modify vehicular traffic patterns at any location, TtEC will notify the ROICC 15 calendar days prior to the proposed modification date, and provide a revised Traffic Control Plan detailing the proposed controls to the traffic movement for approval. The plan shall be in accordance with state and local regulations and the California Manual on Uniform Traffic Control Devices (MUTCD). The contractor shall provide cones, signs, barricades, lights, and other traffic devices or personnel required to control traffic.

4.2 TRAFFIC CONTROLS

Appropriate on-site traffic control measures will be selected in the field based on actual field conditions. Traffic controls will provide for efficient performance of the work in a safe environment while minimizing the impact on normal traffic flow. Traffic controls will be required during construction activities to provide safe working conditions for equipment operations and truck loading for on-site and off-site transportation. Traffic controls may include, but are not limited to, the following:

- The loading and transporting of waste and debris will be scheduled to minimize disruptions to NAVSTA TI traffic. Fieldwork will occur between 7:30 am and 4:00 pm

Monday through Friday, with loading and transporting activities limited to 9:00 am to 2:30 pm to the maximum extent practicable.

- Transportation management strategies such as carpool/vanpool for construction workers will be encouraged.
- Transport trucks removing waste and debris from site area will be staged within the project site to avoid backups along major streets. Close coordination between TtEC and the truck dispatcher will be maintained at all times during loading and unloading activities.
- An area sufficient to park passenger vehicles on-site in the support areas and to park haul trucks in the exclusion zones will be provided.
- Cones, flags, signs, and other traffic control measures will be used as needed to facilitate loading and unloading.

These safety and control measures shall conform to the applicable specifications of the California MUTCD (Caltrans 2010b).

Materials and equipment will not be stored where they might interfere with the free and safe passage of personnel and tenants. At the end of each day's work and at other times when construction operations are suspended for any reason, TtEC will remove equipment and other obstructions from the portion of the roadway used by traffic. In addition, TtEC will adhere to all speed limit requirements.

5.0 DATA AND INFORMATION MANAGEMENT

A large quantity of supportable data will be generated and managed to achieve the DON's objectives for NAVSTA TI. TtEC will seamlessly integrate all phases of the radiological and construction work process using the "cradle-to-grave" data management system that tracks information from initial survey, excavation/hot spot removal, soil screening, and remediation activities through backfilling of survey units and site restoration. In addition, the integrated data management system stores and tracks data generated during radiological survey activities in buildings to confirm the structures are not radiologically contaminated prior to demolition.

The TtEC database management system consists of a series of interconnected Access databases that interact through custom VBA [visual basic for applications] code. Laboratory analytical results are managed in a sample quantitation limit database, which is integrated into the data management system by means of custom computer programs via the Access databases. This system easily incorporates laboratory analytical results, digital photographs, and figures into data packages and reports for the DON and regulatory agency review. This system provides near real-time management of information and facilitates storage of hundreds of thousands of data points, supports querying and analysis functions, and expedites the preparation of quality reports, documents, and presentations. To best support the DON's short- and long-term needs at NAVSTA TI, the system has the capacity for supporting multiple current and future radiological remediation contracts and task orders. An internet portal will be set up to support DON and agency review of data and reports over the course of the fieldwork.

Database modules specifically developed for radiological soil removal actions and building/site radiological survey activities include the following:

- Excavation Survey Unit Module to manage excavation scan readings and static measurements, systematic and biased samples collected, contamination identified and remediated, verification samples, and generated FSS data.
- Excavated Soil Module to track each truckload of excavated soil.
- Soil Screening Module to track excavated soil from the time it enters the screening pad, and if necessary, remediation and disposal activities until final disposition and transfer to the appropriate LLRW or non-LLRW contractors. Screening data will be transmitted to the RASO for concurrence for non-LLRW or LLRW disposal, as appropriate.
- Chain-of-Custody Module to track samples from generation through delivery to the chemical and radiological laboratories. This module prepares and completes chain-of-custody documents and sample labels using optical character recognition technology to ensure accurate sample tracking.
- Building/Site Survey Unit Module to upload field data generated by data logging instruments during survey activities including scan readings and static/direct

measurements; it flags results that indicate that remediation may be required. This module interacts with the swipe and soil sample laboratory analytical results to produce geo-referenced figures and data packages that are ultimately incorporated into reports submitted to the DON and regulators.

- Materials and Equipment (M&E) Module to track materials and equipment (including but not limited to abandoned appliances/material within the buildings) survey activities, results, and final disposition.
- Ancillary Module to track asphalt removed from the excavation areas to ensure proper correlation with the associated survey units and final disposition.
- Waste Management Module to track quantities of contaminated soil, construction materials, and equipment for both LLRW and non-LLRW final disposition.
- Backfill Module to track import material used for backfilling excavations.
- Waste Management Module to track quantities of contaminated soil, construction materials, and equipment for both LLRW and non-LLRW final disposition.
- Analytical Results Module for analytical results. This module facilitates uploading laboratory analytical results to the SQL database for storage and querying on a daily basis by running specifically developed software that can handle multiple laboratory data formats. This module tracks the status of each sample submitted and analyzed, and flags elevated sample analytical results for further review.

Through this system, TtEC will track continuing operations, process flow, and multiple media pathways to ensure a seamless and efficient operation. Reports generated by the data management system will enable the Senior PjM and the DON to efficiently manage and prioritize radiological support and quickly identify potential challenges or issues. The integrated data management system efficiently generates routine updates for the DON, which allows for quick and accurate responses to the DON's data requests, and facilitates the Senior PjM's ability to identify trends and potential issues. The data produced using this system provide the basis for the daily and monthly progress reports, and facilitate the generation of appropriate data packages and presentations for use by the DON. Through the data management system, survey data will be easily uploaded to the Naval Installation Restoration Information Solution database.

6.0 REPORTING

Over the course of this project, two types of reports will be drafted: the FSS Report and the RACR. Each type of report is described in this section.

6.1 FINAL STATUS SURVEY REPORTS

To support obtaining free release of the two hot spot areas, an FSS Report will be completed for the hot spot excavations surveyed and found to meet the radiological remediation objective for free release. This report will include the following:

- Summary of site activities
- Sampling approach for the site
- Sampling methods used
- Data assessment
- Data evaluation
- Dose modeling
- Recommendation for free release

6.2 REMOVAL ACTION COMPLETION REPORT

Once the FSSs of the hot spot removals have been completed and Buildings 1121 and 1323 have been demolished, a RACR will be drafted. The RACR will demonstrate that the appropriate fieldwork has been completed to meet the requirements of the AM and this NTCRA Work Plan. The report will:

- Summarize the surveys and demolition of the buildings and the surveys and removals of the hot spots.
- Discuss unexpected conditions encountered in the field.
- Document deviation from and acceptance of changes to this NTCRA Work Plan, the Task-specific Plan (TtEC 2013a), or the Demolition Work Procedure (TtEC 2013b).
- Provide certifications and verifications.
- Include as-built survey data.
- Include copies of permits (if any).
- Provide waste disposal records.
- Present as-built drawings.

This report will also include the FSS report for the hot spot removals as an appendix. This report will be signed and sealed by an appropriate State of California Registered Professional Engineer.

This page intentionally left blank.

7.0 REFERENCES

American National Standards Institute (ANSI). 2006. Safety and Health Program Requirements for Demolition Operations, A10.6-2006. September 11.

Caltrans (California Department of Transportation). 2010a. Standard Specifications, Section 19 Earthwork.

_____. 2010b. California Manual on Uniform Traffic Control Devices for Streets and Highways.

CDPH (California Department of Public Health). 2011. Treasure Island, Site 12 Gamma Survey Report, Survey Dates: April 5–7, 2011. September 23.

DoD (Department of Defense), Department of Energy, Nuclear Regulatory Commission, and U.S. Environmental Protection Agency. 2000. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, Revision 1. August.

DON (Department of Navy). 2007. Action Memorandum/Interim Remedial Action Plan: Non-Time Critical Removal Action for Solid Waste Disposal Areas, Installation Restoration Site 12, Old Bunker Area, Naval Station Treasure Island, San Francisco, California. February 15.

EPA (U.S. Environmental Protection Agency). 1998. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Ambient Air Specific Methods.

_____. 1999. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. EPA/625/R-96/010a. June.

National Demolition Association. 2004. Demolition Safety Manual.

NAVFAC (Naval Facilities Engineering Command). 1986. Soil Mechanics Design Manual 7.01. September 1.

NIOSH (National Institute for Occupational Safety and Health). 1994. NIOSH Manual of Analytical Methods. Method 7400. August.

OSHA (Occupational Safety and Health Administration). OSHA Technical Manual, Section V, Construction Operation, Chapter 1, Demolition. http://www.osha.gov/dts/osta/otm/otm_v/otm_v_1.html.

Shaw (Shaw Environmental, Inc.). 2007. Removal Action Work Plan/Remedial Design, Non-Time Critical Removal Action, Installation Restoration Site 12, Three Solid Waste Disposal Areas (SWDAs A&B, 1207/1209, and 1231/1233), Treasure Island, San Francisco, California. February 26.

TtEC (Tetra Tech EC, Inc.). 2012. Accident Prevention Plan/Site Safety and Health Plan, Non-Time-Critical Removal Action for Solid Waste Disposal Area, Radiological Hot Spot Removal and Building Demolition, Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California. December.

——————. 2013a. Task-specific Plan for Buildings 1121 and 1323, Non-Time-Critical Removal Action for Solid Waste Disposal Area, Radiological Hot Spot Removal and Building Demolition, Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California. April.

——————. 2013b. Demolition Work Procedure for Buildings 1121 and 1323, Non-Time-Critical Removal Action for Solid Waste Disposal Area, Radiological Hot Spot Removal and Building Demolition, Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California. April.

USACE (United States Army Corps of Engineers). 2008. Safety and Health Requirements Manual, EM 385-1-1.

Weston (Weston Solutions, Inc.). 2006. Treasure Island Naval Station Historical Radiological Assessment, Former Naval Station Treasure Island, San Francisco, California. February.

TABLES

This page intentionally left blank.

TABLE 3-1

SAMPLING FREQUENCY AND MONITORING METHODS

Test Scenario	Type of Analysis	Monitoring Method	Frequency
Excavation, Soil Handling, and Soil Screening (upwind and downwind)	TSP	40 CFR, Part 50, Subpart B EPA Method 12 (Pb)	1 sample per workday 2–3 samples per workweek
	PM_{10}	40 CFR, Part 50, Subpart J	1 sample per workday 2–3 samples per workweek
	PCBs/PAHs	EPA Method TO-04A and TO-13A	1 sample per workday 2–3 samples per workweek
	ROCs	SOP 009*	1 sample per workday 2–3 samples per workweek
Building Demolition and Debris Handling (upwind and downwind)	TSP	40 CFR, Part 50, Subpart B EPA Method 12 (Pb)	1 sample per workday 2–3 samples per workweek
	PM_{10}	40 CFR, Part 50, Subpart J	1 sample per workday 2–3 samples per workweek
	Asbestos	NIOSH Method 7400	1 sample per workday 2–3 samples per workweek
	ROCs	SOP 009*	1 sample per workday 2–3 samples per workweek

Notes:

* SOP 009, Air Sampling and Sample Analysis, is a standard operating procedure used for radiological air sampling activities. Most current version will be used.

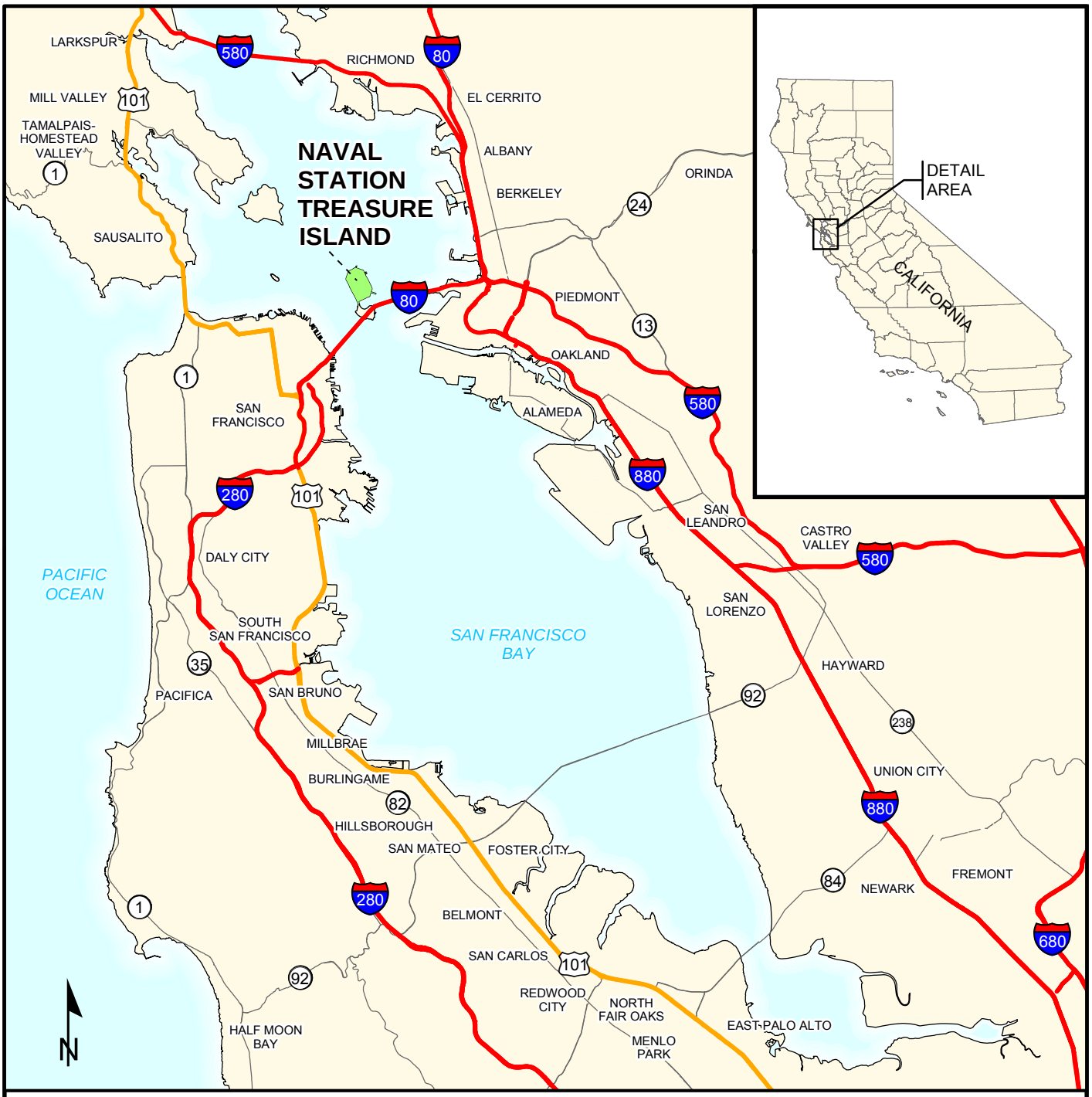
Abbreviations and Acronyms:

CFR – *Code of Federal Regulations*
EPA – U.S. Environmental Protection Agency
NIOSH – National Institute for Occupational Safety and Health
PAH – polynuclear aromatic hydrocarbon
PCB – polychlorinated biphenyl
PM_{10} – particulate matter smaller than 10 microns in diameter
ROC – radionuclide of concern
SOP – standard operating procedure
TSP – total suspended particulates

This page intentionally left blank.

FIGURES

This page intentionally left blank.



LEGEND

- STATE HIGHWAY
- US HIGHWAY
- INTERSTATE HIGHWAY
- NAVAL STATION TREASURE ISLAND
- WATER

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

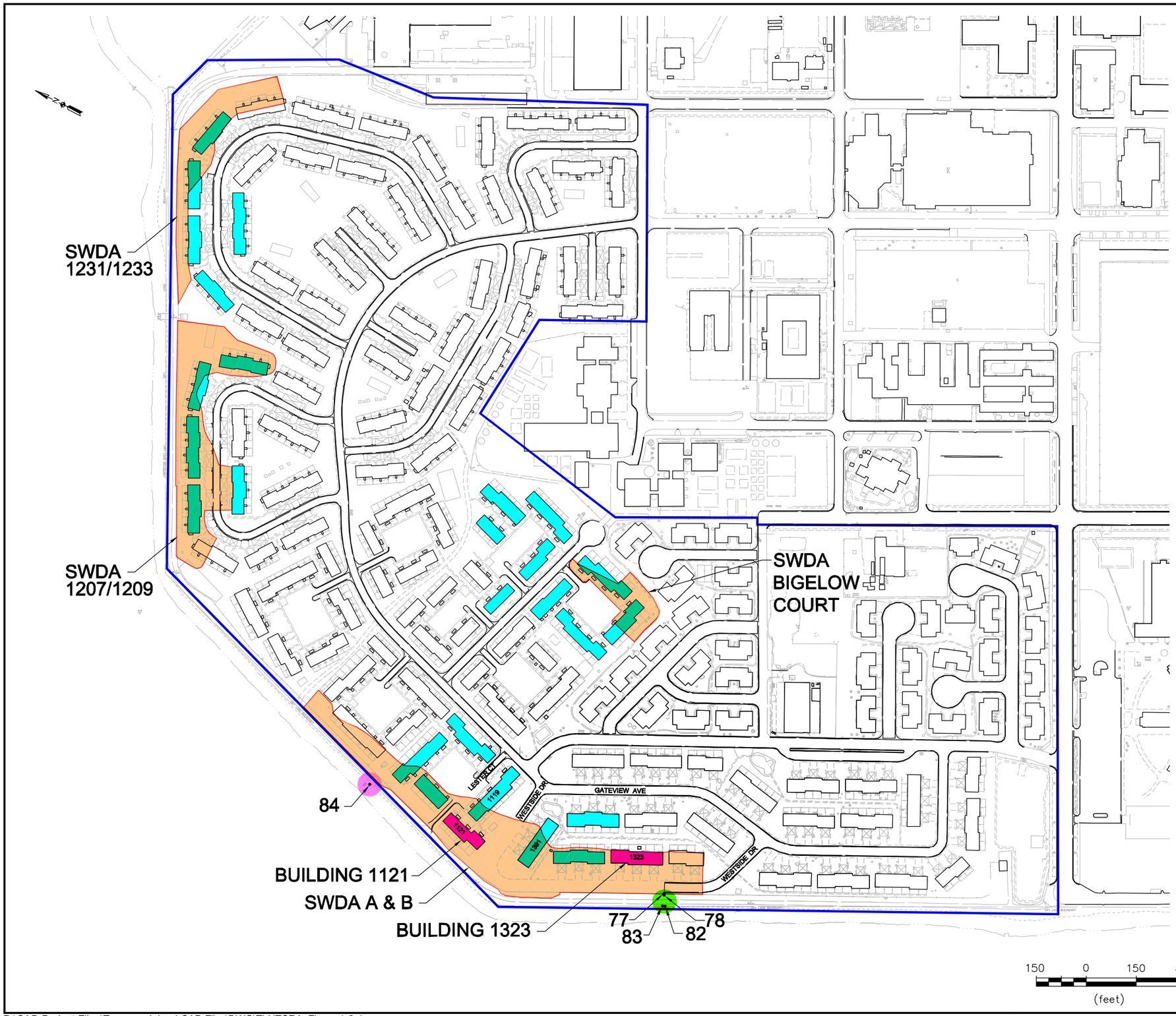
NTCRA WORK PLAN
INSTALLATION RESTORATION SITE 12

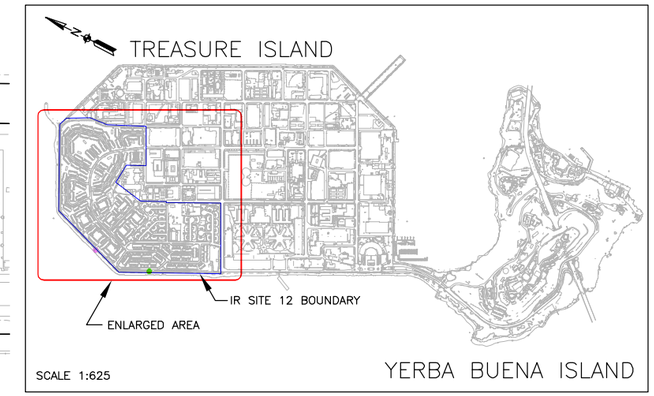
FIGURE 1-1
REGIONAL LOCATION MAP
NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA

REVISION:
AUTHOR: DMACK
DCN:

TETRA TECH EC, INC.

P:\GIS\projects\Treasure Island\Fig1-1 Regional Location Map - Treasure Island (NTCRA).mxd





LEGEND:

- IR SITE 12 BOUNDARY
- SOLID WASTE DISPOSAL AREAS (SWDAs)
- • 77 AREAS OF ELEVATED ACTIVITY
- BUILDINGS TO BE DEMOLISHED
- BUILDINGS
- UNOCCUPIED BUILDINGS
- NORTHERN HOT SPOT (INCLUDES SAMPLE ID 84)
- SOUTHERN HOT SPOT (INCLUDES SAMPLE IDS 77, 78, 82, AND 83)

CDPH Elevated Activity Data

Sample ID	Longitude	Latitude	Exposure Rate one meter (µR/hr)	Exposure Rate contact (µR/hr)	Dose Rate one meter (µrem/hr)	Dose Rate contact (µrem/hr)	Gamma Count Rate contact (cpm)
77	-122.3780747	37.82557866	8	800	4	500	349224
78	-122.3780826	37.82557246	8	11	4	13	53735
82	-122.3781783	37.825522	6.5	90	4	80	155981
83	-122.3781904	37.82554082	6	28	5	10	24428
84	-122.378509	37.8281435	12.5	600	5	450	880097

Source: CDPH 2011

NOTE:
AREAS OF ELEVATED ACTIVITY (77, 78, 82, 83, AND 84) BASED ON CALIFORNIA DEPARTMENT OF PUBLIC HEALTH SURVEY PERFORMED IN APRIL 2011 (TREASURE ISLAND, SITE 12 GAMMA SURVEY REPORT, SURVEY DATES: APRIL 5–7, 2011 DATED SEPTEMBER 23, 2011).

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

NTCRA WORK PLAN
INSTALLATION RESTORATION SITE 12

FIGURE 1-2

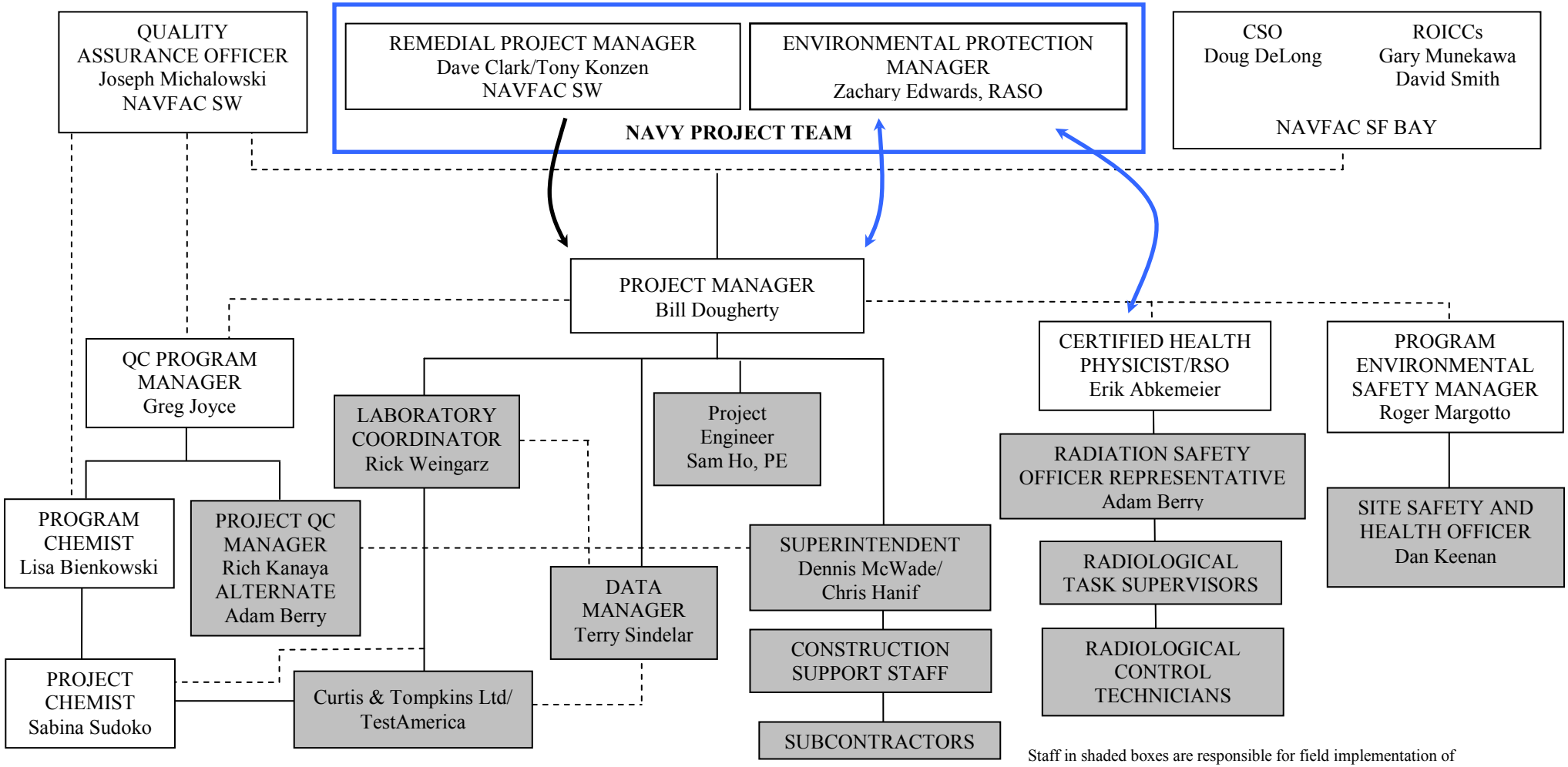
SITE LOCATION MAP
NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CA

REVISION:
AUTHOR: A.CRABTREE
PROJECT NO:
FILE: SEE BELOW

TETRA TECH EC, INC.

FIGURE 1-3

PROJECT ORGANIZATION CHART



Staff in shaded boxes are responsible for field implementation of activities under the NTCRA Work Plan.

The Construction Manager (Jeff Bray) has overall responsibility for coordinating the activities of on-site technical staff.

Abbreviations and Acronyms:
CSO – Contractor Site Office
NAVFAC SW – Naval Facilities Engineering Command Southwest
NTCRA – Non-Time-Critical Removal Action
RASO – Radiological Affairs Support Office
ROICC – Resident Officer in Charge of Construction
RSO – Radiation Safety Officer
QC – quality control
SF – San Francisco

Legend

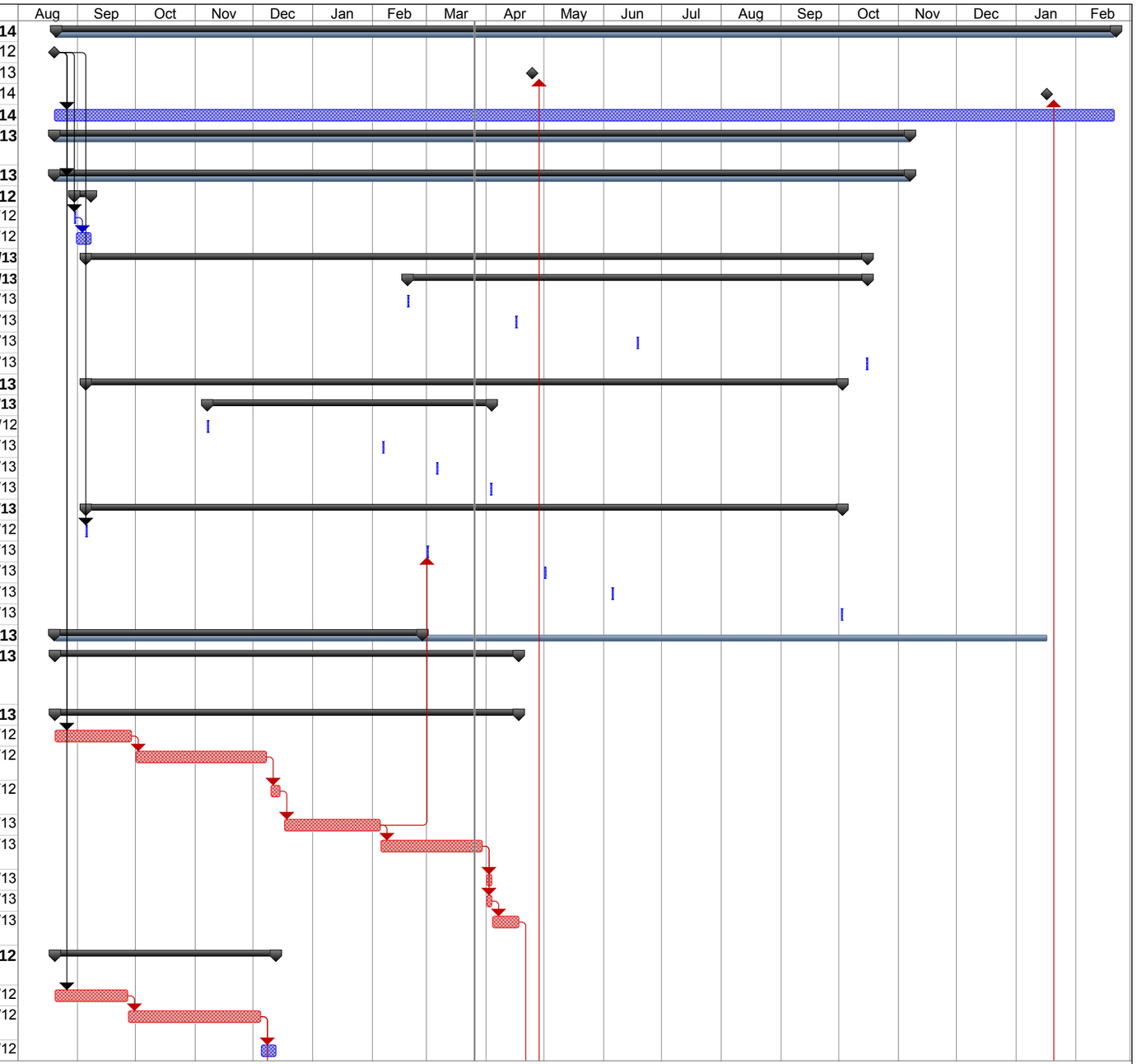
Formal reporting relationship

Supporting relationship

Primary lines of technical communication

Line of technical direction (alternate where dashed)

ID	Task Name	Duration	Start	Finish
1	**GENERAL**	**386 days**	**Tue 8/21/12**	**Fri 2/21/14**
2	Contract Award	0 days	Mon 8/20/12	Mon 8/20/12
3	Field Work Notice to Proceed	0 days	Wed 4/24/13	Wed 4/24/13
4	Project Complete	0 days	Thu 1/16/14	Thu 1/16/14
5	**Project Management/Administrative Support**	**550 edays**	**Mon 8/20/12**	**Fri 2/21/14**
6	**PTO X002 NTCRA for SWDA - Radiological Hot Spot Removal and Building Demolition IR 12**	**311 days**	**Mon 8/20/12**	**Wed 11/6/13**
7	**Project Meetings**	**311 days**	**Mon 8/20/12**	**Wed 11/6/13**
8	**Kick off meeting**	**6 days**	**Thu 8/30/12**	**Fri 9/7/12**
9	Attend Meeting (Meeting date TBD by the RPM)	1 day	Thu 8/30/12	Thu 8/30/12
10	Meeting minutes (within 10 days of meeting)	5 days	Fri 8/31/12	Fri 9/7/12
11	**Community Relations and Regulatory Interaction**	**284 days**	**Wed 9/5/12**	**Tue 10/15/13**
12	**RAB Meetings (3rd Tues pm, Every other Month)**	**168 days**	**Tue 2/19/13**	**Tue 10/15/13**
13	RAB Meeting 1 - Present Draft Work Plan and RTCs	1 day	Tue 2/19/13	Tue 2/19/13
14	RAB Meeting 2 - Update on field activities	1 day	Tue 4/16/13	Tue 4/16/13
15	RAB Meeting 3 - Update on field activities	1 day	Tue 6/18/13	Tue 6/18/13
16	RAB Meeting 4 - Present Draft RACR and RTCs	1 day	Tue 10/15/13	Tue 10/15/13
17	**BCT Meetings (1st Wed every month)**	**275 days**	**Wed 9/5/12**	**Wed 10/2/13**
18	**BCT Monthly Meetings**	**103 days**	**Wed 11/7/12**	**Wed 4/3/13**
19	BCT Monthly Meeting 1 (San Francisco)	1 day	Wed 11/7/12	Wed 11/7/12
20	BCT Monthly Meeting 2 (San Francisco)	1 day	Wed 2/6/13	Wed 2/6/13
21	BCT Monthly Meeting 3 (San Francisco)	1 day	Wed 3/6/13	Wed 3/6/13
22	BCT Monthly Meeting 4 (San Francisco)	1 day	Wed 4/3/13	Wed 4/3/13
23	**BCT Technical Meetings**	**275 days**	**Wed 9/5/12**	**Wed 10/2/13**
24	BCT Technical Meeting 1 - Work Plan Scoping	1 day	Wed 9/5/12	Wed 9/5/12
25	BCT Technical Meeting 2 - Work Plan RTC Meeting	1 day	Fri 3/1/13	Fri 3/1/13
26	BCT Technical Meeting 3 - TBD by Navy	1 day	Wed 5/1/13	Wed 5/1/13
27	BCT Technical Meeting 4 - TBD by Navy	1 day	Wed 6/5/13	Wed 6/5/13
28	BCT Technical Meeting 5 - RACR RTC Meeting	1 day	Wed 10/2/13	Wed 10/2/13
29	**Prepare NTCRA Work Plan and Supporting Documents**	**133 days**	**Mon 8/20/12**	**Tue 2/26/13**
30	**Work Plan w/SAP, RPP, EPP (DMP and SWMP), CQCP, Demolition Work Procedure, RMP, Project Management, WMP, Traffic Plan, Data Management Plan**	**169 days**	**Mon 8/20/12**	**Wed 4/17/13**
31	**Work Plan**	**169 days**	**Mon 8/20/12**	**Wed 4/17/13**
32	Prepare Internal Draft Work Plan	29 days	Mon 8/20/12	Fri 9/28/12
33	Navy Review of Internal draft Work Plan (60 days per SMP for RASO Review)	49 days	Mon 10/1/12	Fri 12/7/12
34	Prepare Draft Work Plan (7 days after Navy comments per SMP)	5 days	Mon 12/10/12	Fri 12/14/12
35	Regulator Review of Draft Work Plan (30 days per SMP)	34 days	Mon 12/17/12	Mon 2/4/13
36	Develop/Submit Internal Final Work Plan and RTCs/Participate in Working Meeting w Navy/Agencies (33 days per SMP)	39 days	Tue 2/5/13	Fri 3/29/13
37	Navy Review of Internal Final Work Plan (14 days per SMP)	3 days	Mon 4/1/13	Wed 4/3/13
38	Develop/Submit Final Work Plan to Agencies (14 days per SMP)	3 days	Mon 4/1/13	Wed 4/3/13
39	Agency Review of Final Work Plan (14 days per SMP; Plan finalized if no comments received within 14 days per SMP)	10 days	Thu 4/4/13	Wed 4/17/13
40	**Site Safety and Health / Accident Prevention Plan (SSHP/APP)**	**81 days**	**Mon 8/20/12**	**Wed 12/12/12**
41	Prepare Internal Draft SSHP/APP	27 days	Mon 8/20/12	Wed 9/26/12
42	NMPHC / RPM / NAVFAC SW Safety Office Review Draft SSHP/APP	48 days	Thu 9/27/12	Tue 12/4/12
43	Prepare Final SSHP/APP Plan	6 days	Wed 12/5/12	Wed 12/12/12

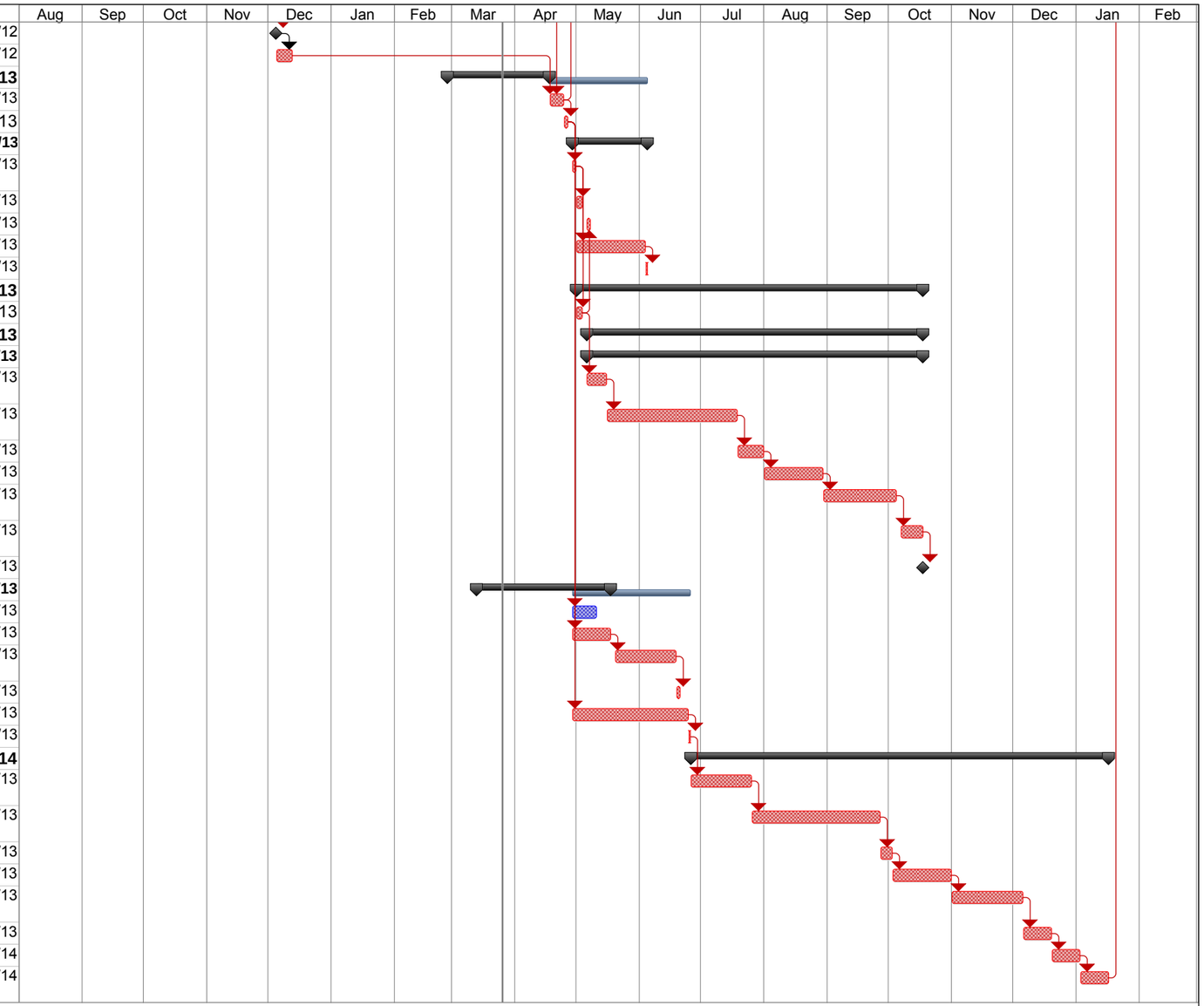


Project: CTO 0013 Draft NAVSTA TI I
Date: Tue 3/26/13

Task		Rolled Up Task		Inactive Task		Manual Task		Start-only	
Critical Task		Rolled Up Critical Task		Inactive Task		Duration-only		Finish-only	
Milestone		Rolled Up Progress		Inactive Milestone		Manual Summary Rollup		Progress	
Summary		Group By Summary		Inactive Summary		Manual Summary			

Figure 1-4 Project Schedule
NTCRA Work Plan
Naval Station Treasure Island, San Francisco, CA

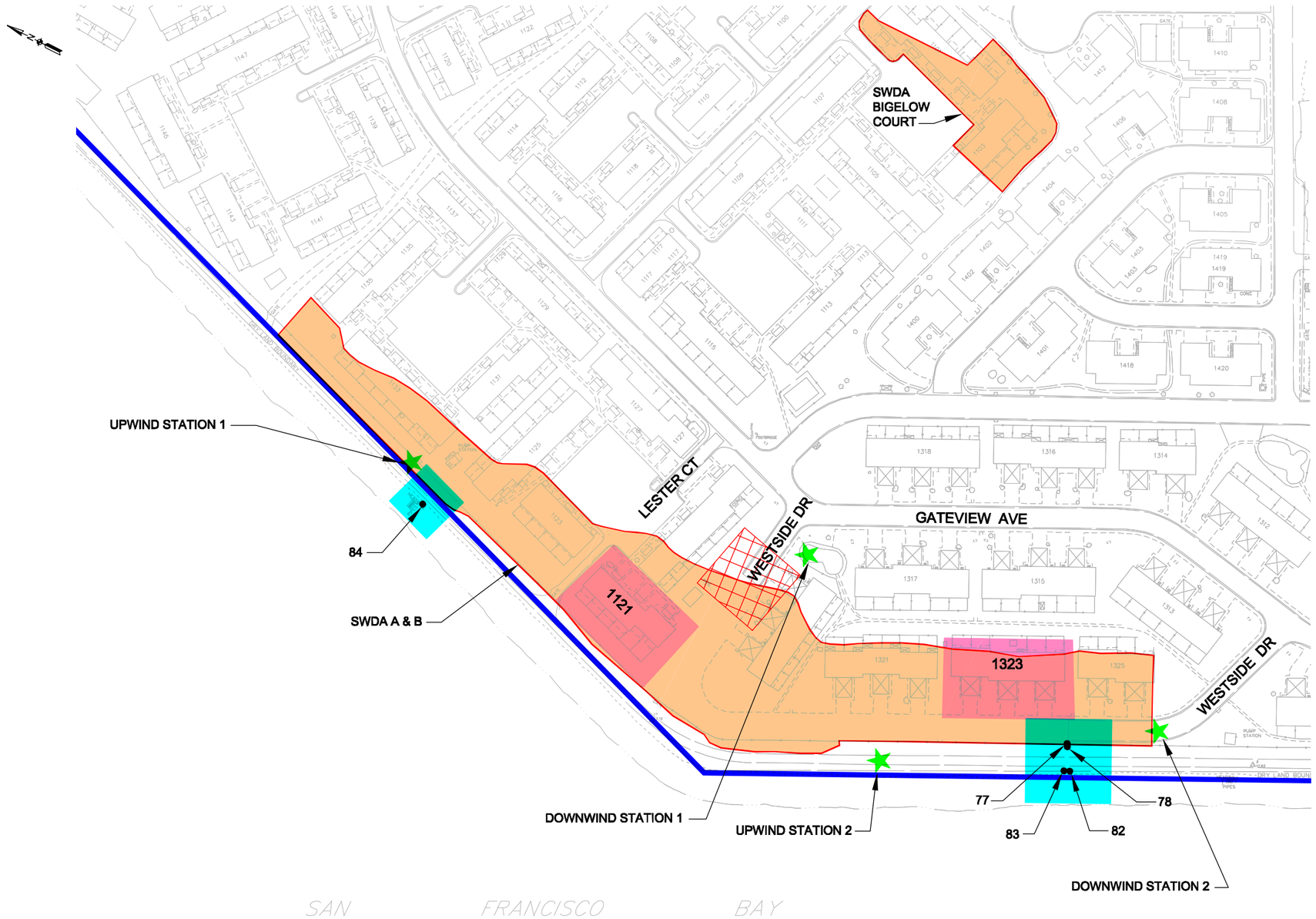
ID	Task Name	Duration	Start	Finish
44	Submit RTC's for Navy Review/Approval	0 days	Tue 12/4/12	Tue 12/4/12
45	Issue Final SSHP/APP Plan	6 days	Wed 12/5/12	Wed 12/12/12
46	**Field Work "Implement the NTCRA Work Plan"**	**36 days**	**Wed 2/27/13**	**Wed 4/17/13**
47	**Receive Notice to Proceed**	5 days	Thu 4/18/13	Wed 4/24/13
48	**Mobilization**	2 days	Thu 4/25/13	Fri 4/26/13
49	**Site Work - Removal Activities**	**26 days**	**Mon 4/29/13**	**Tue 6/4/13**
50	Radiological Soil Screening / Excavation of Hot Spots / Remediate / Spread Material on Pad	2 days	Mon 4/29/13	Tue 4/30/13
51	Scan / Sample Pad Material / Remediate	3 days	Wed 5/1/13	Fri 5/3/13
52	Backfill Excavations / Site Restoration	2 days	Mon 5/6/13	Tue 5/7/13
53	Waste Characterization and Disposal	23 days	Wed 5/1/13	Mon 6/3/13
54	Scan Ground Surface after Pad Removal	1 day	Tue 6/4/13	Tue 6/4/13
55	**Implement Final Status Survey at Westside Drive Hotspots**	**119 days**	**Wed 5/1/13**	**Thu 10/17/13**
56	Survey / Sample Excavated Hot Spots	3 days	Wed 5/1/13	Fri 5/3/13
57	**Final Status Survey Report**	**116 days**	**Mon 5/6/13**	**Thu 10/17/13**
58	**FSS Report for Hot Spots**	**116 days**	**Mon 5/6/13**	**Thu 10/17/13**
59	Prepare Internal Draft FSS (no later than 60 days after FSS confirmation results received)	8 days	Mon 5/6/13	Wed 5/15/13
60	Navy Review of Internal Draft FSS (60 day RASO Review per SMP)	44 days	Thu 5/16/13	Thu 7/18/13
61	Prepare Draft FSS (14 days after Navy comments)	9 days	Fri 7/19/13	Wed 7/31/13
62	Agency Review of Draft FSS (30 days per SMP)	21 days	Thu 8/1/13	Thu 8/29/13
63	Develop Final FSS and RTCs/Participate in Working Meeting w Navy/Agencies (33 days per SMP)	25 days	Fri 8/30/13	Fri 10/4/13
64	Final FSS (14 days after Regulatory/Public Concurrence on RTCs)	9 days	Mon 10/7/13	Thu 10/17/13
65	Issue Final FSS	0 days	Thu 10/17/13	Thu 10/17/13
66	**Demolition of Buildings 1121 and 1323**	**48 days**	**Wed 3/13/13**	**Fri 5/17/13**
67	Asbestos and Lead Abatement	10 days	Mon 4/29/13	Fri 5/10/13
68	M&E / Building Surveys	15 days	Mon 4/29/13	Fri 5/17/13
69	Navy and CDPH Review of Survey Data / CDPH Perform Confirmatory Survey	21 days	Mon 5/20/13	Tue 6/18/13
70	Building Demolition	2 days	Wed 6/19/13	Thu 6/20/13
71	Waste Management and Disposal	40 days	Mon 4/29/13	Mon 6/24/13
72	Demobilization	1 day	Tue 6/25/13	Tue 6/25/13
73	**Removal Action Completion Reports (RACR)**	**144 days**	**Wed 6/26/13**	**Thu 1/16/14**
74	Prepare Internal Draft RACR (no later than 60 days after building demolition/debris disposed)	21 days	Wed 6/26/13	Thu 7/25/13
75	Navy Review of Internal draft RACR (60 day RASO Review per SMP)	44 days	Fri 7/26/13	Thu 9/26/13
76	Prepare Draft RACR(7 days after Navy comments per SMP)	4 days	Fri 9/27/13	Wed 10/2/13
77	Regulator Review of Draft RACR (30 days per SMP)	21 days	Thu 10/3/13	Thu 10/31/13
78	Develop/Submit Internal Final RACR and RTCs/Participate in Working Meeting w/ Navy/Agencies (33 days per SMP)	24 days	Fri 11/1/13	Thu 12/5/13
79	Navy Review of Internal Final RACR (14 days per SMP)	10 days	Fri 12/6/13	Thu 12/19/13
80	Develop/Submit Final RACR to Agencies (14 days per SMP)	10 days	Fri 12/20/13	Thu 1/2/14
81	Agency Review of Final RACR (14 days per SMP; RACR finalized if no comments received within 14 days)	10 days	Fri 1/3/14	Thu 1/16/14

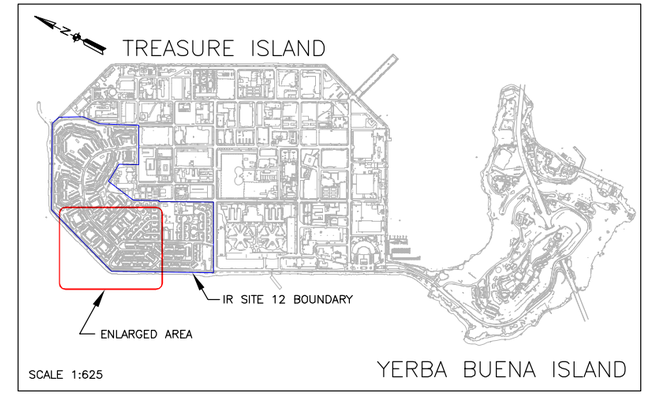


Project: CTO 0013 Draft NAVSTA TI I
Date: Tue 3/26/13

Task	Rolled Up Task	Inactive Task	Manual Task	Start-only
Critical Task	Rolled Up Critical Task	Inactive Task	Duration-only	Finish-only
Milestone	Rolled Up Progress	Inactive Milestone	Manual Summary Rollup	Progress
Summary	Group By Summary	Inactive Summary	Manual Summary	

Figure 1-4 Project Schedule
NTCRA Work Plan
Naval Station Treasure Island, San Francisco, CA





LEGEND:

- IR SITE 12 BOUNDARY
- SOLID WASTE DISPOSAL AREAS (SWDAs)
- BUILDING DEMOLITION WORK AREA
- HOT SPOT EXCAVATION WORK AREA
- ● 77 AREAS OF ELEVATED ACTIVITY
- AIR MONITOR LOCATION
- BUILDINGS
- SOIL SCREENING PAD

NOTE:
AREAS OF ELEVATED ACTIVITY (77, 78, 82, 83, AND 84) BASED ON CALIFORNIA DEPARTMENT OF PUBLIC HEALTH SURVEY PERFORMED IN APRIL 2011 (TREASURE ISLAND, SITE 12 GAMMA SURVEY REPORT, SURVEY DATES: APRIL 5–7, 2011 DATED SEPTEMBER 23, 2011).

80 0 80 160
(feet)

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

NTCRA WORK PLAN
INSTALLATION RESTORATION SITE 12

FIGURE 2-1

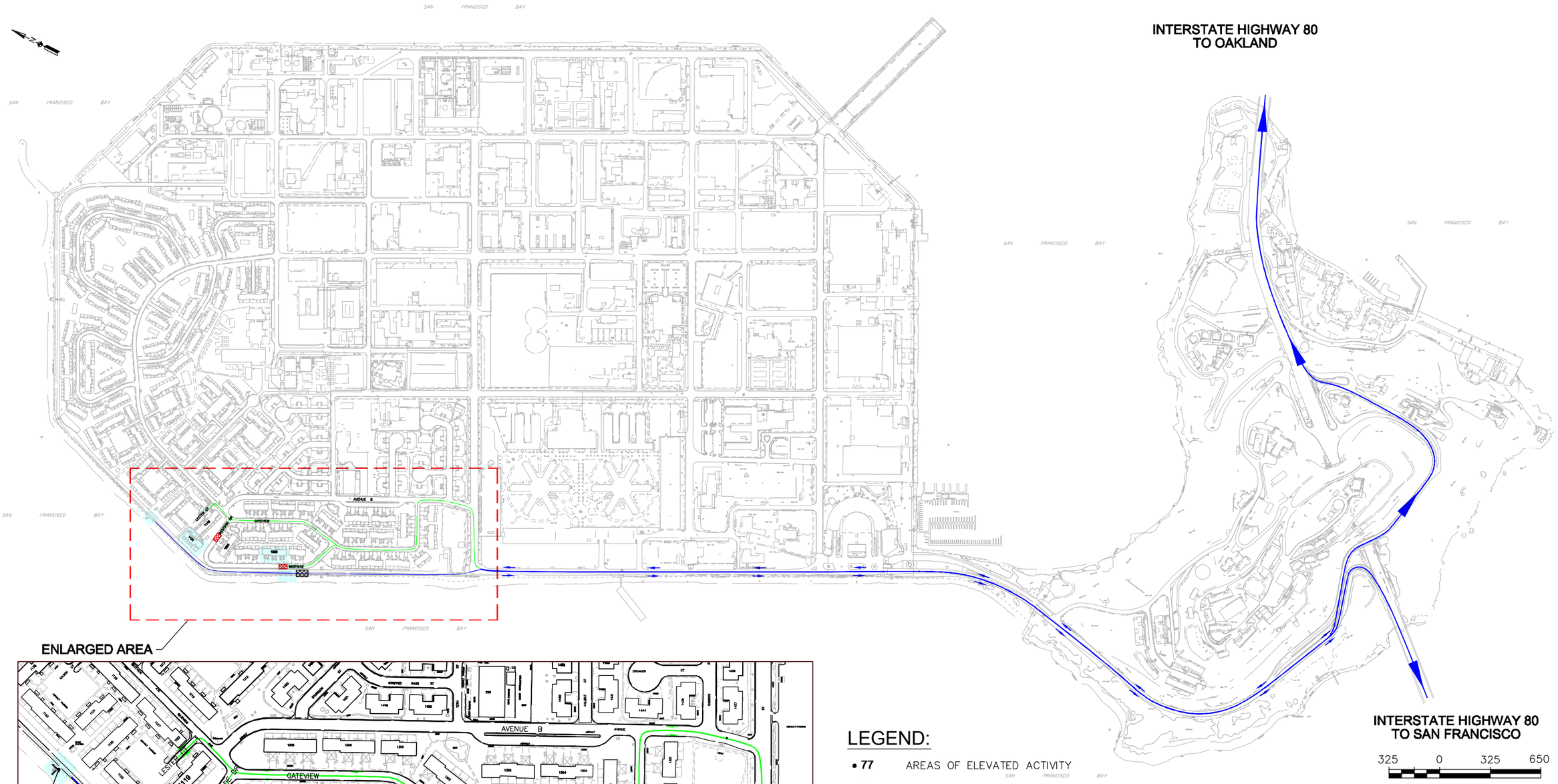
AIR MONITORING STATION LOCATIONS
NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CA

REVISION:
AUTHOR: A.CRABTREE
PROJECT NO:
FILE: SEE BELOW

TETRA TECH EC, INC.

P:\CAD Project Files\Treasure Island CAD Files\DWG\TI-NTCRA_Figure 2-1.dwg

9/26/12



LEGEND:

- • 77 AREAS OF ELEVATED ACTIVITY
- HOT SPOT TRUCK HAUL ROUTE
- CONSTRUCTION PERSONNEL AND BUILDING DEMOLITION TRUCK ROUTES
- WORK AREAS
- TRACK–OUT CONTROL POINT FOR HOT SPOTS
- TRACK–OUT CONTROL POINT FOR BUILDING DEBRIS TRANSPORTATION

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

NTCRA WORK PLAN
INSTALLATION RESTORATION SITE 12

FIGURE 3-1

TRACK-OUT CONTROL POINTS AND TRAFFIC ROUTES
NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CA

REVISION:
AUTHOR: A.CRABTREE
PROJECT NO:
FILE: SEE BELOW

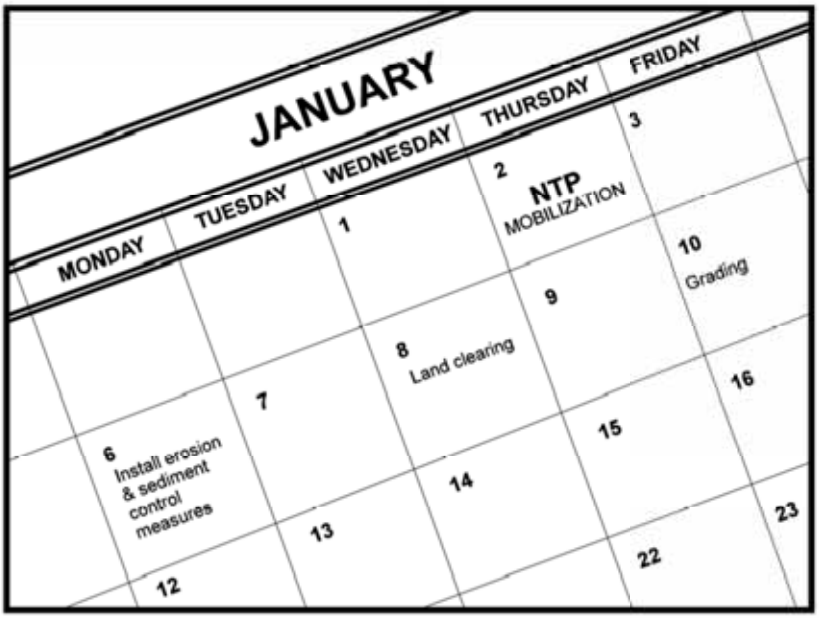
TETRA TECH EC, INC.

APPENDIX A

BMP FACT SHEETS
(on CD ~~only~~)

This page intentionally left blank.

Scheduling EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase

of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

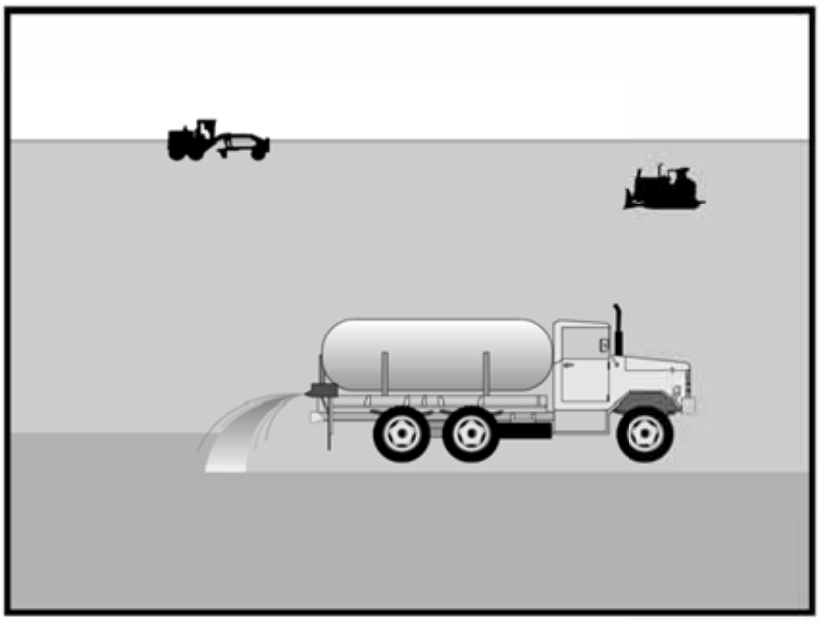
References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Soil Binders

EC-5



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

Soil binding consists of application and maintenance of a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water and wind induced erosion of exposed soils on construction sites.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring temporary protection. Because soil binders, when used as a stand-alone practice, can often be incorporated into the soil, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are commonly used in the following areas:

- Rough graded soils that will be inactive for a short period of time
- Soil stockpiles
- Temporary haul roads prior to placement of crushed rock
- Compacted soil road base
- Construction staging, materials storage, and layout areas

Limitations

- Soil binders are temporary in nature and may need reapplication.

- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.
- Plant-material-based soil binders do not generally hold up to pedestrian or vehicular traffic across treated areas as well as polymeric emulsion blends or cementitious-based binders.
- Soil binders may not sufficiently penetrate compacted soils.
- Some soil binders are soil texture specific in terms of their effectiveness. For example, polyacrylamides (PAMs) work very well on silt and clayey soils but their performance decreases dramatically in sandy soils.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of some chemical soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup.

Implementation

General Considerations

- Soil binders should conform to local municipality specifications and requirements.
- Site soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater when cured. Obtain a Material Safety Data Sheet (MSDS) from the manufacturer to ensure non-toxicity.
- Stormwater runoff from PAM treated soils should pass through one of the following sediment control BMP prior to discharging to surface waters.
  - When the total drainage area is greater than or equal to 5 acres, PAM treated areas should drain to a sediment basin.
  - Areas less than 5 acres should drain to sediment control BMPs, such as a sediment trap, or a series of check dams. The total number of check dams used should be maximized to achieve the greatest amount of settlement of sediment prior to discharging from the site. Each check dam should be spaced evenly in the drainage channel through which stormwater flows are discharged off site.
- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.

- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this Fact Sheet. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application is related to the functional longevity of the binder, which can be affected by subgrade conditions, surface type, climate, and maintenance schedule.
- Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material-Based (Short Lived, <6 months) Binders

Guar: Guar is a non-toxic, biodegradable, natural galactomannan-based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

Application Rates for Guar Soil Stabilizer

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

Psyllium: Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together, but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

Starch: Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material-Based (Long Lived, 6-12 months) Binders

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound typically requires 12 to 24 hours drying time. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with the manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:1 to 1:1	10.0 – 20.0

Poly-Acrylamide (PAM) and Copolymer of Acrylamide: Linear copolymer polyacrylamide for use as a soil binder is packaged as a dry flowable solid, as a liquid. Refer to the manufacturer's recommendation for dilution and application rates as they vary based on liquid or dry form, site conditions and climate.

- Limitations specific to PAM are as follows:

- Do not use PAM on a slope that flows into a water body without passing through a sediment trap or sediment basin.

- The specific PAM copolymer formulation must be anionic. Cationic PAM should not be used in any application because of known aquatic toxicity problems. Only the highest drinking water grade PAM, certified for compliance with ANSI/NSF Standard 60 for drinking water treatment, should be used for soil applications.

- PAM designated for erosion and sediment control should be "water soluble" or "linear" or "non-cross linked".

- PAM should not be used as a stand-alone BMP to protect against water-based erosion. When combined with mulch, its effectiveness increases dramatically.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

Cementitious-Based Binders

Gypsum: This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.

- Prior to application, roughen embankment and fill areas.

- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.

- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.

- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.

- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.

- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd^2 or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd^2.

Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate installed costs:

Soil Binder	Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Plant-Material-Based (Short Lived) Binders	$700-$900	$770-$990
Plant-Material-Based (Long Lived) Binders	$1,200-$1,500	$1,320-$1,650
Polymeric Emulsion Blend Binders	$700 -$1,500	$770-$1,650
Cementitious-Based Binders	$800-$1,200	$880-$1,350

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.
2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

Table 1 Properties of Soil Binders for Erosion Control

Evaluation Criteria	Binder Type			
	Plant Material Based (Short Lived)	Plant Material Based (Long Lived)	Polymeric Emulsion Blends	Cementitious-Based Binders
Relative Cost	Low	Moderate to High	Low to High	Low to Moderate
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies (1)	Varies (1)	Varies (1)	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

References

Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

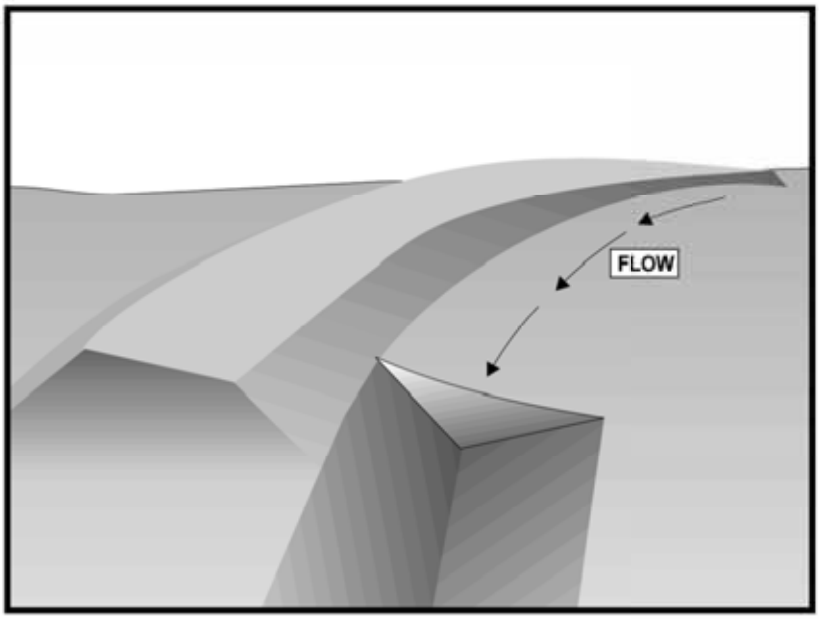
Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Earth Dikes and Drainage Swales EC-9



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert

runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin

(SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd^3.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Metzger, M.E. 2004. Managing mosquitoes in stormwater treatment devices. University of California Division of Agriculture and Natural Resources, Publication 8125. On-line: http://anrcatalog.ucdavis.edu/pdf/8125.pdf

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

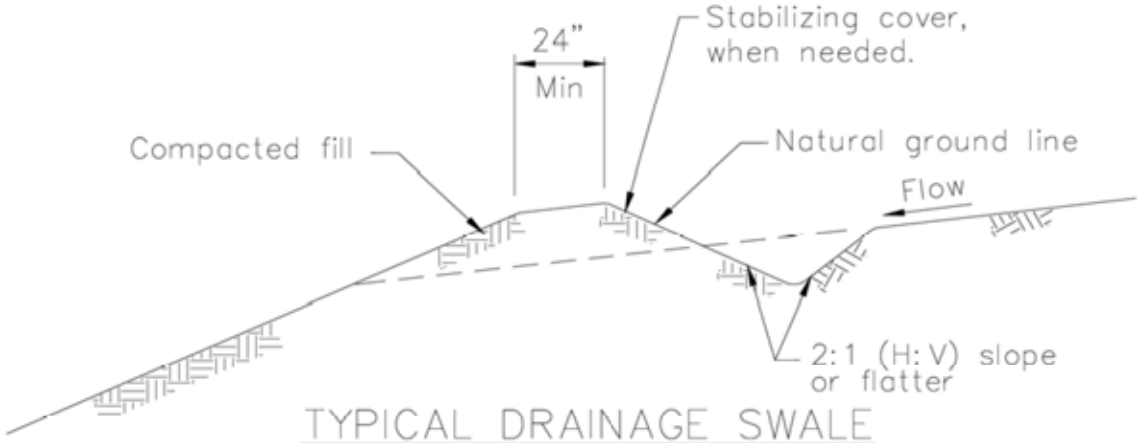
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

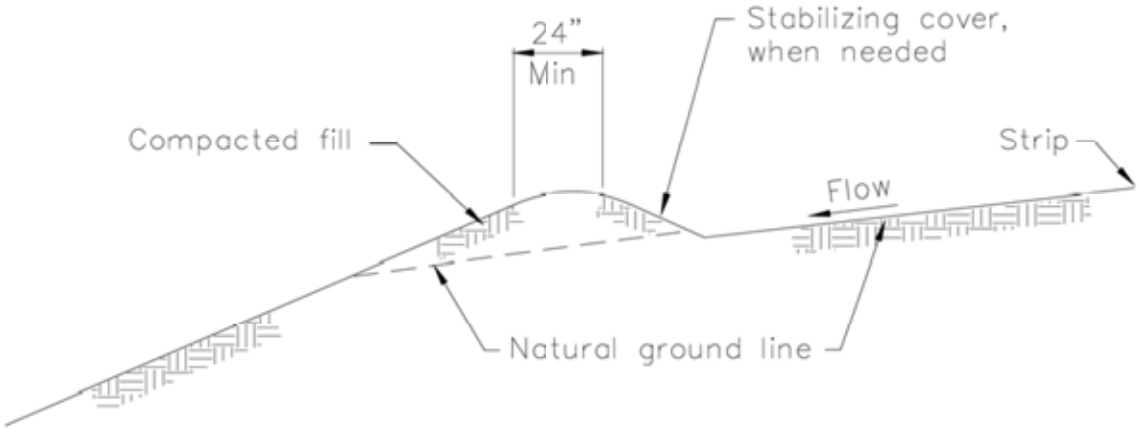
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



TYPICAL DRAINAGE SWALE
NOT TO SCALE

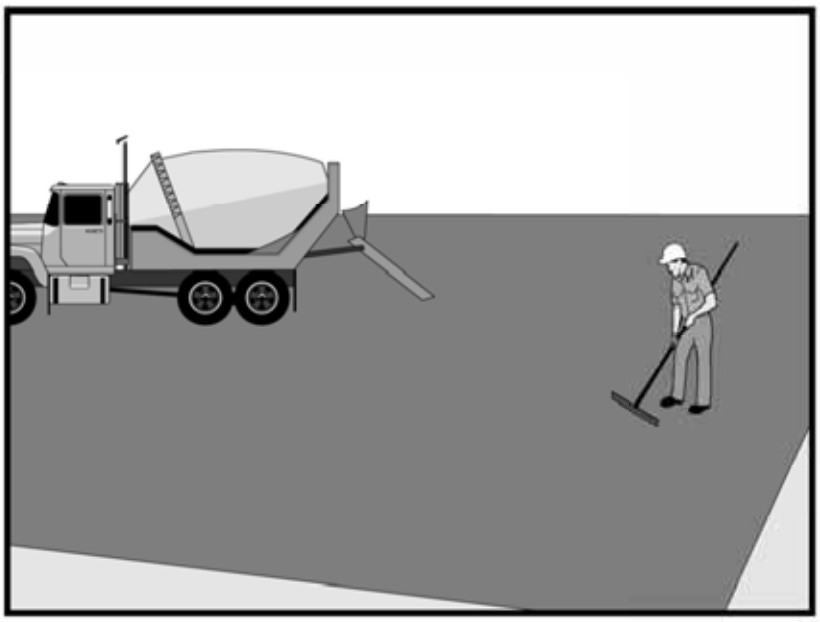
NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE
NOT TO SCALE

Paving and Grinding Operations NS-3



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☒

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.
- Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:
  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.
  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).
- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.
- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.
- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

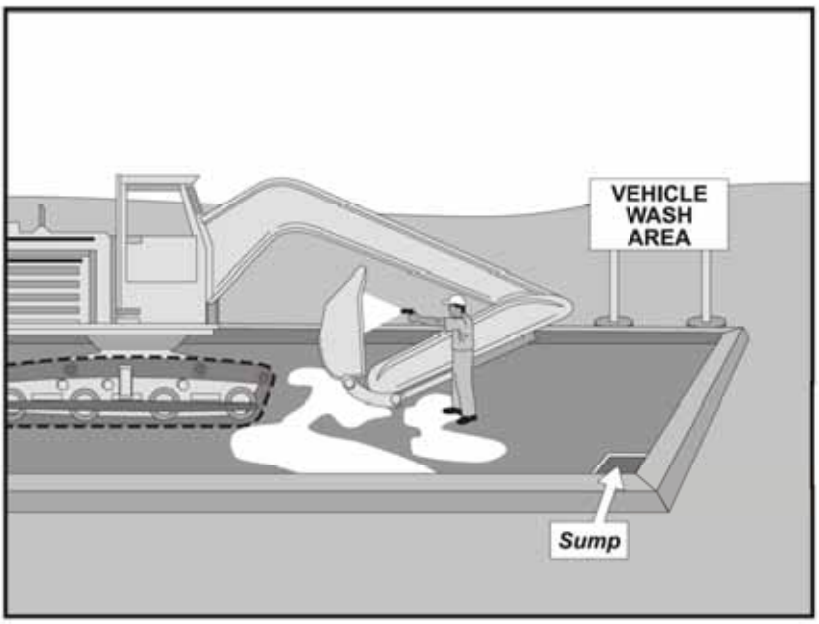
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Vehicle and Equipment Cleaning NS-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

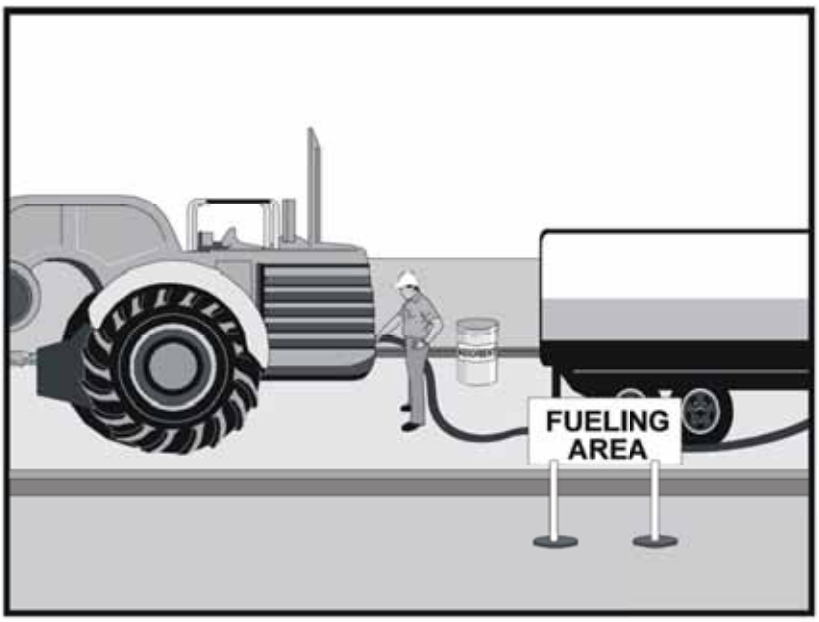
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.
- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should

be disposed of properly after use.

- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

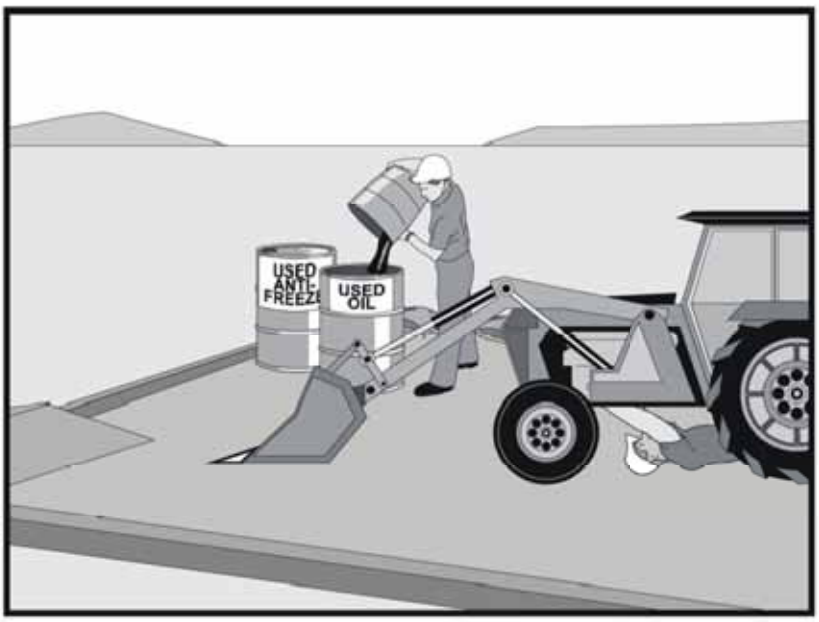
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

References

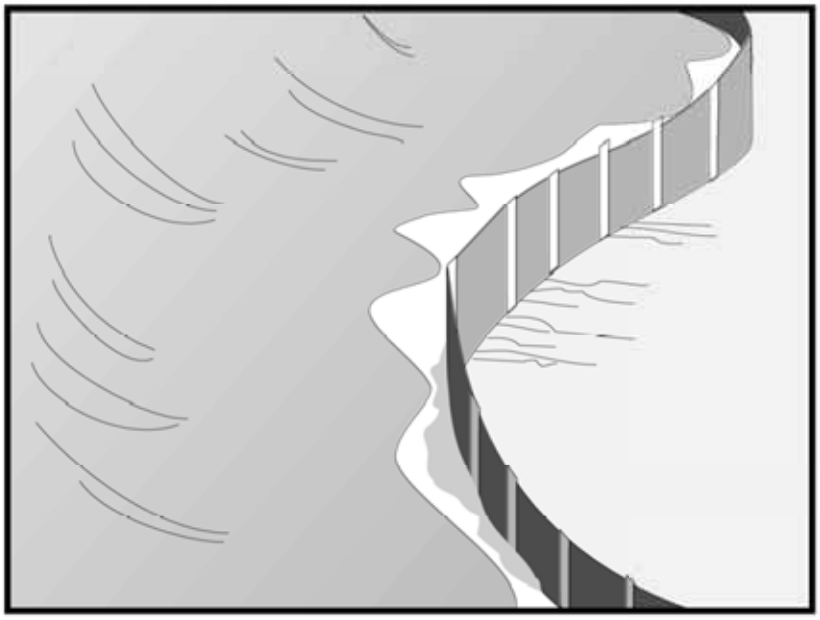
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Silt Fence

SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The

reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the

toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of $^1/_3$ and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
    - Minimal soil disturbance.
    - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
    - Uniform installation.
    - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.
- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

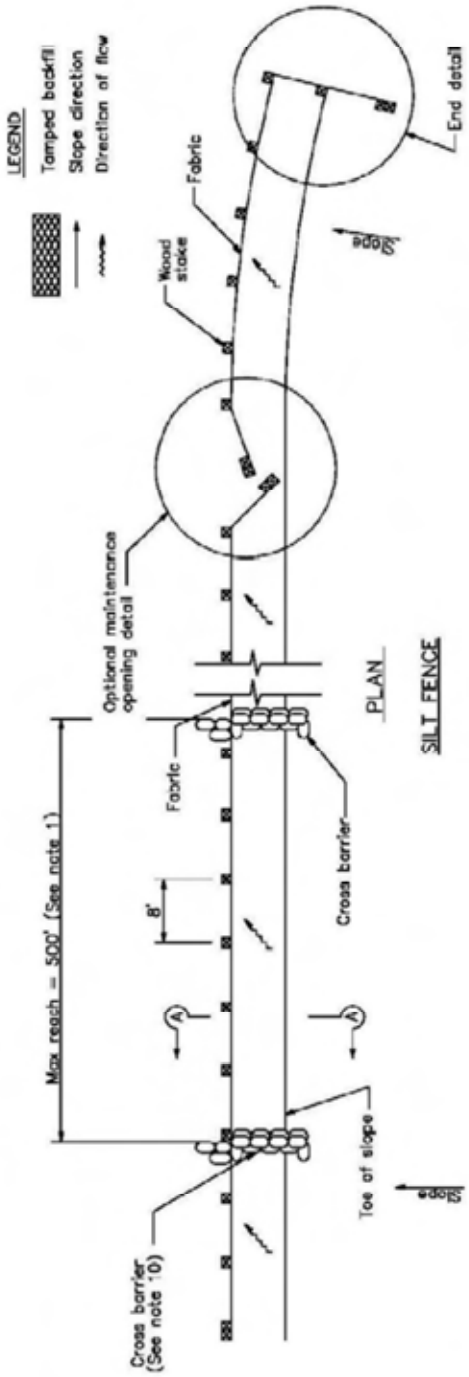
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

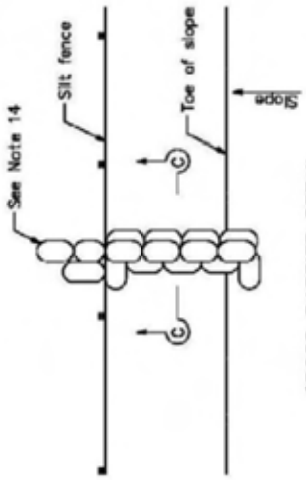
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

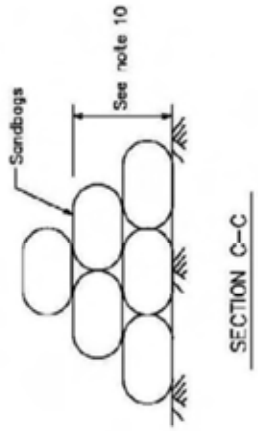
U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

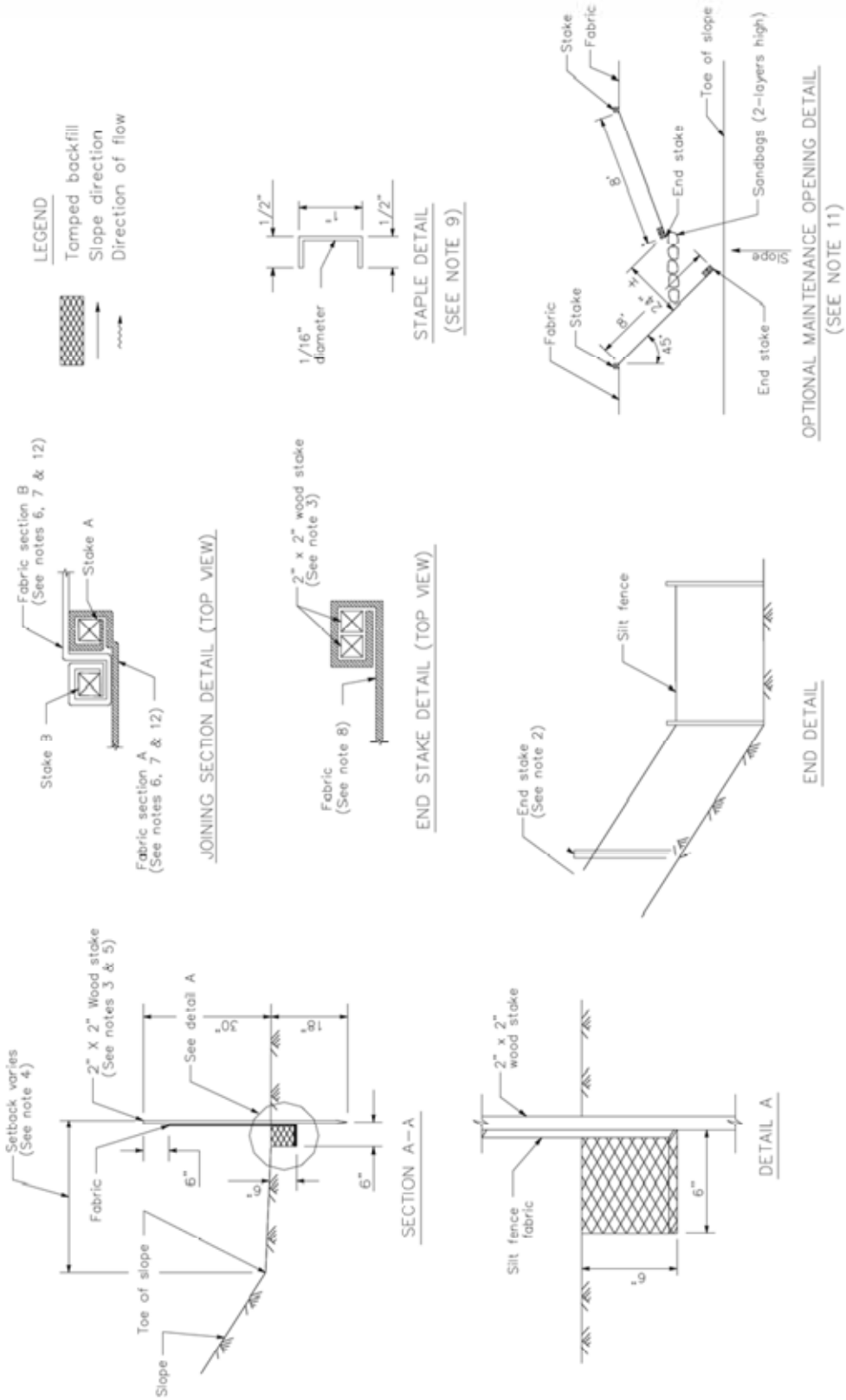






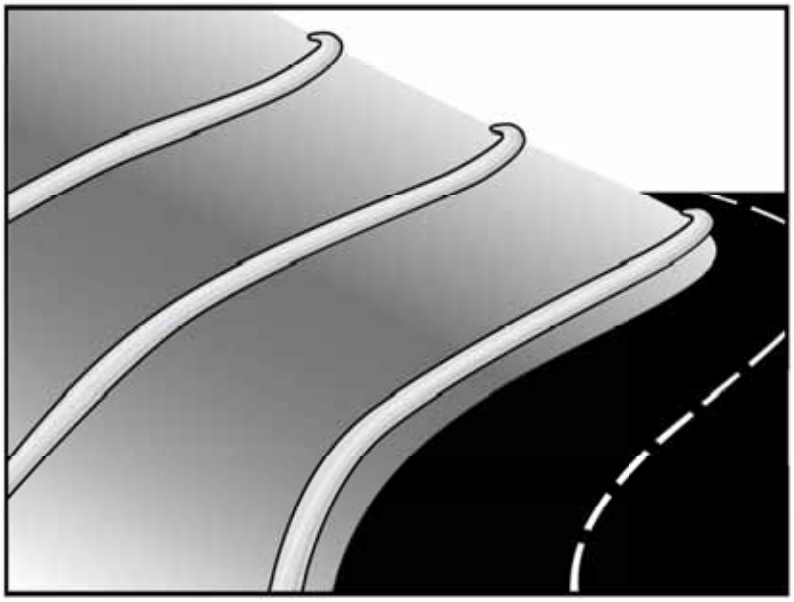
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.


LEGEND
Tamped backfill
Slope direction
Direction of flow
1/2"
1"
1/2"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
Toe of slope
Sandbags (2-layers high)
End stake
8'
Slope
Fabric
Stake
8'
4'
2'
45°
End stake
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Fabric section B
(See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A
(See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake
(See note 3)
Fabric
(See note 8)
END STAKE DETAIL (TOP VIEW)
Silt fence
End stake
(See note 2)
END DETAIL
Setback varies
(See note 4)
2" X 2" Wood stake
(See notes 3 & 5)
See detail A
50"
18"
Fabric
6"
6"
6"
Toe of slope
Slope
SECTION A-A
2" x 2"
wood stake
Silt fence
fabric
6"
6"
DETAIL A

Fiber Rolls

SE-5



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

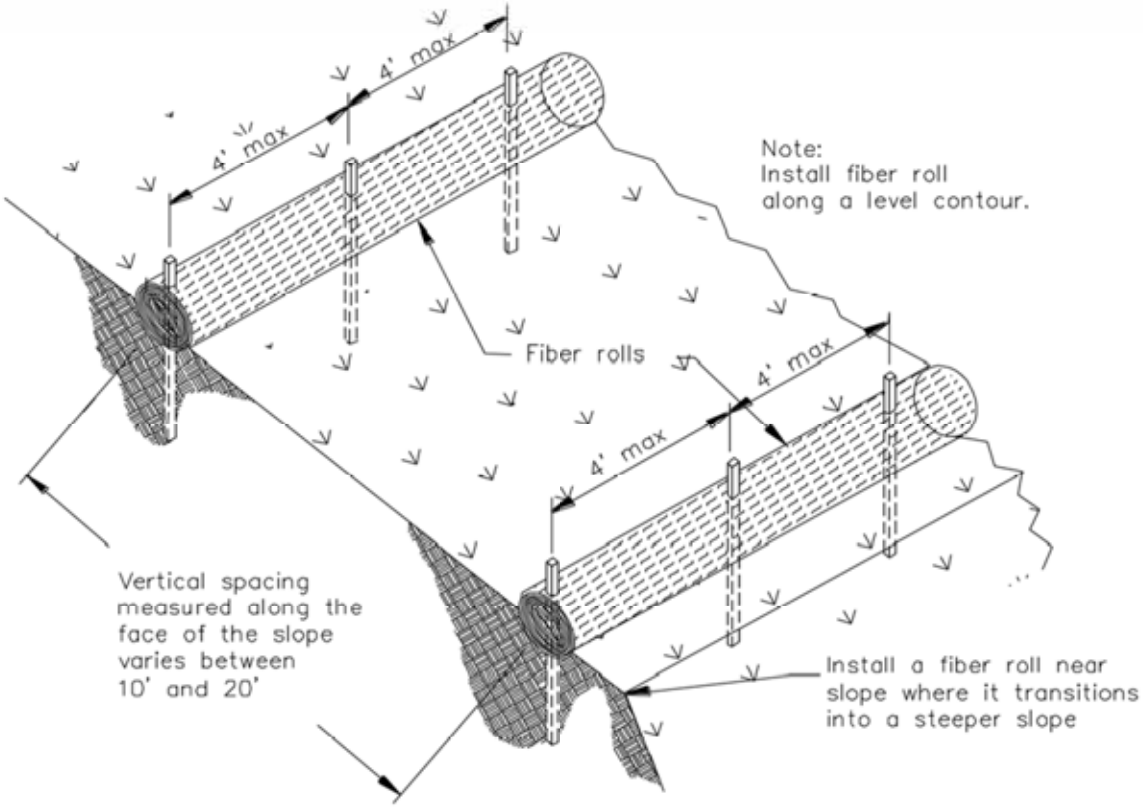
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

References

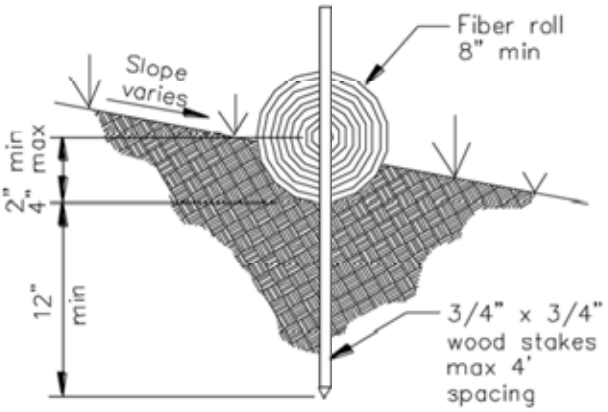
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



TYPICAL FIBER ROLL INSTALLATION

N.T.S.

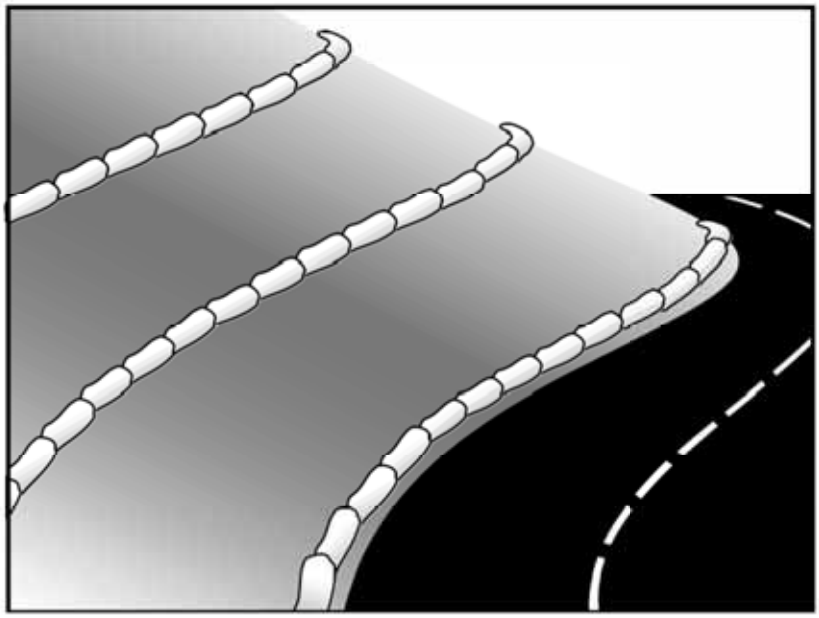


ENTRENCHMENT DETAIL

N.T.S.

Gravel Bag Berm

SE-6



Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Street Sweeping and Vacuuming SE-7

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

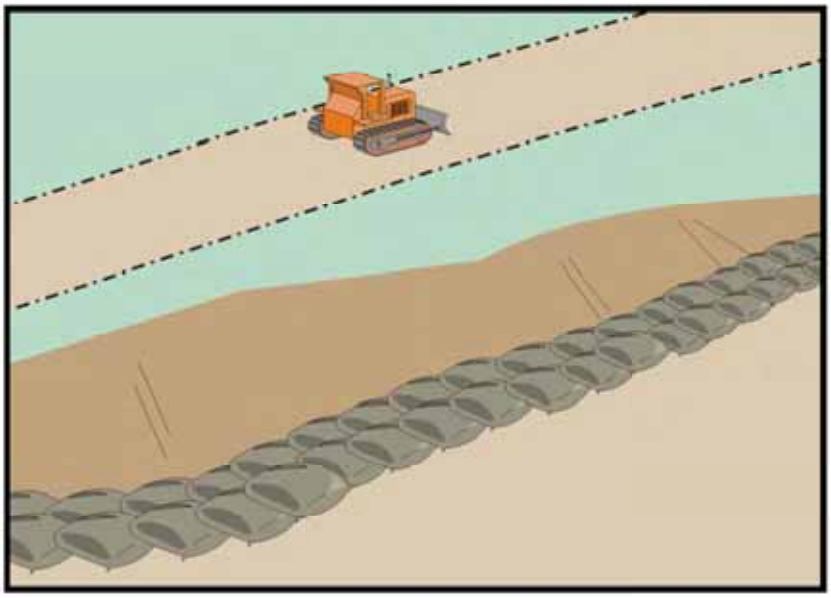
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Sandbag Barrier SE-8



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept or to divert sheet flows. Sandbag barriers placed on a level contour pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications

Sandbag barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes.
  - As sediment traps at culvert/pipe outlets.
  - Below other small cleared areas.
  - Along the perimeter of a site.
  - Down slope of exposed soil areas.
  - Around temporary stockpiles and spoil areas.
  - Parallel to a roadway to keep sediment off paved areas.
  - Along streams and channels.
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

- At the top of slopes to divert runoff away from disturbed slopes.
- As check dams across mildly sloped construction roads.

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Sandbags are not intended to be used as filtration devices.
- Easily damaged by construction equipment.
- Degraded sandbags may rupture when removed, spilling sand.
- Sand is easily transported by runoff if bag is damaged or ruptured.
- Installation can be labor intensive.
- Durability of sandbags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months. When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. Sand-filled bags have limited porosity, which is further limited as the fine sand tends to quickly plug with sediment, limiting or completely blocking the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms or SE-14, Biofilter Bags. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to gravel bag berms, but less porous. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate sandbag barriers on a level contour.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Sandbags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

    Slope inclination 2:1 (H:V) or greater: Sandbags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, sand bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the sand bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Stack sandbags at least three bags high.
- Butt ends of bags tightly.
- Overlap butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 (H:V) or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- See typical sandbag barrier installation details at the end of this fact sheet.

Materials

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not an acceptable substitute, as sand can more easily mobilize out of burlap.
- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 3 (Caltrans Standard Specification, Section 25) permeable material free from clay and deleterious material, such as recycled concrete or asphalt..

Costs

Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Additional labor is required to fill the bags. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag. These costs are based upon vendor research.

Inspection and Maintenance

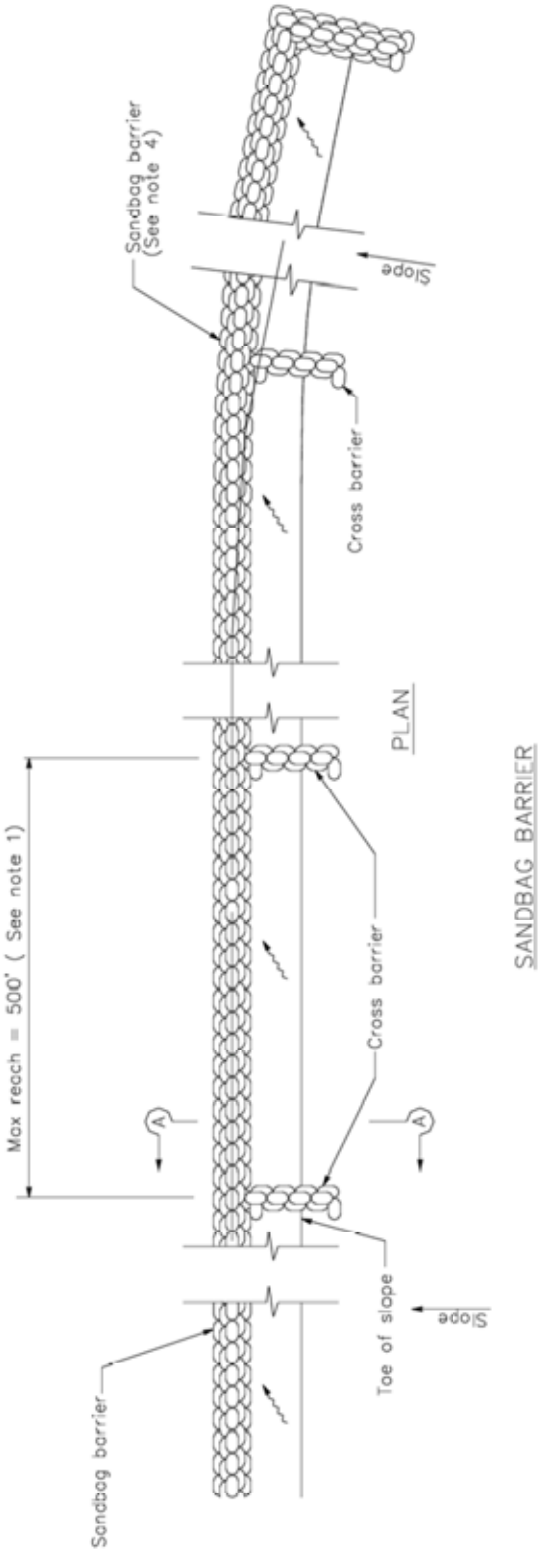
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove sandbags when no longer needed and recycle sand fill whenever possible and properly dispose of bag material. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

References

Standard Specifications for Construction of Local Streets and Roads, California Department of Transportation (Caltrans), July 2002.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

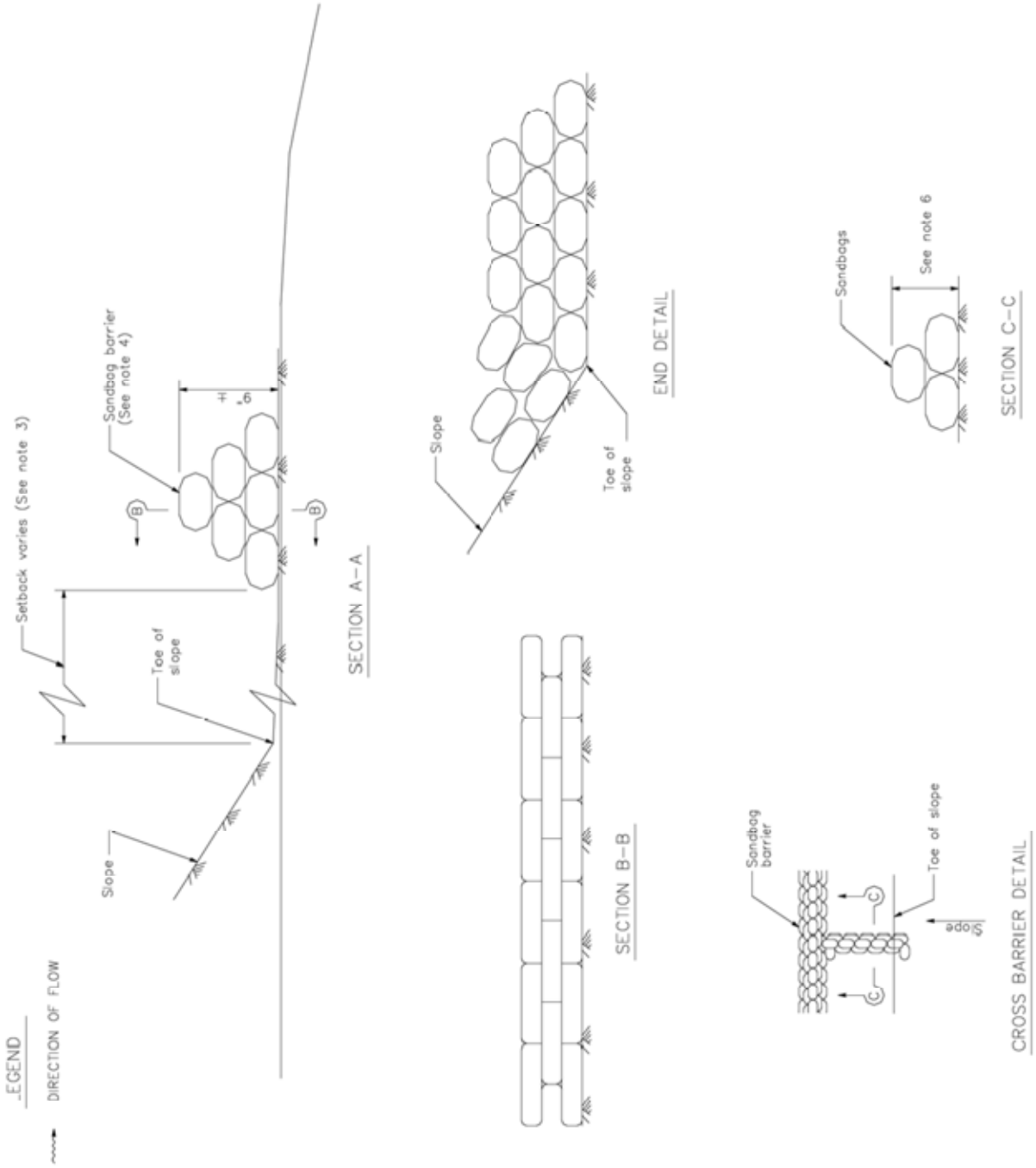
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



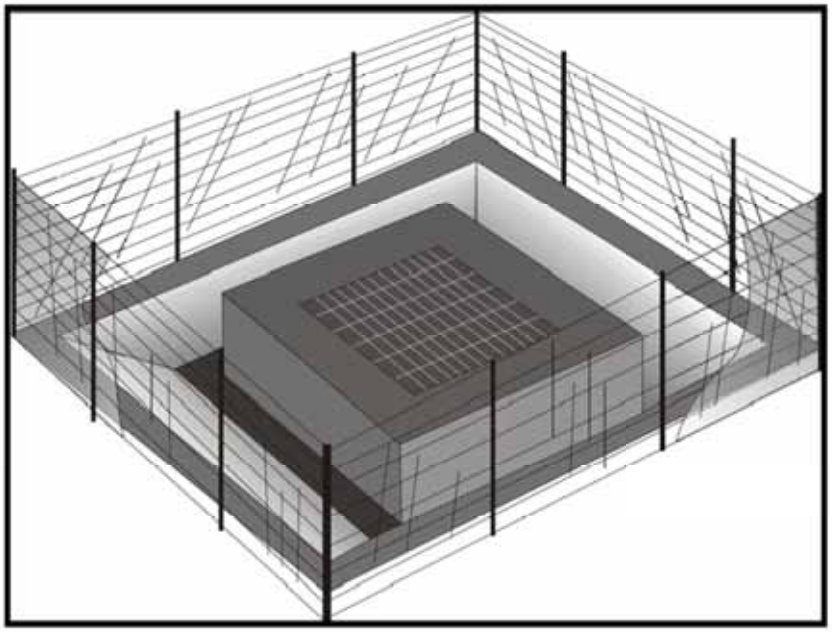
SANDBAG BARRIER

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.


LEGEND
DIRECTION OF FLOW
Setback varies (See note 3)
Sandbag barrier (See note 4)
H
6"
B
B
Toe of slope
Slope
SECTION A–A
Slope
Toe of slope
END DETAIL
SECTION B–B
Sandbags
See note 6
SECTION C–C
Sandbag barrier
Toe of slope
Slope
C
C
CROSS BARRIER DETAIL

Storm Drain Inlet Protection SE-10



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.

- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.
- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Six types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
  - Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
  - Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence*** - Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.

  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag*** - Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

  1. Construct on gently sloping street.

  2. Leave room upstream of barrier for water to pond and sediment to settle.

  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.

  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter*** - Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.

  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.

  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.

  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary)*** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

  1. Construct in a gently sloping area.
  2. Biofilter bags should be placed around inlets to intercept runoff flows.
  3. All bag joints should overlap by 6 in.
  4. Leave room upstream for water to pond and for sediment to settle out.
  5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.
- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.

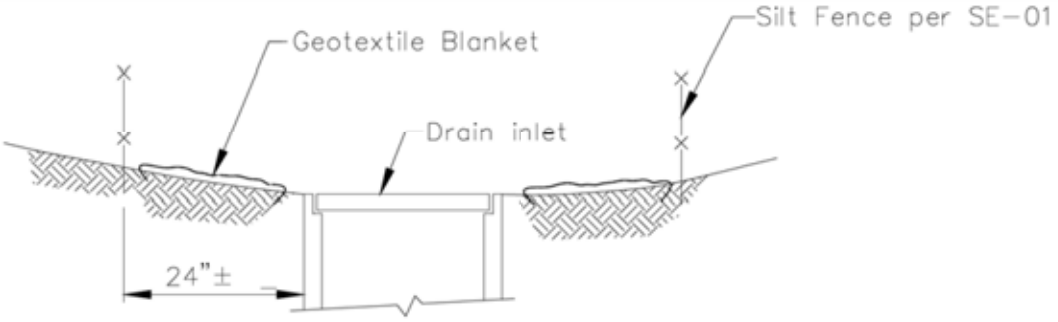
- Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

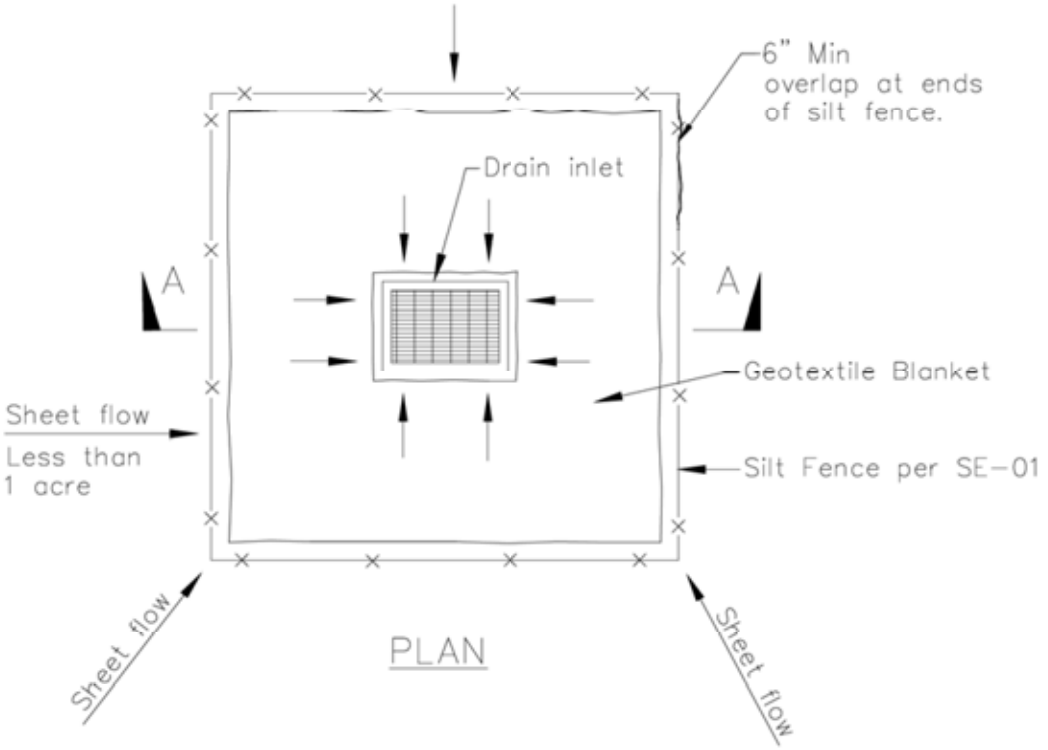
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



SECTION A–A

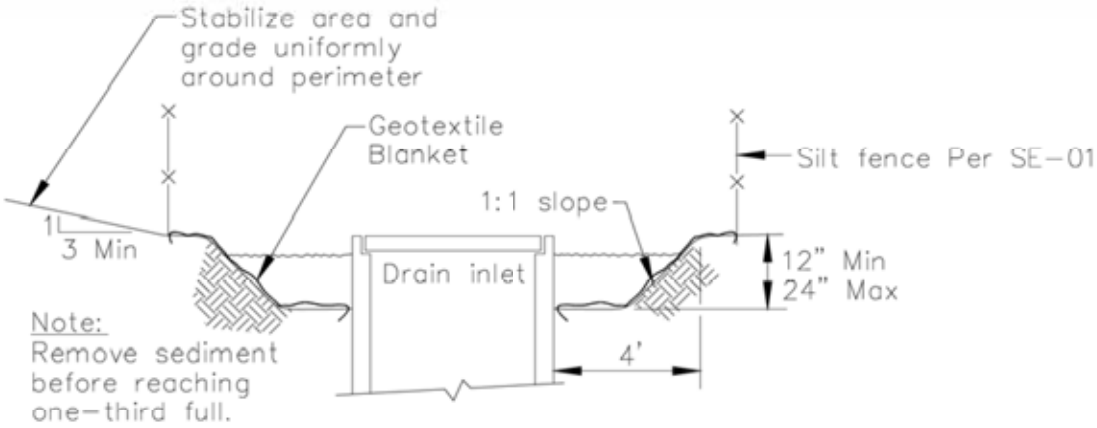


PLAN

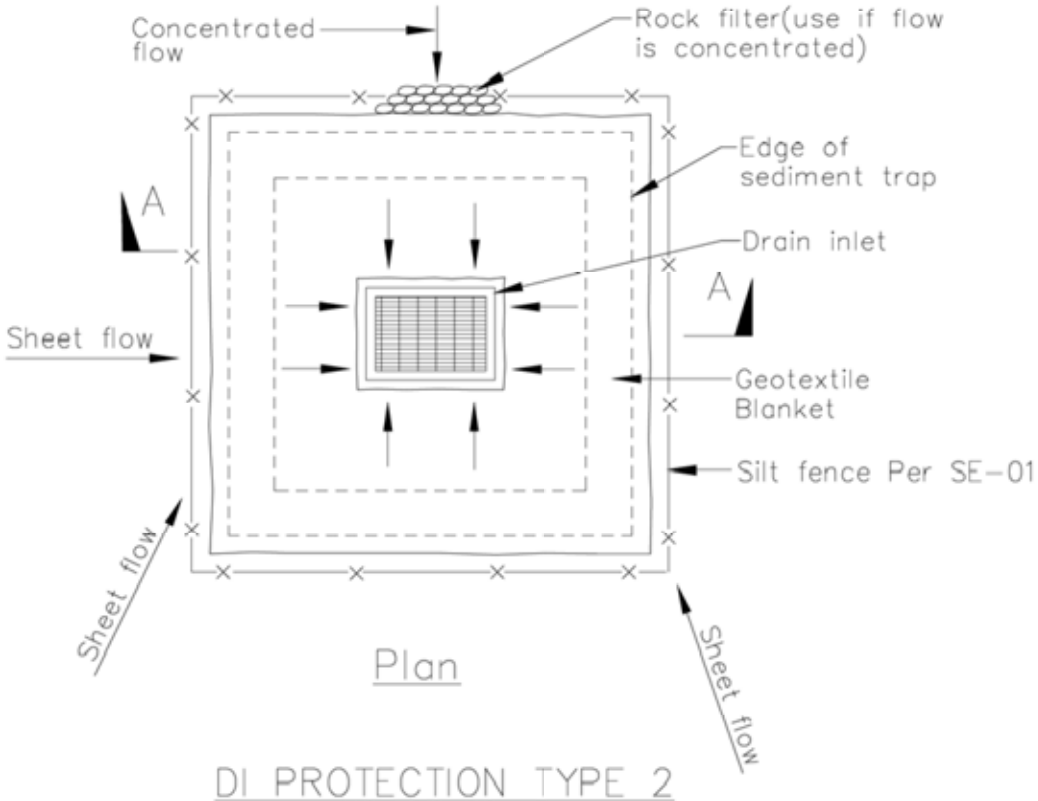
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



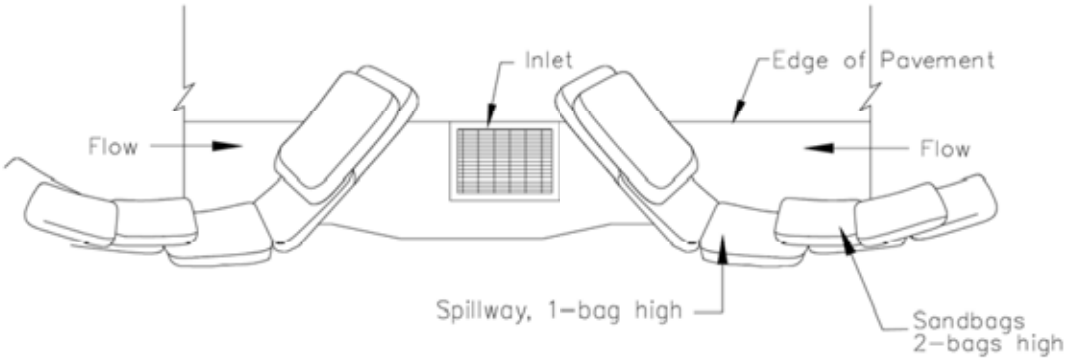
Section A–A



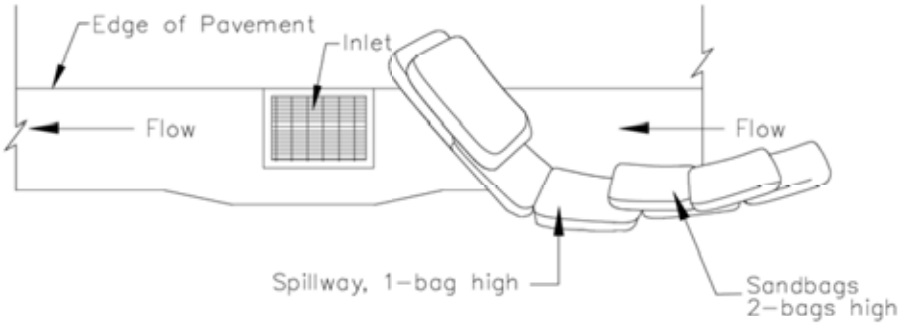
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

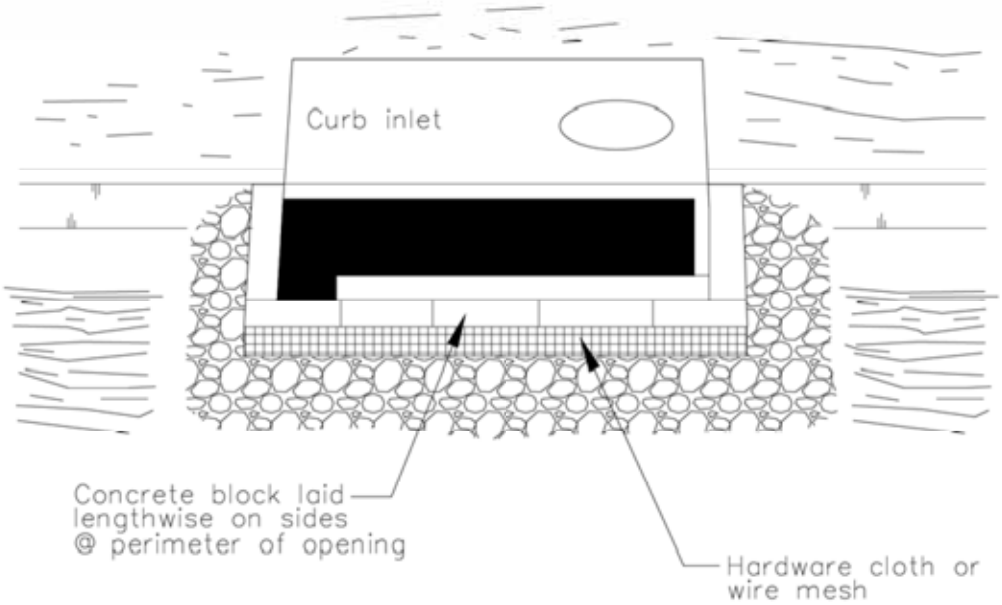


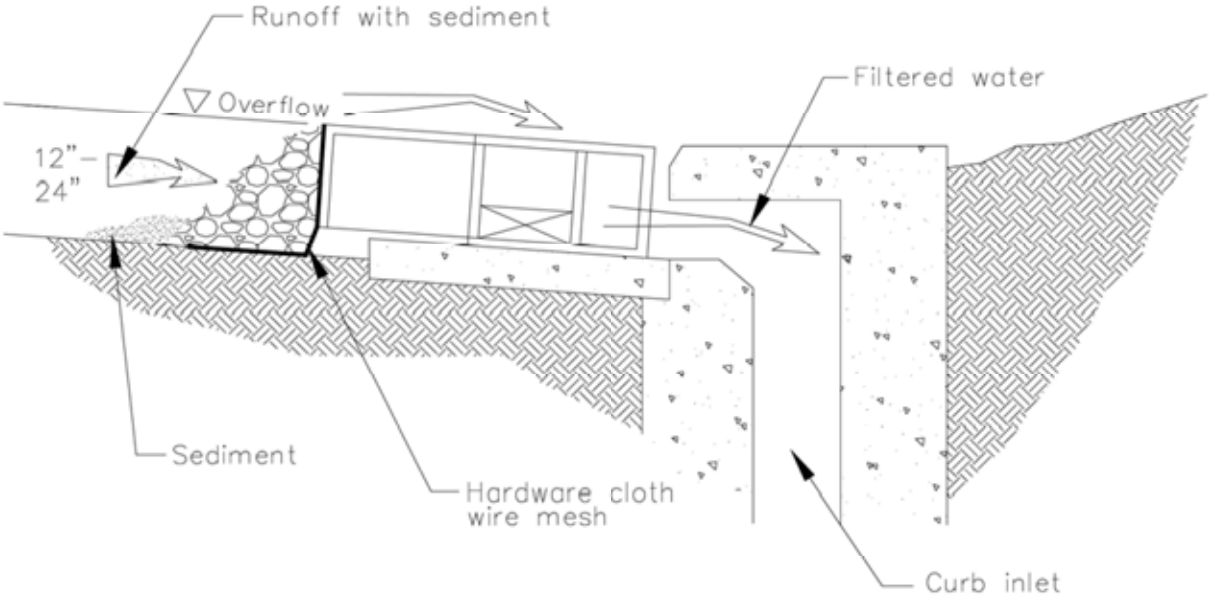
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

DI PROTECTION TYPE 3
NOT TO SCALE





DI PROTECTION – TYPE 4
NOT TO SCALE

Compost Socks and Berms SE-13

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☒
Bacteria	☒
Oil and Grease	☒
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

Compost socks and berms act as three-dimensional biodegradable filtering structures to intercept runoff where sheet flow occurs and are generally placed at the site perimeter or at intervals on sloped areas. Compost socks are generally a mesh sock containing compost and a compost berm is a dike of compost, trapezoidal in cross section. When employed to intercept sheet flow, both BMPs are placed perpendicular to the flow of runoff, allowing filtered runoff to pass through the compost and retaining sediment (and potentially other pollutants). A compost sock can be assembled on site by filling a mesh sock (e.g. with a pneumatic blower). The compost berm should be constructed using a backhoe or equivalent and/or a pneumatic delivery (blower) system and should be properly compacted. Compost socks and berms act as filters, reduce runoff velocities, and in some cases, aid in establishing vegetation.

Compost is organic, biodegradable, and renewable. Compost provides soil structure that allows water to infiltrate the compost medium which helps prevent rill erosion and the retained moisture promotes seed germination and vegetation growth, in addition to providing organic matter and nutrients important for fostering vegetation. Compost improves soil quality and productivity, as well as erosion and sediment control. The compost of the compost sock or berm can be selected that targets site specific objectives in capturing sediment and other pollutants, supporting vegetation, or additional erosion control.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Compost is typically derived from combinations of feedstocks, biosolids, leaf and yard trimmings, manure, wood, or mixed solid waste. Many types of compost are products of municipal recycle or "Greenwaste" programs. Compost is organic and biodegradable and can be left onsite. There are many types of compost with a variety of properties with specific functions, and accordingly compost selection is an important design consideration in the application of this type of erosion and sediment control.

Suitable Applications

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow (compost berms should only be used at the top of slopes or on slopes 4:1 (H:V) or flatter, all other slope applications should use compost socks)
- Along the perimeter of a project
- As check dams in unlined ditches (compost socks only)
- Down-slope of exposed soil areas
- At operational storm drains as a form of inlet protection (compost socks only)
- Around temporary stockpiles

Compost socks and berms do not require special trenching or BMP removal compared to other sediment control methods (e.g. silt fence or fiber rolls). Compost socks and berms can remain in place after earth disturbing activities are completed or the compost components can be spread over the site providing nutrients for plant growth and augmenting soil structure. BMPs that remain in place are particularly advantageous below embankments, especially adjacent streams, by limiting re-entry and the disturbance to sensitive areas.

Compost can be pre-seeded prior to application (recommended by the EPA for construction site stormwater runoff control and required for compost socks) or seeded after installation (for compost berms only). The compost medium can also remove pollutants in stormwater including heavy metals; oil and grease; and hydrocarbons.

Limitations

- Compost can potentially leach nutrients (dissolved phosphorus and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies (Adams et. al, 2008).
- Compost may also contain other undesirable constituents that are detrimental to water quality. Compost should be obtained from a supplier certified by the California Integrated Waste Management Board or compost should otherwise meet the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7. Carefully consider the qualifications and experience of any compost producer/supplier.
- Application by hand is more time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of assembly.
- Compost socks and berms should not be employed at the base of slopes greater than 2:1 (H:V). They can be employed with other erosion control methods for steeper slopes.

- Difficult to move once saturated.
- Compost berms should not be applied in areas of concentrated flows.
- Compost socks and berms are easy to fix; however, they are susceptible to damage by frequent traffic. Compost socks can be used around heavy machinery, but regular disturbance decreases sock performance.

Implementation

Compost Materials

- California Compost Regulations (Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7, Section 17868.3) define and require a quality of compost for application. Compost should comply with all physical and chemical requirements. Specific requirements are provided in Table 1, taken from Caltrans Standard Special Provision 10-1 (SSP 10-1), Erosion Control (Compost Blanket).
- The compost producer should be fully permitted as specified under the California Integrated Waste Management Board, Local Enforcement Agencies and any other State and Local Agencies that regulate Solid Waste Facilities. If exempt from State permitting requirements, the composting facility should certify that it follows guidelines and procedures for production of compost meeting the environmental health standards of Title 14, California Code of Regulations, Division 7, Chapter 3.1, Article 7.
- The compost producer should be a participant in United States Composting Council's Seal of Testing Assurance program.
- Compost medium parameter specifications for compost socks and berms have been developed to assist in compost selection, such as those provided by the American Association of State Highway Transportation Officials (AASHTO).
- Particle size is important parameter for selecting compost. Well consolidated coarser grades of compost (e.g. small and large pieces) perform better for filtration objectives, while finer grades better support vegetation. Particle size of the compost should be selected based on site conditions, such as expected precipitation, and filtration goals and / or long term plant nutrients.
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air.
- If vegetation establishment is a desired function of the compost, a compost sample should be inspected by a qualified individual. Vegetation has different nutrient and moisture needs.
- Organic content of the compost is also important and should range from 30 to 65% depending on site conditions.

- Compost should not be derived from mixed municipal solid waste and should be reasonably free of visible contaminates.
- Compost should not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Metal concentrations in compost should not exceed the maximum metal concentrations listed under Title 14, California Code of Regulations, Division 7, Chapter 3.1, Section 17868.2.
- Compost should not possess objectionable odors.
- Compost should be weed free.

Table 1. Physical/Chemical Requirements of Compost
Reference - Caltrans SSP-10 Erosion Control Blanket (Compost)

Property	Test Method	Requirement
pH	*TMECC 04.11-A Elastometric pH 1:5 Slurry Method pH Units	6.0–8.0
Soluble Salts	TMECC 04.10-A Electrical Conductivity 1:5 Slurry Method dS/m (mmhos/cm)	0-10.0
Moisture Content	TMECC 03.09-A Total Solids & Moisture at 70+/- 5 deg C % Wet Weight Basis	30-60
Organic Matter Content	TMECC 05.07-A Loss-On-Ignition Organic Matter Method (LOI) % Dry Weight Basis	30–65
Maturity	TMECC 05.05-A Germination and Vigor Seed Emergence Seedling Vigor % Relative to Positive Control	80 or Above 80 or Above
Stability	TMECC 05.08-B Carbon Dioxide Evolution Rate mg CO_2-C/g OM per day	8 or below
Particle Size	TMECC 02.02-B Sample Sieving for Aggregate Size Classification % Dry Weight Basis	100% Passing, 3 inch 90-100% Passing, 1 inch 65-100% Passing, 3/4 inch 0 - 75% Passing, 1/4 inch Maximum length 6 inches
Pathogen	TMECC 07.01-B Fecal Coliform Bacteria < 1000 MPN/gram dry wt.	Pass
Pathogen	TMECC 07.01-B Salmonella < 3 MPN/4 grams dry wt.	Pass
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Plastic, Glass and Metal % > 4mm fraction	Combined Total: < 1.0
Physical Contaminants	TMECC 02.02-C Man Made Inert Removal and Classification: Sharps (Sewing needles, straight pins and hypodermic needles) % > 4mm fraction	None Detected

*TMECC refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC).

Installation

- Prior to application, prepare locations for socks and berms by removing brush and thick vegetation. The compost of the sock and/or berm should be allowed to come in full contact with the ground surface.
- Select method to apply the compost sock or berm. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations.
- The compost of the berm should be distributed evenly to the surface, compacted, and shaped trapezoidal in cross section. Berm design is generally consists of a base two times the height. AASHTO specification MP 9-03 provides compost berm dimensions based on anticipated site precipitation (AASHTO, 2003 and USEPA, 2009). State agencies, such as Oregon

Department of Environmental Quality (ODEQ) have developed berm dimension based on slope steepness and length (ODEQ, 2004).

- Compost socks can be assembled on site by filling mesh socks with the selected compost. Mesh socks can be tied at one end, filled, and then tied at the other end. The ends of socks can be interlocked until the desired length is achieved. The sock diameter is a function of slope steepness and length. Again, ASSHTO provides specifications for various parameters. Compost socks range from 8" to 18", but are typically 12" to 18" in diameter.
- Compost socks are typically placed in contours perpendicular to sheet flow. They can also be placed in V formation on a slope. Compost socks need to be anchored, typically stakes, through the center of the sock. To prevent water flowing around them, the ends of compost socks should be placed upslope.
- Locate compost socks and berms on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Socks and/or berms should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Socks should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Socks should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Place perimeter socks and berms using a j-hook installation. Use of vegetation will also provide additional anchoring.
- Compost socks and berms can be placed around the perimeter of an affected area, like a silt fence, if the area is flat or on a contour. Do not place these socks and berms where ponded water could become an issue.
- If used at the toe of slopes, the compost sock or berm should at a minimum of 5 to 10 feet away.
- Use additional anchoring and erosion control BMPS in conjunction of the compost socks and berms as needed.
- Consider using compost berms or socks as necessary at the top and/or bottom of the slope for additional erosion control performance.
- Compost socks and berms can also be effective over rocky and frozen ground if installed properly.
- It is recommended that the drainage areas of these compost BMPs do not exceed 0.25 acre per 100 feet placement interval and runoff does not exceed 1 cubic foot per second.

Costs

Recently obtained vendor costs indicated $3.50 per linear foot for compost berm application and $2.00 per linear foot for 8" socks and $2.50 per linear foot for 12"socks. Costs do not include final compost sock or berm functions at the end of construction activities, including spreading or removal, if required. ODEQ estimates that compost berms cost 30 percent less than silt fences to install.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Once damage is identified, mend or reapply the sock or berm as needed. Washed out areas should be replaced. If the sock or berm height is breached during a storm, an additional sock can be stacked to increase the sock height and similarly the berm dimensions can be increased, as applicable. An additional sock or berm may be installed upslope, as needed. It may be necessary to apply an additional type of stormwater BMP, such as a compost blanket.
- Sediment contained by the sock or berm should be removed prior reaching 1/3 of the exposed height of the BMP. The sediment can be stabilized with the compost sock or berm with vegetation at the end of construction activities.
- Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Limit traffic to minimize damage to BMPs or impede vegetation establishment.

References

An analysis of Composting as an Environmental Remediation Technology, U.S. Environmental Protection Agency (USEPA), Solid Waste and Emergency Response (5305W), EPA530-R-8-008, 1998.

Characteristics of Compost: Moisture Holding and Water Quality Improvement, Center for Research in Water Resources, Kirchoff, C., Malina, J., and Barrett, M., 2003.

Compost Utilization for Erosion Control, The University of Georgia College of Agricultural and Environmental Sciences, pubs.caes.uga.edu/caespubs/pubcd/B1200.htm, Faucette, B. and Risse, M., 2001.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Standard Special Provision 10-1, Erosion Control (Compost Blanket), State of California Department of Transportation (Caltrans). 2007 Update.

Evaluation of Environmental Benefits and Impacts of Compost and Industry Standard Erosion and Sediment Controls Measures Used in Construction Activities, Dissertation, Institute of Ecology, University of Georgia, Faucette, B., 2004.

National Pollutant Discharge Elimination System (NPDES), Compost Blankets, U.S. Environmental Protection Agency (USEPA). http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118, 2009.

Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Designation MP-9, Compost for Erosion/Sediment Control (Filter Berms), Provisional, American Association of State Highway Transportation Officials (AASHTO), 2003.

Stormwater Best Management Practices (BMPs) Field Trials of Erosion Control Compost in Reclamation of Rock Quarry Operations, Nonpoint Source Protection Program CWA §319(h), Texas Commission on Environmental Quality, Adams, T., McFarland, A., Hauck, L., Barrett, M., and Eck, B., 2008.

Biofilter Bags

SE-14

Categories

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-4 Check Dams

SE-5 Fiber Roll

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

Description and Purpose

Biofilter bags, or bio-bags, are a multi-purpose sediment control BMP consisting of a plastic mesh bag filled with 100% recycled wood product waste. Biofilter bags come in a variety of sizes (30" X 18" and 30" X 9" being common) and generally have between 1-2 cubic yards of recycled wood waste (or wood chips). Biofilter bags work by detaining flow and allowing a slow rate of discharge through the wood media. This action removes suspended sediment through gravity settling of the detained water and filtration within the bag.

Suitable Applications

Biofilter bags are a short-term BMP that can be rapidly deployed, maintained, and replaced. Biofilter bags can be an effective short-term solution to place in developed rills to prevent further erosion until permanent measures can be established. Suitable short-term applications include:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - Below other small cleared areas
  - Along the perimeter of a site (with low-expected flow)
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Along streams and channels

- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
  - At the top of slopes to divert runoff away from disturbed slopes
  - As check dams across mildly sloped construction roads
- Inlet Protection (See SE-10)
- Supplement to silt fences or other sediment control devices

Limitations

- Short life-span (2-3 months); regular maintenance and replacement required to ensure effectiveness. Bags will rapidly fill with sediment and reduce permeability.
- Easily damaged by construction vehicles.
- If not properly staked, will fail on slope applications.
- If improperly installed can allow undercutting or side-cutting flow.
- Not effective where water velocities or volumes are high.
- Potentially buoyant and easily displaced if not properly installed.

Implementation

General

Biofilter bags are a relatively low cost temporary BMP that are easily deployed and have a simple installation that can be performed by hand. Without proper installation, however, biofilter bags can fail due to their light weight, potential displacement, and multiple joint locations. One of the benefits of utilizing biofilter bags is that the media (wood-product) can be recycled or used onsite when no longer needed (where acceptable).

Design and Layout – Linear control

- Locate biofilter bags on level contours.
  - Slopes between 20:1 and 4:1 (H:V): Biofilter bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slopes between 4:1 and 2:1 (H:V): Biofilter bags should be placed at a maximum interval of 15 ft, with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Biofilter bags should be placed at a maximum interval of 10 ft., with the first row placed the slope toe.

- Turn the ends of the biofilter bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the biofilter bag berm to allow ponding, and to provide room for sediment storage.
- Stake biofilter bags into a 1 to 2 in. deep trench with a width equal to the bag.
  - Drive one stake at each end of the bag.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- Biofilter bags should be overlapped (6 in.), not abutted.

Costs

Pre-filled biofilter bags cost approximately $2.50-$3.50 per bag, dependent upon size.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Biofilter bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace biofilter bags as needed.
- Repair washouts or other damage as needed.
- Sediment that is retained by the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove biofilter bag berms when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Biofilter media may be used on-site, if allowed.

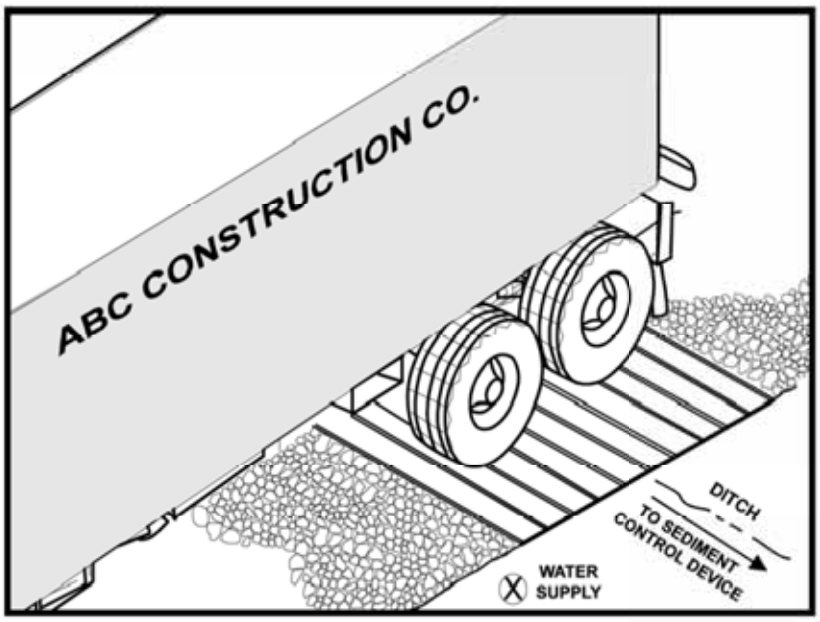
References

Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. Volume 2, Section 7, BMP 34 – Biofilter Bags, Idaho Department of Environmental Quality, 2005.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Entrance/Outlet Tire Wash TC-3



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

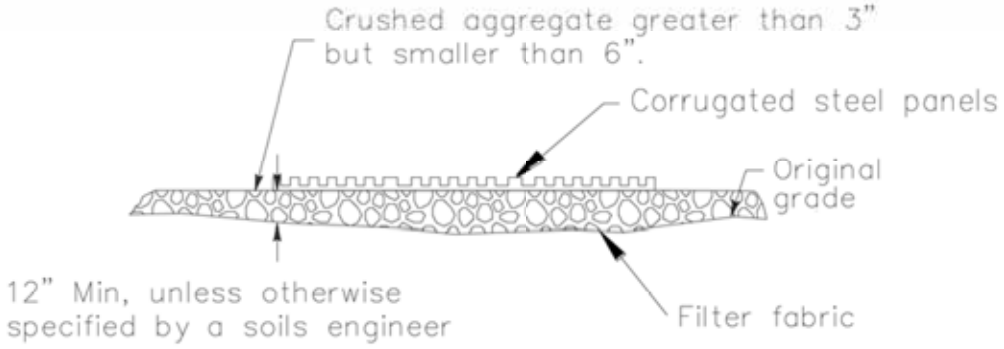
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

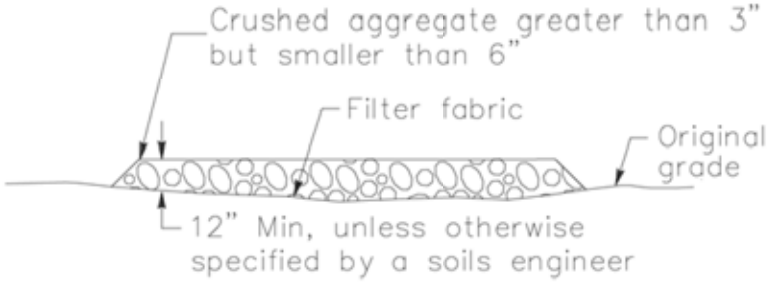
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

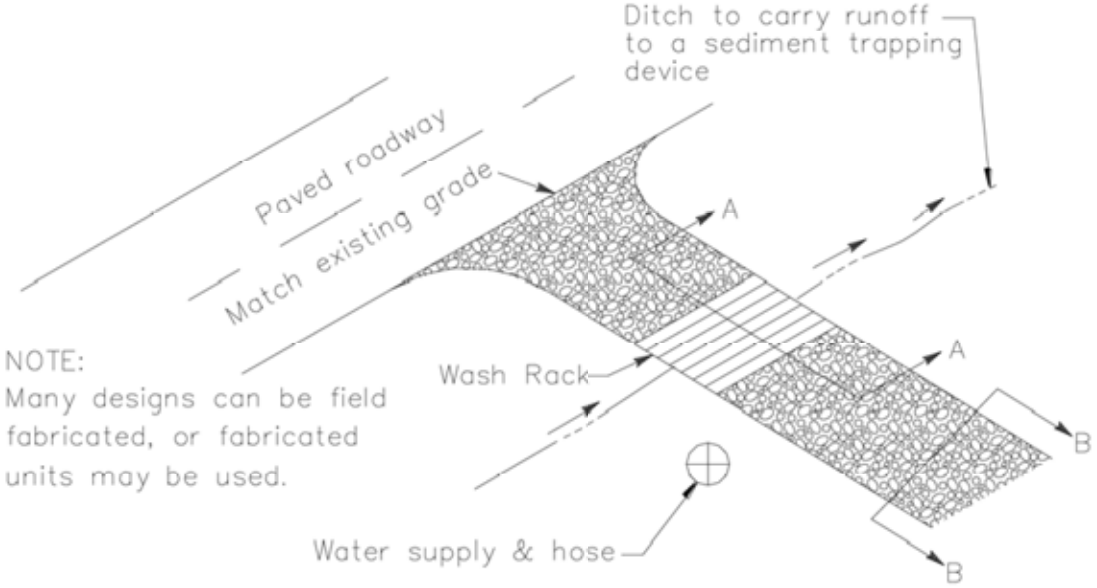
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



SECTION A–A
NOT TO SCALE

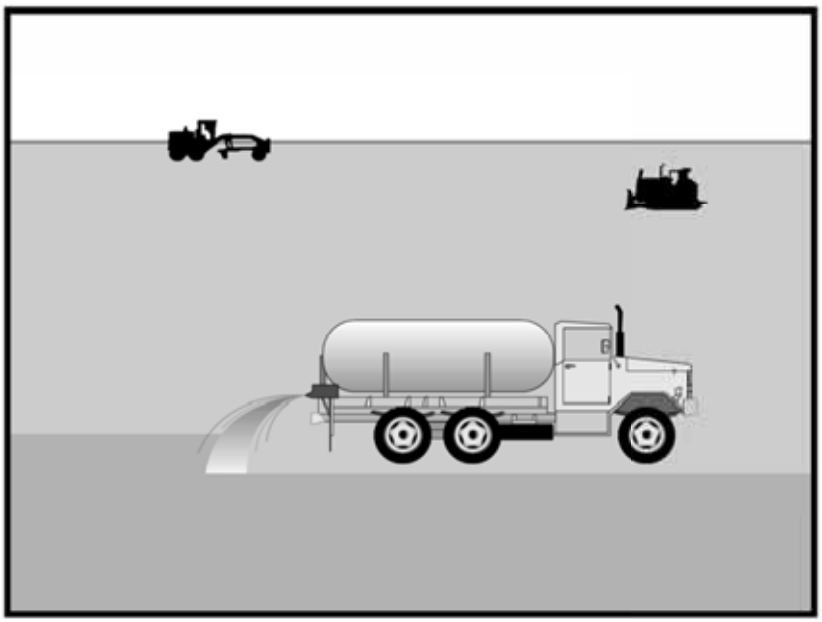


SECTION B–B
NTS



TYPICAL TIRE WASH
NOT TO SCALE

Wind Erosion Control WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/ Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Tracking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

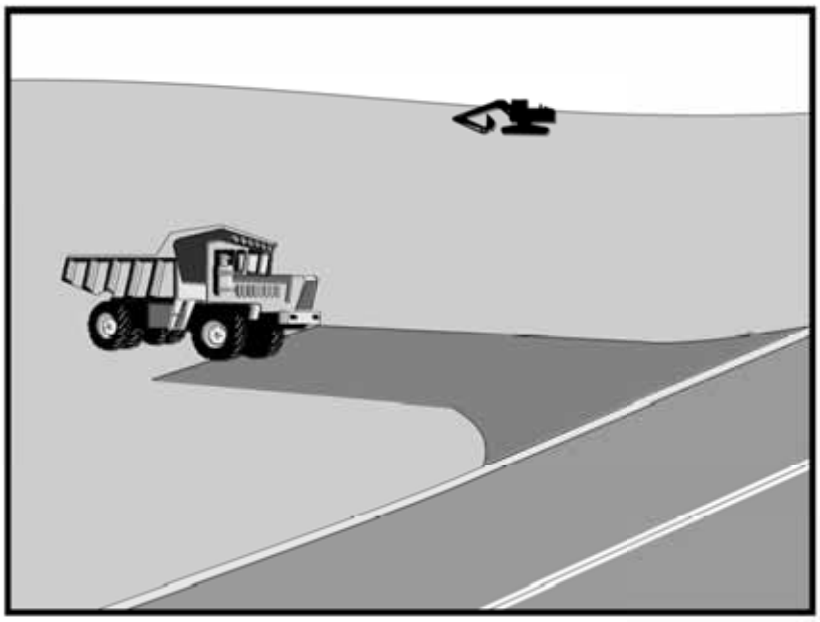
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stabilized Construction Entrance/Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

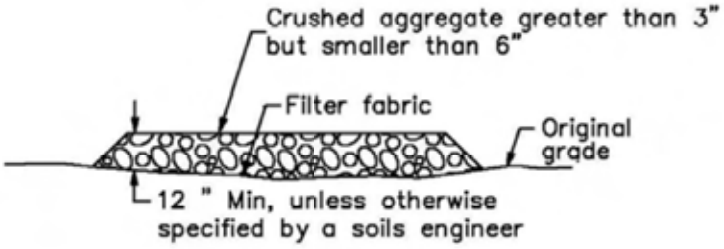
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

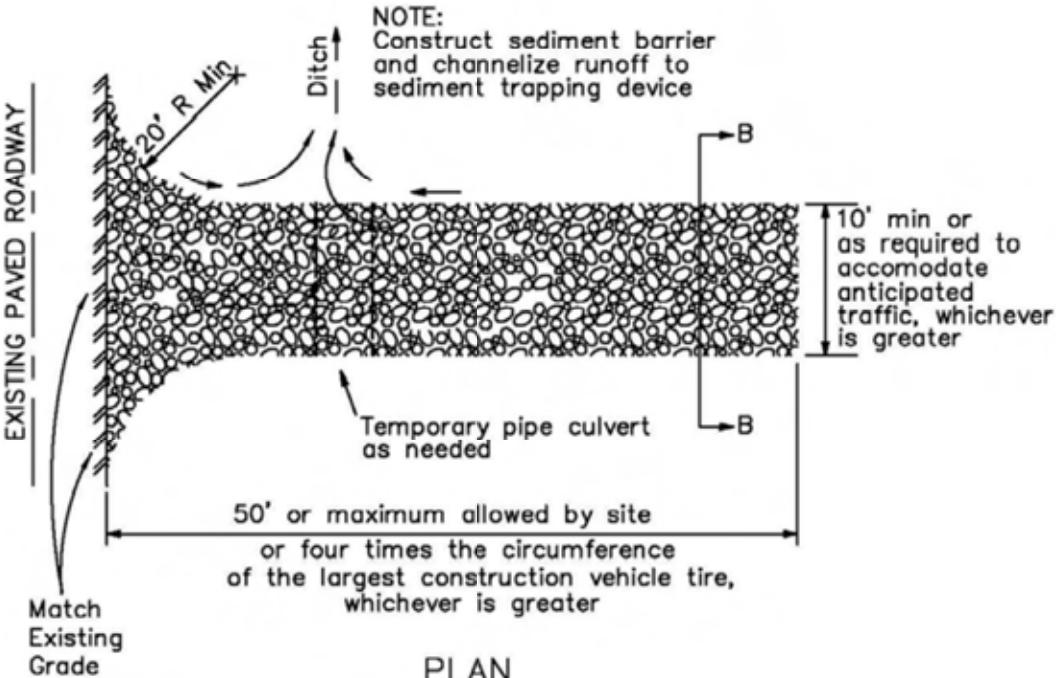
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

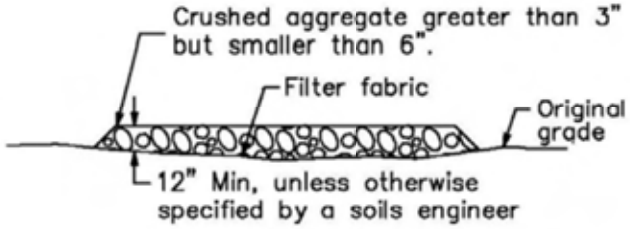
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



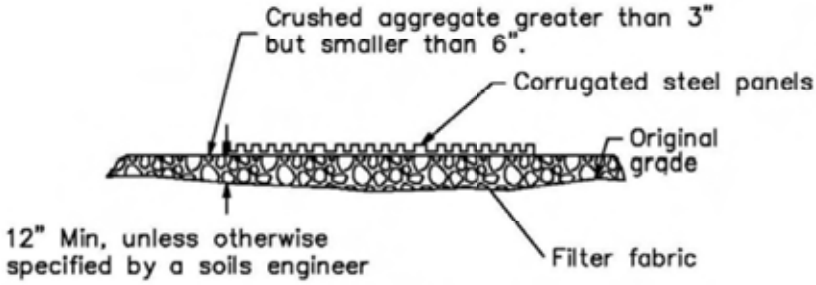
SECTION B–B
NTS



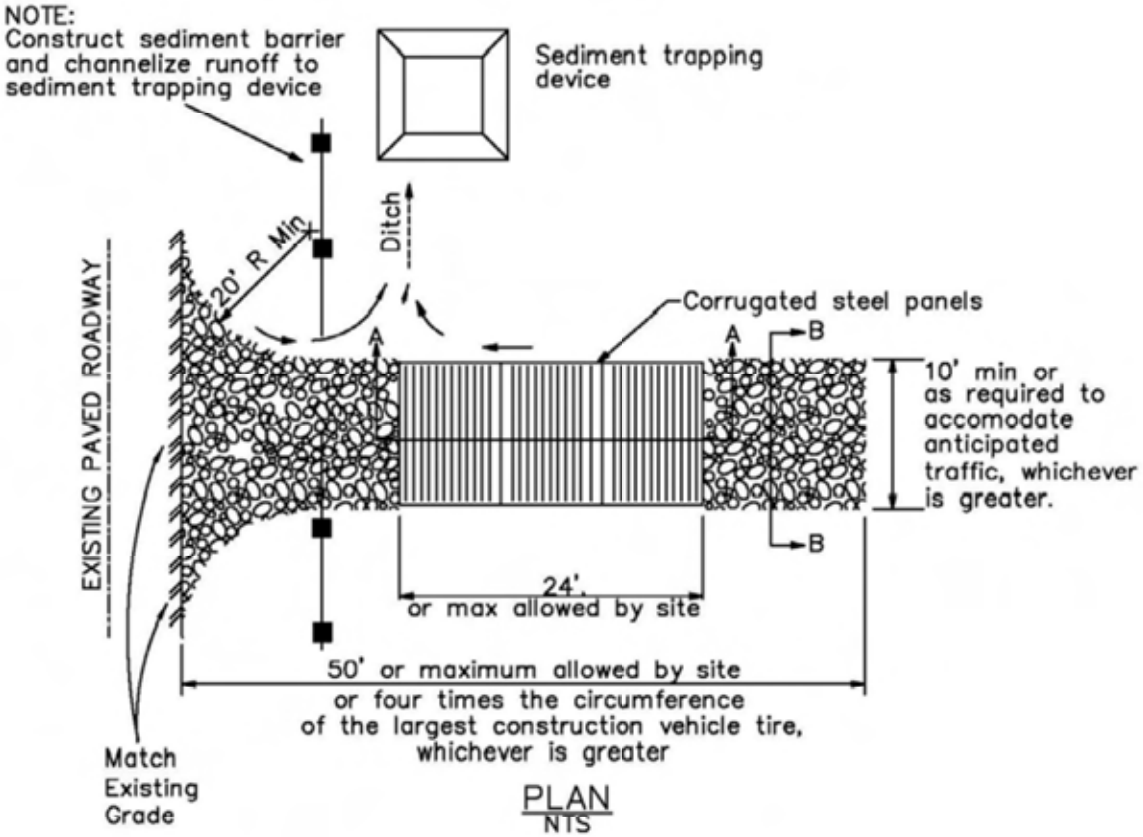
PLAN
NTS



SECTION B–B
NTS

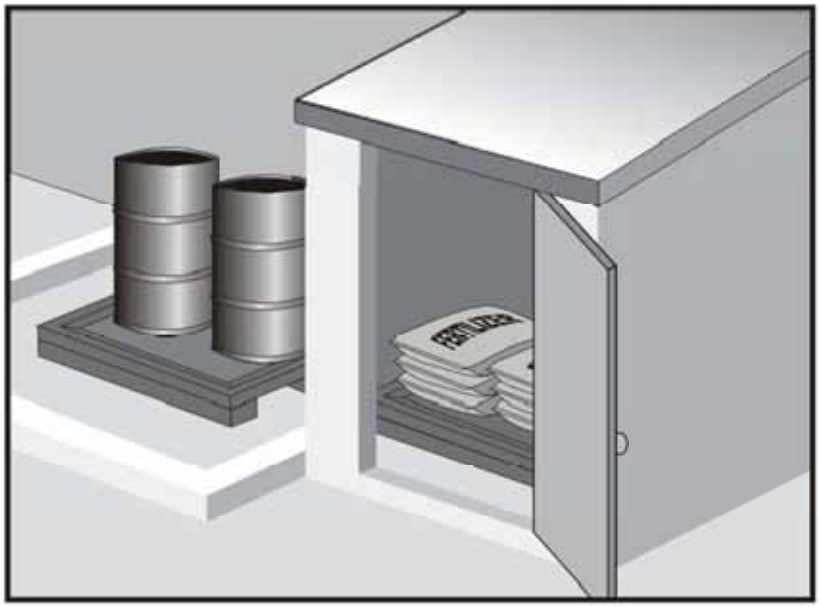


SECTION A–A
NOT TO SCALE



PLAN
NTS

Material Delivery and Storage WM-1



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
    - Avoid transport near drainage paths or waterways.
    - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
    - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

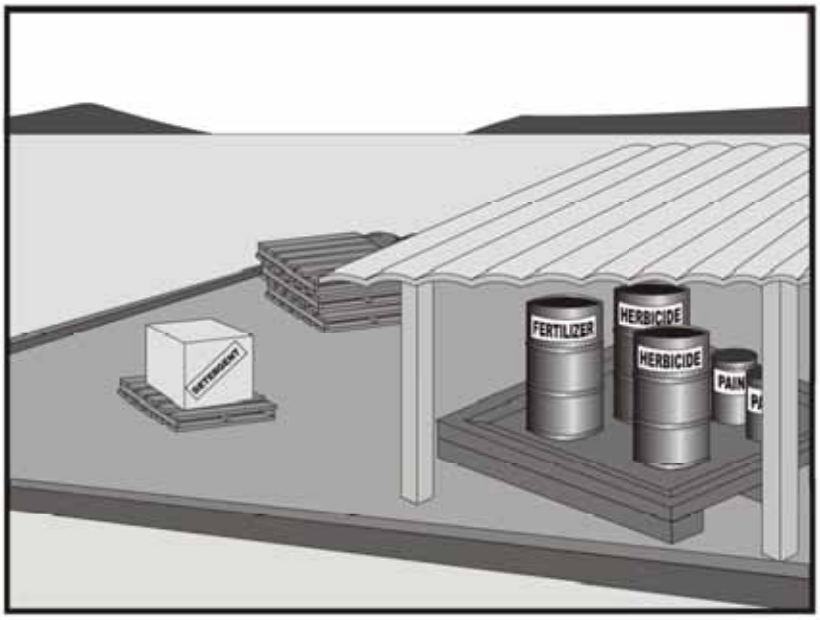
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use

WM-2



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

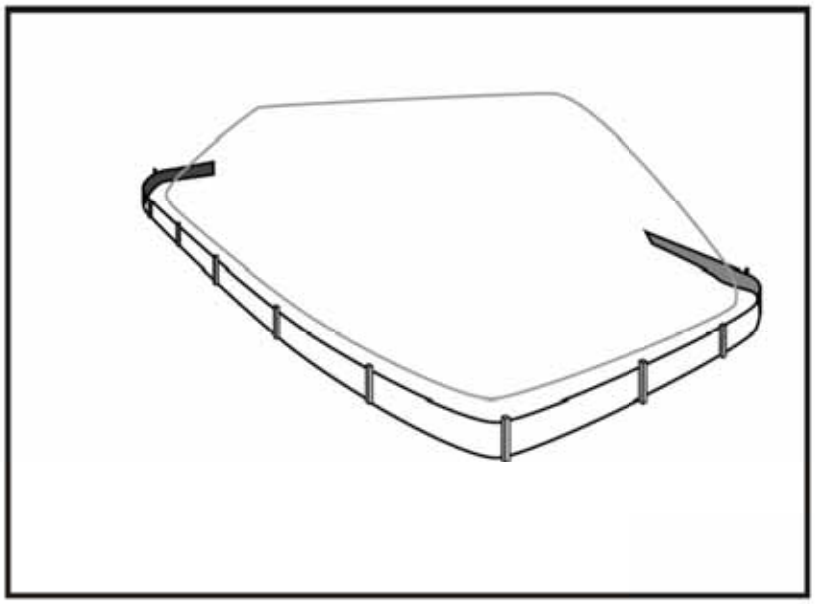
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of plastic materials should be avoided when feasible and photodegradable plastics should not be used.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater run-on using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Cover and project soil stockpiles with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Consider temporary vegetation for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Provide covers and protect these stockpiles with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cover cold mix stockpiles and place them on plastic sheeting (or comparable material) and surround the stockpiles with a berm all times.

Stockpiles of fly ash, stucco, hydrated lime

- Cover stockpiles of materials that may raise the pH of runoff (i.e., basic materials) with plastic and surround the stockpiles with a berm at all times.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate)

- Cover treated wood with plastic sheeting (or comparable material) and surround with a berm at all times.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

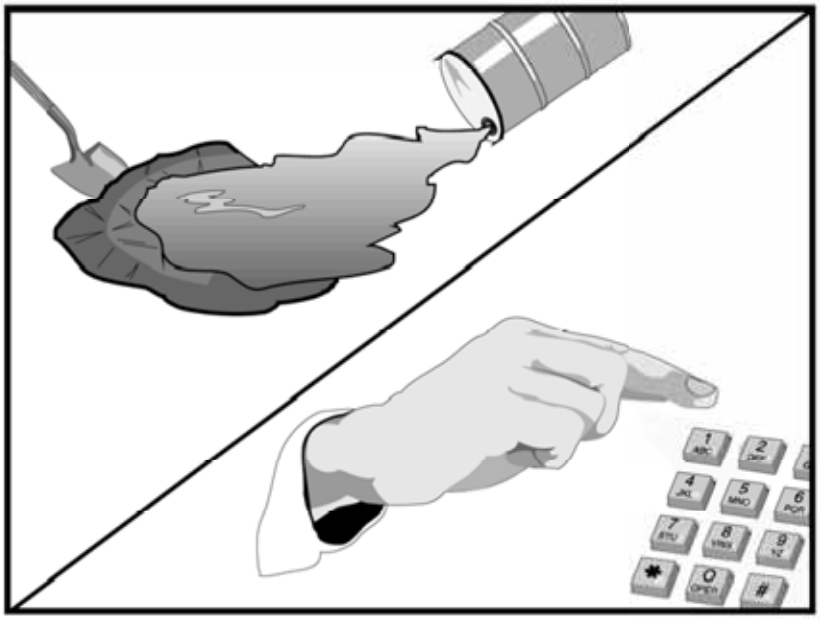
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

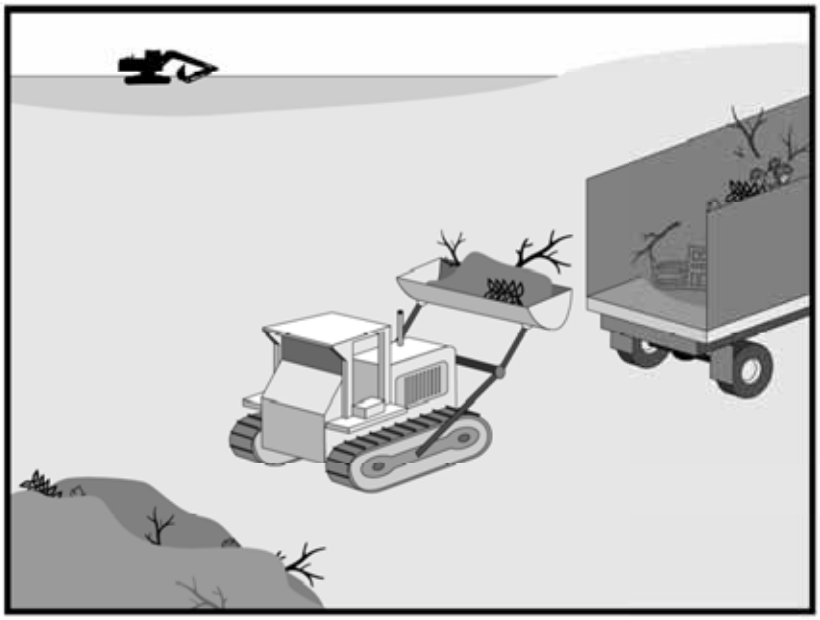
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

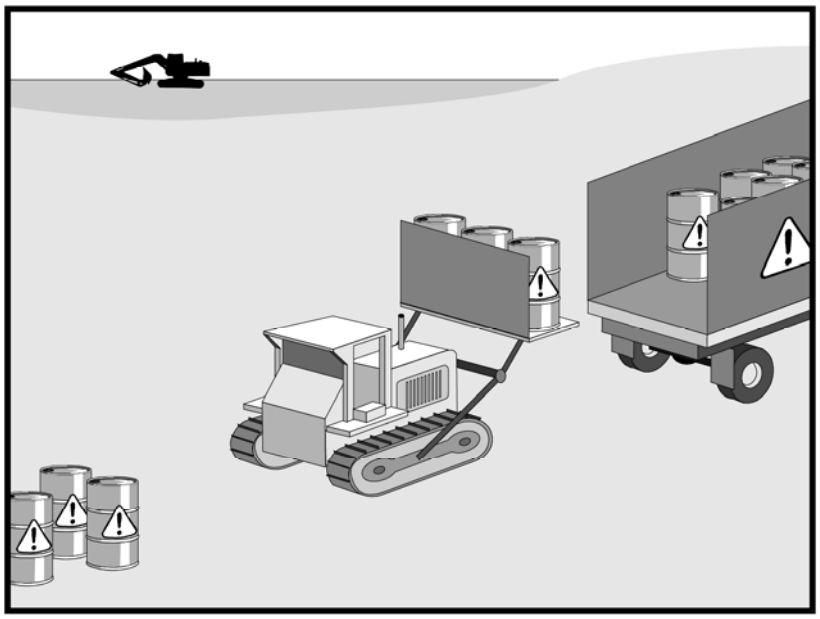
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Hazardous Waste Management WM-6



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Concrete Curing Compounds
- Palliatives
- Septic Wastes
- Stains
- Wood Preservatives
- Asphalt Products
- Pesticides
- Acids
- Paints
- Solvents
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- The following actions should be taken with respect to temporary contaminant:
  - Ensure that adequate hazardous waste storage volume is available.
  - Ensure that hazardous waste collection containers are conveniently located.
  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
  - Minimize production or generation of hazardous materials and hazardous waste on the job site.
  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
  - Segregate potentially hazardous waste from non-hazardous construction site debris.
  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

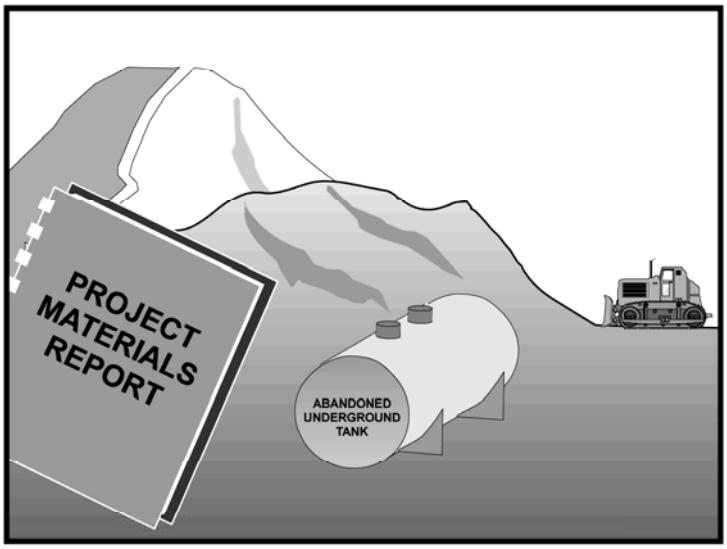
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Contaminated Soil Management WM-7



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

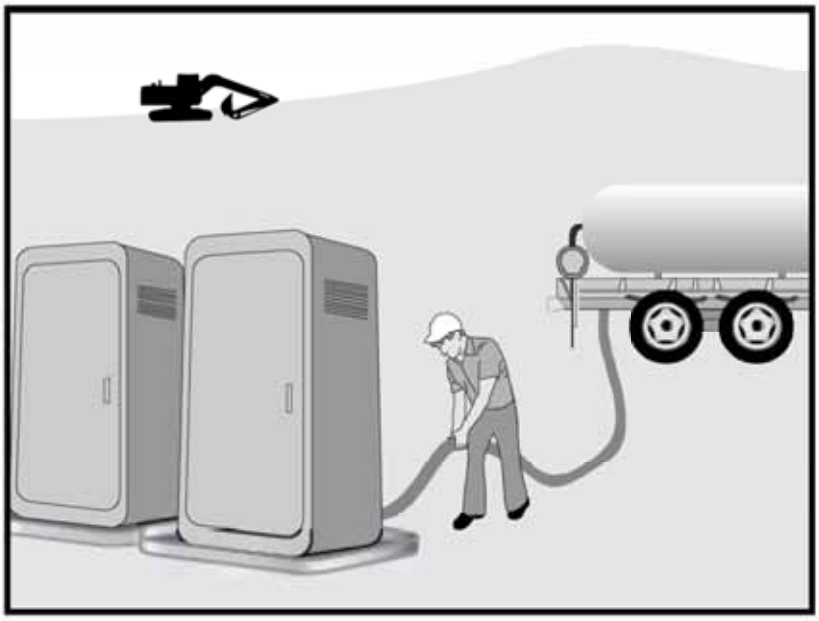
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Sanitary/Septic Waste Management WM-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

APPENDIX B

RESPONSE TO COMMENTS

This page intentionally left blank.

RESPONSE TO COMMENTS ON
DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN
NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA
RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments from Remedios V. Sunga
Project Manager
Department of Toxic Substances Control

Comments Dated: January 22, 2013

COMMENT	RESPONSE
Comment 1. General Comment. The following is a clarification on the agency review of these documents as discussed at the January 9th BCT meeting. The Demolition Work Procedure for Buildings 1121 and 1323 does not require DTSC and CDPH EMB review. This document will be reviewed by CDPH RHB since the work includes demolition and removal of the buildings and not the slabs. DTSC understands that removal of the slabs and remediation of underlying soil will be addressed in the Phase III NTCRA Work Plan for Site 12 SWDA A&B. Therefore, DTSC and CDPH EMB are not required to provide comments on the Demolition Work Procedure document.	**Response 1.** Comment noted.
Comment 2. Work Plan Title and Introduction. The title of the Work Plan should reflect the title in the Document Tracking Sheet that was provided at the January 9th BCT meeting to clarify that this document is the second phase of the NTCRA at Site 12 SWDA A&B. This clarification should be discussed in the Introduction.	**Response 2.** The title in the Document Tracking Sheet will be revised to reflect the title of the Work Plan, which is based on the title provided on the contract award document. The following has been added as the last sentence of the first paragraph under Section 1.0: "The field activities to be performed under this CTO will be performed under the second phase of the NTCRA at IR Site 12 SWDA A & B."

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comment 3. Page 2-4, Radiological Structure Surveys. Please clarify that the building demolition does not include removal of buildings slabs or foundations. Slab removal will be included in the Phase III NTCRA for Site 12 SWDA A&B.	**Response 3.** The first sentence of the second paragraph under Section 2.2 has been revised as follows: "Once written concurrence is received from the DON to proceed and CDPH concurs that the building materials are not radiologically contaminated, the buildings will be demolished up to the concrete foundations. The removal of the concrete foundations will be performed by others during the third phase of the NTCRA for IR Site 12 SWDA A & B."
Comment 4. Page 3-8, Air Monitoring. Air sampling and analysis is discussed in this section; however, action levels to implement controls or stopping work were not discussed. Please discuss the action levels or refer to a site document where they were presented.	**Response 4.** The action levels are provided in the second paragraph of Section 3.3.1. As stated, the analytical results for TSP will be compared with a standard of 0.5 milligram per cubic meter (mg/m^3) (level chosen to minimize overall permissible dust release from site), 1.5 mg/m^3 averaged over 1 month for lead, 50 mg/m^3 for PM_{10}, 0.1 fiber/cubic centimeter for asbestos, and 0.5 mg/m^3 for both PAHs and PCBs. All standard operating procedures controlling radiological work are referenced in Attachment 4, Table 1-1 of the Radiological Management Plan. Copies have been provided as an attachment. Air sampling and analysis requirements are contained in SOP-009, "Air Sampling and Sample Analysis." Posting and access control requirements concerning airborne radioactivity areas are contained in SOP-012, "Radiologically Controlled Area Posting and Access Control."

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comment 5. Removal Action Objectives, Page 1-3. Please clarify that this work plan addresses phase II of the NTCRA Site 12 at SWDA A&B to address radiological contamination only.	**Response 5.** The first sentence of the second paragraph of Section 1.3 has been revised as follows: "The removal action objectives for this NTCRA are to address radiological contamination in SWDA A & B, which includes 1) performing hot spot removal in two areas until the release criterion for Ra-226 is achieved and then performing an FSS for free release of these two hot spots; and 2) demolishing Buildings 1121 and 1323."

RESPONSE TO COMMENTS ON
DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN
NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA
RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments from Larry Morgan
Senior Health Physicist
California Department of Public Health

Comments Dated: January 16, 2013

COMMENT	RESPONSE
Comment 1. The Environmental Management Branch (EMB) of the California Department of Public Health (CDPH) appreciates the opportunity to review the submitted Draft *Non-Time-Critical Removal Action Work Plan December 2012;* Naval Station Treasure Island, San Francisco, California.	**Response 1.** Comment noted.
Comment 2. It might be helpful to include a designation that this work plan is for Site 12 in the title of the work plan.	**Response 2.** The title of the work plan has been revised to "Non-Time-Critical Removal Action Work Plan for IR Site 12 Hot Spots and Buildings 1121 and 1323."

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comment 3. EMB will be greatly assisted if all aspects of the Final Status Survey (FSS) compare the distribution data from each of the buildings and excavation sites' final status survey results, individually, to reference area results. Please include as a minimum these methodologies the Department of Navy has previously agreed to: • Cumulative probability curves to analyze Gamma Walk-over Surveys (GWS) and gamma static data, • final status reports and remedial action completion reports will include normal probability plots of the Ra-226 concentrations along with comparison to the Ra-226 concentrations in the soil samples collected from the background reference areas, • a comparison of the static count rate data distributions will be included in the final status survey reports and remedial action completion reports. The comparison of static count rate data distributions cited above refers to a comparison to background distribution.	**Response 3.** The Navy will include the following methodologies in the Final Status Survey Reports: • Cumulative probability curves to analyze Gamma Walk-over Surveys (GWS) and gamma static data. • Normal probability plots of the Ra-226 concentrations along with comparison to the Ra-226 concentrations in the soil samples collected from the background reference areas. • Comparison of the static count rate data distributions. The comparison of static count rate data distributions cited above refers to a comparison to background distribution.

Comment 4.	**Response 4.**
EMB does not concur with, "... Ra-226 and the release criterion for this isotope is 1 picocurie per gram above background." (page 1-4,section 1.4, Release Criteria, paragraph one, sentence three.) As a result of a Superior Court order (Committee to Bridge the Gap V. Bonta et.al, Sacramento County Superior Court Case No. 01CS01445," Order Requiring Supplemental Return to Amended Preparatory Writ", August 17, 2002) which held that," ... the standard in California for decommissioning and termination of licenses for radioactive sites is found in ... Section 30256", EMB utilizes the California Code of Regulations (CCR), Title 17, Section 30256(k). This section requires that radioactive material be removed, a reasonable effort has been made to eliminate residual radioactive contamination, and the licensee can demonstrate the site is suitable for unrestricted release.	The Navy agrees that a reasonable effort must be made to eliminate residual radioactive contamination. The 1 picocurie per gram above background for Ra-226 is a field screening guide for the contractors to determine an initial end point for the characterization and remediation of radiologically contaminated soils. The Navy will collect and analyze systematic samples from survey units, and statistically analyze the Ra-226 results to determine whether the distribution from the remaining soil is representative of non-contaminated soil (i.e., a normal distribution). See response to EMB Comment #3. In a normal distribution, with an appropriate reference area background selected, the expectation is that the middle of the normal distribution curve would be centered in the proximity of the mean of the reference area value with a number of soil sample values at the mean plus/minus 2 to 3 sigma range. The "1 picocurie per gram" above the reference area is a reasonable estimate of the upper 2 to 3 sigma range of the sample result distribution. The Navy understands that remediation may be iterative in nature after analysis of the statistical distribution of the systematic sample results, if these results do not indicate a normal distribution. The Navy believes the combination of a field screening guide and statistical analyses provides a reasonable process to eliminate residual radioactive contamination, and demonstrate a site is suitable for unrestricted release.

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comment 5. EMB does not concur with Table 6-1, Release Criteria, Notes: (g), "Limit is 1 pCi/g above the background, per agreement with EPA"(see General Comment number 2 above). Has the EPA listed Treasure Island as a site in the "National Priority List"(NPL)? If EPA has not, please explain how 42 CFR §9620(a)(4) applies to a non-NPL site.	**Response 5.** Note (g) has been deleted from Table 6-1, Release Criteria, in the Radiological Management Plan provided as Attachment 4 to the NTCRA Work Plan.
Comment 6. SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples, Notes:(a) "The statement of work lists the release criterion for Ra-226 as background + 1 pCi/g, which implies that the background concentration has been established at 0.7 pCi/g." EMB uses comparison to background as its key release criterion; EMB hopes to see a more robust, technically based citation for background values.	**Response 6.** See the response to Comment 4 above. A similar approach for establishing background concentrations through collecting systematic samples in a non-impacted area has been used for other Navy radiological remediation projects within the San Francisco Bay area, and EMB has concurred on the recommendations for release in reports using that methodology. For this project, when samples are collected, a mean background level will be determined by taking measurements at systematic or random locations within the designated reference area and collecting and analyzing soil samples through gamma spectroscopy. SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples, Notes:(a) "The statement of work lists the release criterion for Ra-226 as background + 1 pCi/g, which implies that the background concentration has been established at 0.7 pCi/g." has been deleted.

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comment 7. SAP Worksheet# 17 – Sampling Design and Rationale page 83 of 162, paragraph one, sentence five, "... with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent) ..." EMB recommends the use of Ludlum Model 44-20 with a 3-inch by 3-inch NaI scintillation detector. While both models are acceptable, the a *priori* Ra-226 MDC is 0.85 pCi/g for a Ludlum Model 44-20 GWS of a NUREG-1507 hot spot assuming a 0.95 true positive proportion and a 0.60 false positive proportion when the detector is directly over the hot spot term (NRC, 1998). This is considerably more robust than the calculated a *priori* Ra-226 MDC of 1.33 pCi/g of a Ludlum Model 44-10 given the same conditions.	**Response 7.** As both the Ludlum Model 44-10 and 44-20 detectors are acceptable for use based on *a priori* MDCs, and the Ludlum 44-20 is technically equivalent to the Ludlum 44-10, no changes have been made to SAP Worksheet #17. Detector model use will be on a case-by-case basis taking into consideration the required MDC as well as size and space of areas to be surveyed.

RESPONSE TO COMMENTS ON
DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN
NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA
RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments from Scott Warner, CHG, CEG
AMEC Environment & Infrastructure, on behalf of Treasure Island Development Authority

Comments Dated: January 18, 2013

GENERAL COMMENT	RESPONSE
As a general comment, we wish to be assured that all construction work will be performed according to applicable laws and regulations, and best management practices for protecting public areas and areas outside construction zones will be used. This includes assuring that no debris or spoils will be left on roadways or outside constructed/secured zones, that appropriate tarping of trucks will occur, and that all reasonable methods to prevent wind blown dust and debris will be taken.	**Response.** Comment noted. All construction work will be performed according to applicable laws and regulations, and best management practices for protecting public areas and areas outside construction zones will be used. This will include ensuring that no debris or spoils will be left on roadways or outside constructed/secured zones, that appropriate tarping of trucks will occur, and that all reasonable methods to prevent windblown dust and debris will be taken.

COMMENT	RESPONSE
Comment 1. Page 1-2, Section 1.1, Third Paragraph. Please update the subject document so that reference is made to the Draft, Historical Radiological Assessment Supplemental Technical Memorandum (HRASTM) that has been under review since being published in 2012. Although a final HRASTM has not yet been completed and its development remains in progress, we believe that it has undergone sufficient review by representative parties, including the public, that mention of this document should be made in all subsequent work plans for Treasure Island that involve radiological characterization and remediation.	**Response 1.** Since the Draft HRASTM does not affect the work described in this Work Plan, there is no reason to reference a draft document under regulatory review. As stated in Section 1.3, the removal action is being performed in accordance with the final Action Memorandum (DON 2007).

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comment 2. Page 1-4, Section 1.4. Please confirm that the "release criteria" to be used for Ra-226 for remedial work in all cases is to be 1 picocurie per gram above background. If this release criteria is not to be applied to any of the work described in this work plan, please clarify when such release criteria will not be used.	**Response 2.** The release criterion to be used for Ra-226 is 1 picocurie per gram above background as stated in Section 1.4.
Comment 3. Page 2-3, Section 2.1.6, 2nd Paragraph. Please clarify that if utilities damaged during the remedial work are replaced, they will not just be replaced with materials that meet "industry standards" but will be replaced upon agreement from the utility operators including the San Francisco PUC.	**Response 3.** If utilities are damaged during the remedial work, the utilities will be replaced with in-kind materials or with other materials that meet current industry standards in consultation with the Navy. The text in the second paragraph of Section 2.1.6 has been revised accordingly.
Comment 4. Page 2-3, Section 2.1.6, 3rd Paragraph. Please list the monitoring wells that may be affected by the excavation work.	**Response 4.** The three monitoring wells that are located within the southern hot spot excavation work area are 1325-A3, 1323-F3, and 12-SG090. The locations of these wells in relation to the hot spots will be verified in the field upon start of field activities. The first sentence of the third paragraph under Section 2.1.6 has been revised as follows: "Three groundwater monitoring wells (1325-A3, 1323-F3, and 12-SG090) are located in the vicinity of planned excavation areas."
Comment 5. Page 2-4, Section 2.1.8. Please provide an update as to when the "One Task Specific Plans" for the Radiological Structure Surveys for Buildings 1121 and 1323 will be completed. We cannot concur with this Work Plan until these important additional document(s) is(are) available.	**Response 5.** This plan has been provided to the Navy's Radiological Affairs Support Office for review and approval. A copy of the Task-specific Plan will be included as an appendix to the Removal Action Completion Report.

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comment 6. Page 2-5, Section 2.3. Please clarify the meaning of "in situ identification and removal" of discrete sources/commodities.	**Response 6.** The "in situ identification and removal" of discrete sources/commodities is discussed in Section 2.3.1.
Comment 7. Figure 2-1, Air Monitoring Program. Considering the public's attention to wind blown affects during construction activities, and the typical windy conditions on Treasure Island, the number and placement of air monitoring stations is insufficient in our opinion. At least one additional downgradient monitoring area, should be included. Please also include contingencies for variable wind directions during the construction work.	**Response 7.** The text in Section 3.3.2 has been revised as follows: "Two air monitoring stations will be installed to collect air samples upwind and downwind of each work area for the duration of the activities. As work progresses, the stations will be moved to ensure adequate air monitoring site coverage of the field activities. The proposed locations of air monitoring stations based on the predominant prevailing wind direction at NAVSTA TI (west) are shown on Figure 2-1. Air monitoring is performed to estimate and assess the impact of the field activities. The locations of the air monitoring stations will be determined based on the actual prevailing wind direction and may be modified as needed. At the start of field activities, an additional monitoring station will be established downwind to allow flexibility of changing which downwind air monitoring station will be used based on the actual prevailing wind direction. Monitoring stations will not be moved while they are sampling. Radiological air monitoring will be conducted both upwind and downwind of the excavations and in the immediate vicinity of each excavation site in accordance with the applicable radiation work permit requirements and SOP 009, Air Sampling and Sample Analysis. In addition, a windsock will be set up to show wind direction."

RESPONSE TO COMMENTS ON
DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN
NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA
RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Comments from Bob Burns, CHP
NGTS, Inc., on behalf of Treasure Island Development Authority

Comments Dated: January 18, 2013

GENERAL COMMENT	RESPONSE
Comment 1. The Plan should document that the 3-sigma over background screening criterion for gamma scans will be sufficiently sensitive with respect to the 1 pCi/g (net) release criterion or state where this evaluation will be presented.	**Response 1.** The 3-sigma over background screening criterion is not intended to conclusively identify Ra-226 at a concentration exceeding 1 pCi/g above background. Per MARSSIM, Section 5.5.2.6, this investigation level is used to identify areas that should be further investigated by sample collection and analysis by gamma spectroscopy, which is sufficiently sensitive with respect to the stated Ra-226 release criterion.
Comment 2. With respect to Buildings 1121 and 1323, the Plan uses a definition of radiologically impacted that differs from the MARSSIM definition used in the Supplemental Technical Memorandum and other project documents. Those buildings are radiologically impacted per the MARSSIM definition.	**Response 2.** Verbiage stating “radiologically impacted,” but intended to mean “radiologically contaminated” has been changed to state “radiologically contaminated” for Buildings 1121 and 1323.

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
SPECIFIC COMMENT	**RESPONSE**
Comment 1. Section 1.4. The text should also address the applicable radiological release criteria for building surfaces.	**Response 1.** The applicable radiological release criteria for building surfaces have been included in Section 1.4.
Comment 2. Section 2.3.1 Item 3. Where will the process of selecting the background reference areas and determination of applicable instrument backgrounds for the soil surveys be documented?	**Response 2.** The process of selecting the background reference areas and determination of applicable instrument backgrounds for the soil surveys will be documented in the Removal Action Completion Report.
Comment 3. Section 2.3.1 Item 5. As written the text implies a two-step process where soil will be excavated and surveyed to determine what portion of the lift should be taken to the soil screening pad discussed in Section 2.4. This would seem inefficient and would run the risk of contaminating two laydown areas instead of just one. If such a two-step process is not intended then the text should be clarified accordingly. Otherwise, additional detail should be provided describing the initial screening and segregation process, the location of the initial laydown area, characterization for its as-found radiological conditions, etc.	**Response 3.** Section 2.3.1 Item 5 describes surveying in situ soil and soil transferred to a screening pad, with only one laydown area. For clarity, the second bullet has been changed to read: "In situ soil above 3 sigma of the mean background area level will be segregated and placed into a soil hopper for transfer to the soil screening pad (see Section 2.4)."
Comment 4. Section 3.1.1.4 (and elsewhere). Discussion of the track-out control stations focuses on mud and loose soils. Will radiological surveys be performed for vehicles leaving the hot spot areas?	**Response 4.** Radiological surveys will be performed on vehicles leaving the hot spot areas per the standard operating procedures listed in the Radiation Protection Plan.

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comment 5. Section 3.3.2.5 does not provide sufficient detail on the air sampling to be performed with respect to ensuring that radiologically-contaminated soil is not inadvertently spread to other areas during hot spot remediation or other soil handling activities.	**Response 5.** Air sampling and analysis for radiologically contaminated soil that has become airborne is detailed in SOP-009, "Air Sampling and Analysis" referenced in Attachment 4, Table 1-1 of the Radiological Management Plan. A copy has been provided as an attachment.
Comment 6. Attachment 1, SAP Worksheet #15.1. For screening-level soil sample results (those counted without ingrowth with a MDC of 1.3 pCi/g) what criteria will be used to identify samples or areas that warrant follow-up evaluations?	**Response 6.** For screening-level soil sample results (those counted without ingrowth with a MDC of 1.3 pCi/g), the Ra-226 186.2 keV gamma energy peak, along with results of the Bi-214 and Pb-214 concentrations with a corresponding in-growth correction factor will be used with professional judgment to identify samples or areas that warrant follow-up evaluations. Note that all final definitive data will be based on a 21 day in-growth sample analysis result based on Bi-214 concentration.
Comment 7. Attachment 1, SAP Worksheet #17. Given a background reference level for Ra-226 in soil has already been established for Treasure Island (0.7 pCi/g per footnote (a) to SAP Worksheet #15.1), is additional reference area sampling anticipated?	**Response 7.** Reference area sampling will be conducted to ensure samples from the reference area and the radiologically impacted survey units have been analyzed by the same Department of Defense Environmental Laboratory Accreditation Program. The 0.7 pCi/g background reference level for Ra-226 in soil was used as a placeholder until the Work Plan is approved and work can commence.

RESPONSE TO COMMENTS ON DRAFT NON-TIME-CRITICAL REMOVAL ACTION WORK PLAN NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12, NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA	
Comments from Dale Smith Naval Station Treasure Island Restoration Advisory Board Comments Dated: January 16, 2013	
COMMENT	**RESPONSE**
Comment 1. The two plans do not appear to describe the same rationale for building removal. The work plan identifies radiological contamination as the driver of the remediation, while the demolition plan is silent. Both plans indicate the buildings will be removed and the slab left in place. However, the meeting minutes of October 2012 state that the slab will also be removed, although at a later date. It seems beneficial to bring the two plans into agreement ite 12why the work is being conducted and to echo the meeting minutes.	**Response 1.** TtEC is not tasked to remove the concrete foundations at this time. This will be performed by others under the third phase of the NTCRA for SWDA A & B (see response to DTSC's Comment #3 above).

ATTACHMENT TO RTCs
STANDARD OPERATING PROCEDURES REFERENCED IN RESPONSES
(on CD only)

This page intentionally left blank.

Standard Operating Procedure

RADIATION AND CONTAMINATION SURVEYS

SOP-001

Revision 0

Approved By:

11/9/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/9/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 General 5
4.1.1 Discussion 5
4.1.2 Planning and Prerequisites 5
4.2 Procedure Process 6
4.2.1 Exposure/Dose Rate Surveys 6
4.2.2 Removable Contamination Surveys 6
4.2.3 Surveys for Fixed Alpha/Beta Contamination 8
4.2.4 Gamma Surveys 9
5.0 RECORDS 10
6.0 REFERENCES 10
7.0 ATTACHMENTS 10

1.0 PURPOSE

The purpose of this procedure is to specify methods and requirements for radiological surveys, and to provide 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.

Exposure/Dose Rate – The amount of radiation (exposure or dose) delivered at a given point per unit time. Typical units for exposure are microroentgen per hour (microR/hr) while typical units for dose are micro Rem per hour (microRem/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.

4.0 PROCEDURE DETAILS

4.1 General

Radiation surveys are performed to identify radiation areas, measure the exposure and or dose 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 survey forms like 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.

Field backgrounds will be checked and MDC calculations verified each work day.

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.
- A routine survey is required to meet TtEC's Nuclear Regulatory Commission Radioactive Materials License or Agreement State Radioactive Materials License.
- 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:

- Checked to make sure battery is charged.
- 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/Dose Rate Surveys

Always survey a sufficient number of locations to determine the average and maximum general area and contact radiation levels.

A Ludlum Model-19, Bicron MicroREM, or equivalent meter, should be used for performing exposure or dose rate surveys for 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/dose 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/dose rate.
- Perform contact exposure/dose rate measurements with the detector within 1 inch of the surface to be surveyed.
- Perform surveys at approximately 1 meter (waist level) from the surface to establish posting requirements for the area.
- Verify the exposure/dose rates of known elevated exposure/dose rate locations.

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.

4.2.2.3 Counting Swipes

A Ludlum Model-2929 scaler with a Model 43-10-1 ZnS(Ag) scintillation probe (or equivalent) or Protean Alpha/Beta Gas Flow Proportional Counter (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 areas, 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 survey requirements.
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 LAW to dry prior to counting.
2. Scan the LAW with an appropriate field instrument (Ludlum Model-2360 meter with a 43-89 probe, or equivalent), in an area with a low background.
3. Hold the detector within a quarter 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.

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 meter with a 43-68 probe, 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 a quarter 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 a quarter 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:

$$A_S = \frac{R_{S+B} - R_B}{\varepsilon_i \varepsilon_s \frac{W_A}{100\,\mathrm{cm}^2}}$$

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 meter with a 44-10 probe, or equivalent, should be used for gamma radiation surveys. For large areas, a RASO-approved vehicle towed array system may be used in accordance with *SOP 013, Vehicle Towed Array*.

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 gamma 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

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 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:						
RSOR:						
Isotopes of Concern:						
Description or drawing:						

Routine (Daily / Weekly / Monthly) ☐ Non-routine ☐

All radiation readings in µr/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:	RSOR	Date/Time:

Standard Operating Procedure

PREPARATION OF PORTABLE RADIATION AND CONTAMINATION SURVEY METERS AND INSTRUMENTS FOR FIELD USE

SOP-002

Revision 0

Approved By:

11/9/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/9/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 CALIBRATION 5
4.2 GENERAL CONSIDERATIONS 5
4.3 DETERMINATION OF INSTRUMENT BACKGROUND 6
4.4 CHI-SQUARE TEST 7
4.5 INSTRUMENT EFFICIENCY FOR PORTABLE INSTRUMENTS 7
4.6 OPERATION CHECK 9
4.7 MAINTENANCE 10
5.0 RECORDS 10
6.0 REFERENCES 10
7.0 ATTACHMENTS 10

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 (i.e., Task-specific Plans (TSPs), work instructions, and other Work Plan 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 $\pm$ 20 percent or $\pm$ 2σ 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, 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 disintegration though are typically recorded as a unitless value.

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 Radiation Safety Officer Representative (RSOR), 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

Upon receipt of survey equipment from an offsite vendor, and prior to shipment to an offsite vendor, the survey equipment shall be surveyed for alpha/beta fixed and loose contamination in accordance with *SOP 003, Release of Materials and Equipment from Radiologically Controlled Areas*. If any contamination limits are exceeded, notify the RSOR immediately.

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.

In the event that any instrument and detector combination fails a chi-square test or daily operation check or has exceeded its annual calibration date without RSO approval, the instrument shall be put in an "out of service" condition by placing an "out of service" tag or equivalent on the instrument and detector combination, and securing in a separate area such that the instrument and detector combination cannot be issued for use. The RTS shall be notified immediately when any survey instrumentation has been placed "out of service".

Any instrument and detector combinations that have not had a daily operation check performed because daily plans do not include their use shall be secured in an area to prevent their use until operation checks have been performed.

Table 4-1 gives suggested geometries to use for the most common instrument types to be used. Alternate geometries can be used provided that they are more appropriate for the intended usage of the instrument.

4.3 Determination of Instrument Background

The determination of an instrument specific background is an optional procedure which may be employed at the discretion of the RSOR. 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.

TABLE 4-1

SUGGESTED GEOMETRIES FOR BACKGROUND MEASUREMENTS AND SOURCE CHECKS

Measurement	Instrument/Detector Combinations	Probe Location
Exposure/Dose Rate	Ludlum Model 19, RO-20, Bicron MicroREM, or equivalent meter with integral tissue equivalent plastic or sodium iodide (NaI) 1”x1” detector	contact[a]
Gamma	Ludlum Model 2221, 2350-1 or 2360 portable survey meter or equivalent with a Ludlum Model 44-10, FIDLER or equivalent detector	4 inches above ground surface/source
Beta/Gamma	Ludlum Model 2360 portable survey meter or equivalent with a Ludlum Model 43-37, 43-68, 43-89 or equivalent detector; Ludlum Model 3 portable survey meter with a Ludlum Model 44-9 G-M probe or equivalent	¼ inch above ground surface/source
Alpha/Beta	Ludlum 2360 portable survey meter or equivalent with a Ludlum 43-37, 43-68, 43-89 or equivalent detector	¼ inch from surface/source

Notes:

[a] Field readings with exposure/dose 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.

When required, background determinations will be documented on Attachment A or equivalent 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, this procedure 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 testing is not required to be performed on exposure rate instruments (e.g., Ludlum Model 19 or RO-20) or personnel contamination "frisking" instrument/detector combinations (e.g., Ludlum Model 3 or 177 with 44-9) unless specified in work-specific documents.

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 in Attachment B or equivalent, 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 for a test using 20 counts. 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 RSOR 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,

E_i = the instrument efficiency (counts per disintegration)
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 equipment manufacturer'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 RSOR)

The resulting efficiency should be reported in units of counts per disintegration.

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)

Instructions for performing operation checks for specific instruments and detectors are included in Attachment C of this procedure. Failure of any of the above checks shall result in the instrument being removed from active service until the condition can be addressed. The RSOR 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. A separate check log shall be maintained for each instrument type. 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.

A sticker annotating that daily operation checks have been completed satisfactorily shall be affixed to each instrument. The sticker shall contain the following information at a minimum:

- Initials of technician

- Date of operational check

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, instrument calibration and check logs. Record forms shall be obtained from the attachments of this procedure or equivalent electronic versions or as specified in work-specific procedures.

6.0 REFERENCES

None.

7.0 ATTACHMENTS

Attachment A, Instrument/Detector Background Form

Attachment B, Chi Square Form

Attachment C, Instrument and Detector Operational Check Procedures

Instrument/Detector Background Form

Instrument Model:					Instrument Serial No.		
Cal due date					Data Type		
Detector Model:					Detector Serial No.:		
Today's Date:					Data Collected by:		

Count Number	Background
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
Total	
Mean Count:	
Standard Deviation:	
Mean + 3 σ Value:	

Comments:

Mean +20%	
Mean -20%	

Calculations Completed by:	Date:
Reviewed by:	Date:

Attachment A

Chi Square Form

Instrument Model:				Instrument Serial No.		
Cal due date				Data Type		C_B
Detector Model:				Detector Serial No.:		
Today's Date:				Data Collected by:		
Source ID:		Activity	dpm			
Radionuclide:		CPM	CPM			
Count Number	Background	(Gross) C_G	(Net) C_I		$(C_I - \bar{c})$	$(C_I - \bar{c})^2$
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
Total				SUM		$\Sigma(C_I - c)^2$
Mean Count: $\bar{c}$						
Chi Squared Value (C^2):		10.11 - 30.14	Standard Deviation:			
+ 2 σ Value:		- 2 σ Value:				
Calculations Completed by:						Date:
Reviewed by:						Date:

+20%
-20%

Performed By *(Print)* : _____

Signature: _____

Daily QC Worksheet
Model RO-20 Meters

Date: _____ Time: _____

Instrument Model #	Data #	Instrument Serial #	Calibration Due Date	Battery Check	Calibration Check	Condition	Physical Damage	Background Reading	Background QC Limits	Source Reading (Net)	Source QC Limits

Source Information:	**Isotope**	**ID**	**Half Life**	**Activity**	**Creation Day**
Source Information:	**Isotope**	**ID**	**Half Life**	**Activity**	**Creation Day**

Note_____

Reviewed By: _____ Date: _____

Performed By *(Print)* : _____

Signature: _____

Daily QC Worksheet
Countrate Friskers

Date: _____ Time: _____

Instrument Model #	Data #	Instrument Serial #	Probe	Probe Serial #	Calibration Due Date	Battery Check	Calibration Check	Condition	Physical Damage	Background Reading (CPM)	Background QC Limits (CPM)	Source Reading (Net CPM)	Source QC Limits (CPM)

Source Information:	Isotope	ID	Half-life	Activity	Creation Day

Note_____

Reviewed By: _____ Date: _____

Performed By *(Print)* : _____

Signature: _____

Daily QC Worksheet
2360 Countrate Meters

Date: _____ Time: _____

Instrument Model #	Data #	Instrument Serial #	Probe	Probe Serial #	Calibration Due Date	Battery Check	Calibration Check	Condition	Physical Damage	Background Readings	Background QC Limits (CPM)	Instrument Readings (Net CPM)	Source QC Limits (CPM)
												Section 1: α β	α β
												Section 2: α β	α β
												Section 3: α β	α β
												Section 4: α β	α β
										α β		Section 1: α β	α β
												Section 2: α β	α β
												Section 3: α β	α β
												Section 4: α β	α β

*These meters are paired with floor monitoring detectors and require a four-part source check.

Source Information:	Isotope	ID	Half-life	Activity	Creation Day
Source Information:	Isotope	ID	Half-life	Activity	Creation Day

Note_____

Reviewed By: _____ Date: _____

Performed By *(Print)* : _____

Signature: _____

Daily QC Worksheet
2350-1 Countrate Meters

Date: _____ Time: _____

Instrument Model #	Data #	Instrument Serial #	Probe	Probe Serial #	Calibration Due Date	Battery Check	Calibration Check	Condition	Physical Damage	Background Readings (CPM)	Background QC Limits (CPM)	Instrument Readings (Net CPM)	Source QC Limits (CPM)

Source Information:	Isotope	ID	Half-life	Activity	Creation Day
Source Information:	Isotope	ID	Half-life	Activity	Creation Day

Note_____

Reviewed By: _____ Date: _____

Performed By *(Print)* : _____

Signature: _____

Daily QC Worksheet
Model 19 Micro-R Meters

Date: _____ Time: _____

Instrument Model #	Data #	Instrument Serial #	Calibration Due Date	Battery Check	Calibration Check	Condition	Physical Damage	Background Reading	Background QC Limits	Source Reading (Net)	Source QC Limits

Source Information:	**Isotope**	**ID**	**Half Life**	**Activity**	**Creation Day**
Source Information:	**Isotope**	**ID**	**Half Life**	**Activity**	**Creation Day**

Note_____

Reviewed By: _____ Date: _____

Performed By *(Print)* : _____

Signature: _____

Daily QC Worksheet
Friskers

Date: _____ Time: _____

Instrument Model #	Data #	Instrument Serial #	Probe	Probe Serial #	Calibration Due Date	Battery Check	Calibration Check	Condition	Physical Damage	Background Reading	Background QC Limits	Source Reading (Net CPM)	Source QC Limits (CPM)

Source Information:	Isotope	ID	Half-life	Activity	Creation Day

Note_____

Reviewed By: _____ Date: _____

Standard Operating Procedure

RELEASE OF MATERIALS AND EQUIPMENT FROM RADIOLOGICALLY CONTROLLED AREAS

SOP-003

Revision 0

Approved By:

Erik J. Abkemeier

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 4
4.1 GENERAL 4
4.2 LIMITATIONS 4
4.3 RELEASE PROCEDURE 5
4.3.1 Material History 5
4.3.2 Contamination Surveys 5
4.3.3 Inaccessible Surfaces 5
4.3.4 Release of Material and Equipment 5
5.0 REFERENCES 7
6.0 ATTACHMENTS 7

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 *SOP 001, 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 *SOP 005, 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 *SOP 001, Radiation and Contamination Surveys*.

Swipes collected for removable surface contamination shall be analyzed with a Ludlum Model 2929 scaler with a Model 43-10-1 ZnS(Ag) scintillation probe (or equivalent) or Protean Alpha/Beta Gas Flow Proportional Counter (or equivalent).

Scan surveys will be conducted on all accessible surfaces of the material or equipment that may have come in direct contact with radioactively contaminated material. Whenever practical, 100 percent of these areas will be scanned for alpha and beta contamination.

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

If items have inaccessible surfaces that may have been exposed to contamination, or if it is unknown if they have been exposed to contamination, the items 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 Radiation Safety Officer Representative (RSOR), 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 *SOP 007, Decontamination of Equipment and Tools*, or packaged for disposal.
3. Results of the swipe, scan, and static surveys shall be documented in accordance with *SOP 001, Radiation and Contamination Surveys*.
4. If the equipment and/or materials are being returned to a vendor or removed from the site, a completed Attachment 1 – Unconditional Release of Equipment or Materials Form – or copy of the Radiation/Contamination Survey and Supplement form (Attachments 1 and 2 from *SOP 001, Radiation and Contamination Surveys*) with the statement "Equipment or materials have been surveyed and found to be within acceptable surface contamination levels for unconditional release as required by AEC Guide 1.86" written or stamped on the Radiation/Contamination Survey Form or equivalent 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) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	20
Beta (β-) Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000	200
Beta-Gamma (β-γ) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	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*
SOP 001	*Radiation and Contamination Surveys*
SOP 005	*Radiological Protective Clothing Selection, Monitoring, and Decontamination*
SOP 007	*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 $\beta\gamma$	Removable
	dpm/100 cm^2 α	Removable
	dpm/100 cm $\beta\gamma$	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:

Standard Operating Procedure

RADIOLOGICAL RECORDS

SOP-004

Revision 0

Approved By:

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 OVERVIEW 4
3.0 RESPONSIBILITIES 4
3.1 Radiation Safety Officer 4
3.2 Radiation Safety Officer Representative 4
3.3 Other Project Personnel 5
4.0 REQUIREMENTS 5
5.0 DOCUMENT QUALITY STANDARDS 5
6.0 PROCEDURE 6
6.1 Preparation of Radiological Records 6
6.2 Review of Records 6
6.3 Approval of Records 6
6.4 Individual Monitoring 6
6.4.1 Monitoring Records 7
6.4.2 Other Monitoring Records 7
7.0 RECORD RETENTION 8
8.0 REFERENCES 8
9.0 ATTACHMENTS 8

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
- Radiological control (RadCon) Personnel Training (course records and individual records)
- Radiological instrumentation test, repair, and calibration records
- Radiological surveys
- Dosimetry results
- Dose to Members of the general public
- Radiological work permits
- Radiological incident reports
- The results of internal audits and other reviews of program content and implementation
- Written declarations of pregnancy, including the estimated date of conception
- Records for release of material from radiologically controlled areas
- Records of Waste Disposal

Radiological records are transferred to the project file located in San Diego following completion for projects completed under California Agreement State Radioactive Material License (RML) number 7909-01, and to the Corporate Headquarters in New Jersey for projects completed under Nuclear Regulatory Commission (NRC) RML number 32-31396-01.

3.0 RESPONSIBILITIES

3.1 Radiation Safety Officer

The Radiation Safety Officer is responsible for:

- Ensuring effective implementation of the RadCon records management program and that the program is in compliance with regulatory requirements.

3.2 Radiation Safety Officer Representative

The Radiation Safety Officer Representative:

- 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 the 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

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.

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.

If working copies of records are used for reference, they will be stored 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 substance. 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)

To the maximum extent possible, upload electronic copies of radiological records to the TtEC sharepoint site to ensure retrievability by the RSO and RSORs in the event of program audits or inspections.

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

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 any 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.

- 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 records of the current year 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, or positive bioassay.

6.4.2 Other Monitoring Records

The following other information will be documented and maintained:

- Results of area monitoring
- 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, the records of released property will include:
  (a) A description or identification of the property

(b) The date of the survey
(c) The identity of the individual who performed the monitoring operation
(d) The type and identification number of monitoring instruments
(e) The results of the monitoring operation

- Results of maintenance and calibration performed on instruments and equipment
- 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

None.

9.0 ATTACHMENTS

None.

Standard Operating Procedure

RADIOLOGICAL PROTECTIVE CLOTHING SELECTION, MONITORING, AND DECONTAMINATION

SOP-005

Revision 0

Approved By:

Erik J. Abkemeier

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 Selection of Personnel Protective Equipment 5
4.2 Procedure Process 7
4.2.1 Donning Protective Clothing 7
4.2.2 Removal of Protective Clothing 7
4.2.3 Monitoring 8
4.2.4 Personnel Decontamination 9
4.2.5 Radiological Follow-up 11
5.0 RECORDS 12
6.0 REFERENCES 12
7.0 ATTACHMENTS 12

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

Radiation Type	Release Limits[1] (Fixed) (dpm per 100 cm^2)	Release Limits[1] (Removable) (dpm per 100 cm^2)
Alpha (α) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	20
Beta (β-) Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000	200
Beta-Gamma (β-γ) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	1,000

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 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.

4.0 PROCEDURE DETAILS

4.1 Selection of Personnel Protective Equipment

The following factors should be considered when selecting personnel protective equipment (PPE):

- 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) (i.e., 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 PPE when radiological hazards are present or suspected.

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

The guidelines specified in Table 4-1 for PPE 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 Radiation Safety Officer Representative (RSOR) and Site Health and Safety Specialist (SHSS).

4.2 Procedure Process

4.2.1 Donning Protective Clothing

1. Select the appropriate PPE.
2. Inspect the clothing for holes, tears, or other indications of damage. If damaged, remove PPE from service.
3. Place dosimetry, if worn, in the upper body area on the interior of the breast tab with the window of the dosimeter facing out. When coveralls that do not have a breast tab or pocket are worn, dosimetry should be attached per the direction of the RSOR or designee.
    - The dosimeter shall not be worn inside clothing or placed in pockets if exposure of bare skin to beta radiation is expected.
4. If a respirator is specified on the RWP, then:
    - Ensure that any required surgeons cap or hood is situated such that it will not interfere with the respirator face to facepiece seal area.
    - Don the respirator.
    - Don the hood if required, allowing it to overlap the rubber around the lens of the face piece and fall over the shoulder.
    - If required, tape the hood to the respirator and to the coveralls.
    - Ensure that any required hood is slack enough around the shoulders to allow for full head movement.
5. Don rubber gloves.
    - More than one pair of rubber gloves may be required for certain jobs.
    - Tape the innermost pair of rubber gloves to the coverall sleeves.
    - Leather work gloves may be substituted for outer rubber gloves on some jobs as specified by the corresponding Radiation Work Permit.
6. If specified on the RWP, then don additional PPE as required.

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. If worn, remove the hood.
4. If worn, remove the respirator.
5. If worn exterior to coveralls, remove dosimetry.
6. Remove coveralls, if worn, by peeling off inside out and rolling downward over the shoes or inner booties.
7. Remove booties.
8. 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.

9. 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 1/4 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 RSOR 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 RSOR.
4. When performing skin decontamination:
    - Exercise care to avoid damaging the skin.
    - If skin irritation becomes apparent, then discontinue the decontamination and notify the RSOR.
    - 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 RSOR.
- 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 PPE, then complete Section A, “Event Directly Related to Wearing PPE.”
    - Check the appropriate Contamination Event Description.
    - Check the appropriate Basic Cause.
6. If the contamination occurred while removing PPE, then complete Section B, “Event Occurred While Removing PPE.”
    - Check the appropriate “Contaminating Event Description.”
    - Check the appropriate “Basic Cause.”
7. If the contamination event was not related to wearing PPE, then complete Section C, “Event Not Directly Related to Using PPE.”
    - 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 RSOR shall:

1. Review the Personnel Contamination Report to verify that all required information has been accurately recorded.
2. Complete the “RSOR” 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 Site Health and Safety Specialist (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 RSO 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 RSO 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*

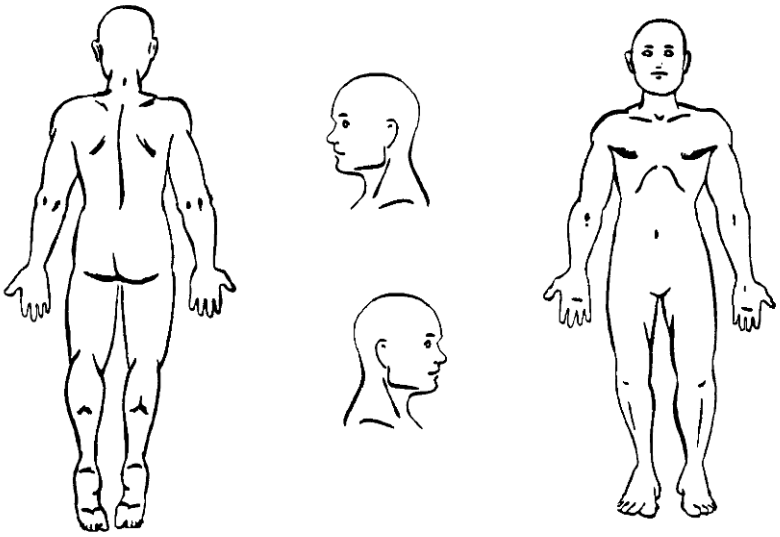
7.0 ATTACHMENTS

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 PPE

Contaminating Event Description	Basic Cause
[ ] Contaminated by physical compromise of PPE (tear, etc.)	[ ] Improper donning of PPE
[ ] Contamination penetration of intact PPE	[ ] Improper PPE use related to worker knowledge/experience
[ ] Contamination came from PPE	[ ] Work area not deconned to extent practicable
[ ] Contaminated skin by touching contaminated item	[ ] Practical limitation of available alternatives
[ ] Contamination came from contaminated liquid	[ ] Improper PPE requirement on RWP
[ ] Contamination came from airborne radioactivity	[ ] Improper control by RCT of worker activity in PPE
	[ ] Improper laundry/monitoring of PPE

B - Event Occurred While Removing PPE

Contaminating Event Description	Basic Cause
[ ] Contaminated during removal of hood	[ ] Lack of knowledge in proper methods to remove PPE
[ ] Contaminated during removal of respiratory equipment	[ ] Lack of knowledge in proper methods to remove respirator
[ ] Contaminated during removal of outer PPE	[ ] [ ] Worker actions while removing PPE - accident
[ ] Contaminated during removal of inner PPE	[ ] RCT technician actions
[ ] Contaminated during removal of plastics	[ ] [ ] Improper monitoring of PPE
[ ] Contamination came from airborne radioactivity	

C - Event Not Directly Related To Using PPE

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

Radiation Safety Officer Representative

[ ] 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

RSOR /

Print Sign Date

SHSS /

Print Sign Date

RSO /

Print Sign Date

Standard Operating Procedure

SAMPLING PROCEDURES
FOR RADIOLOGICAL SURVEYS

SOP-006

Revision 0

Approved By:

11/9/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/9/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 SAMPLING PROCEDURE DETAILS 4
4.1 GENERAL PROCEDURES 4
4.2 SAMPLING PROCEDURE PROCESS 5
4.2.1 Swipe Sampling 5
4.2.2 Soil Sampling 5
4.2.3 Sediment Sampling 6
4.2.4 Solid Material Sampling 6
4.2.5 Water Sampling 7
4.3 SAMPLE PACKAGING AND TRANSPORT 7
5.0 RECORDS 7
6.0 REFERENCES 7
7.0 ATTACHMENTS 8

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.

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 from the top 15 centimeters (cm) (6 inches) of the surface, unless otherwise noted in the applicable work-planning document [e.g. a Task-specific Plan (TSP), Work Instruction or Work Plan].

Sediment Samples – Sediment samples are defined as a collection of clay, silt, sand, and/or gravel deposited by water, wind, or glaciers used for analytical purposes.

Solid Material Samples – Solid material samples are defined as pieces of concrete, brick, porcelain, wood, or any other hard material collected for analytical purposes from buildings or surrounding areas. The samples could include accumulations from ventilation systems or drain systems.

Liquid Samples – Liquid samples are defined as liquid collected for analytical purposes from sinks, drain piping, sewer systems, rinsate, groundwater, leachate, liquid investigation-derived waste, and low-point accumulation areas inside of buildings, sumps, and excavation pits.

4.0 SAMPLING PROCEDURE DETAILS

4.1 General Procedures

Field instruments used for measurements required by this procedure shall be function checked daily with NIST traceable standards and verified to have current calibration.

Anytime this procedure is in effect, the Radiation Safety Officer Representative (RSOR) (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 SOP 001, *Radiation and Contamination Surveys*. Swipe samples will be documented in a logbook as applicable. Sample COC records shall be completed in accordance with the applicable SAP.

4.2.2 SOIL SAMPLING

Because standard surface soil contamination criteria for radionuclides are applicable to the average concentration in *the upper 15 cm (6 inches) of soil*, the sampling protocol described here is based on obtaining a sample of this upper 15 cm (6 inches). Special situations, such as sampling at depths greater than 15 cm (6 inches), evaluating trends or airborne deposition, determining near-surface contamination profiles, and measuring non-radiological contaminants, may require special sampling procedures. These special situations will be evaluated and incorporated into TSPs as the need arises.

Samples will be collected with a hand-auger, hollow-stem auger, split-spoon sampler, disposable scoop, or equivalent. The soil removed for sampling must be sufficient to yield a sample of sufficient volume for the sample container being used. Soil samples will be collected and handled as follows:

1. Loosen the soil at the selected sampling location to a depth of approximately 15 cm (6 inches), using a clean trowel or other digging instrument. In rocky terrain, a pick axe or mechanical means such as a Hilti gun may be used to remove soil for sampling. If an excavator is used due to health and safety reasons, extreme care should be used to ensure that the soil collected is from the upper com (6 inches) of the original surface.
2. Remove large rocks, vegetation and foreign objects. In some cases, however, these objects may be the source of the contamination and may be collected as separate samples for characterization.
3. Place as much soil as practical into a 250-milliliter (mL)-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag, or other suitable collection device. Approximately 1000 grams may be necessary for soil with significant moisture. Note that if a “split sample” is necessary for a regulatory agency to perform confirmatory analysis, collection of up to 2000 grams of soil will be necessary. Ensure that the material collected is from the upper 15 cm (6 inches) of soil. Note that this may require digging a hole wider, as opposed to deeper.
4. Tape the cap of the container in place or seal the ziplock plastic bag.
5. Label the sample container in accordance with the applicable SAP.
6. Document all samples collected in the sample logbook as applicable. Sample COC records shall be completed in accordance with the applicable SAP.

7. Transport samples in a project vehicle to the on-site laboratory for analysis as soon as possible after sample collection. Sample packaging and shipment procedures for transporting samples to an off-site laboratory are described in Section 4.3 of this procedure.
8. Clean or decontaminated tools will be used at each sampling location. Sampling tools will be decontaminated as described in the applicable SAP.

4.2.3 SEDIMENT SAMPLING

Several methods are available to collect sediment samples. The tools used will be appropriate to the circumstances and may include use of trowels, augers, or other hand tools. Sediment sampling will be conducted as follows:

1. A hand-auger, trowel or similar device will be used to access each sampling location. The sample collection tool will be selected based on physical limitations accessing the sample location.
2. Place as much material as practical into a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag or other suitable container.
3. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.2.4 SOLID MATERIAL SAMPLING

Several methods are available to collect solid material samples. To collect samples, solid materials may need to be broken into smaller pieces. Solid materials will be collected as follows:

1. Break up the material into small enough pieces to fill a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag or other suitable container. A pick axe or mechanical means such as a Hilti gun may be used to remove solid material for sampling. At no time shall an excavator be used to collect samples.
2. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.2.4.1 Pipe and Drain Line Sampling

Pipe and drain line sampling is conducted to assess residual radioactivity that may be inside of drain lines or materials within sanitary sewer and storm drain systems.

1. Since the type of material found inside drain lines varies, there is no specific method identified to collect these samples. Samples may be collected using a plumber's snake, swabs, scraper, trowel, etc.
2. Place as much material as practical into a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag or other suitable container.
3. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.2.4.2 Ventilation Sampling

Ventilation sampling will be performed to identify if the system is impacted and assess the residual radioactivity that may be present.

1. If visible dust is present inside the ventilation system, use a masslin cloth to accumulate the material into a pile. (If no visible dust is present, collect a swipe sample as discussed in SOP 001, *Radiation and Contamination Surveys*.)
2. Using a flat utensil such as a piece of paper or scraper carefully place as much material as possible into a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag or other suitable container.
3. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.2.5 WATER SAMPLING

Water samples will be collected as follows:

1. Collect water using any of the following sampling equipment: disposable bailer, pump, coliwassa-type tube sampler, or equivalent. Care will be taken to avoid collection of bottom sediment or vegetation.
2. Fill completely a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container or two liter plastic bottles.
3. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.3 Sample Packaging and Transport

Samples will be delivered for analysis to the laboratory via a box, cooler, or similar container (ice is not required if only radiological analysis will be performed), along with the COC completed as described in the applicable SAP..

The applicable SAP may require samples to be sent to an off-site laboratory for analysis, (e.g., total strontium, isotopic uranium, isotopic plutonium). 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. Prepared packages will be surveyed prior to shipment using an appropriate exposure rate meter in accordance with SOP 001, Radiation and Contamination Surveys.

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*
SOP 001	Radiation and Contamination Surveys

7.0 ATTACHMENTS

None.

Standard Operating Procedure

DECONTAMINATION OF EQUIPMENT AND TOOLS

SOP-007

Revision 0

Approved By:

Erik J. Abkemeier

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 SCOPE 4
2.0 DEFINITIONS AND ABBREVIATIONS 4
3.0 PROCEDURE DETAILS 4
3.1 GENERAL 4
3.1.1 Precautions 4
3.1.2 Limitations 5
3.2 PRE-DECONTAMINATION PREPARATION 5
3.3 ESTABLISHMENT OF DECONTAMINATION AREAS 5
3.4 ITEM PREPARATION FOR DECONTAMINATION 6
3.5 DECONTAMINATION OF REMOVABLE CONTAMINATION 7
3.6 DECONTAMINATION OF FIXED CONTAMINATION 7
3.6.1 Abrasive Hand Decontamination 8
3.6.2 Power Tool Decontamination 8
3.7 POST-DECONTAMINATION 9
4.0 RECORDS 10
5.0 REFERENCES 10
6.0 ATTACHMENTS 10

PURPOSE

This procedure provides instruction and methods for the decontamination of equipment and tools.

1.0 SCOPE

This procedure describes 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.

2.0 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.

3.0 PROCEDURE DETAILS

3.1 General

3.1.1 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 Radiation Safety Officer Representative (RSOR) 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.

3.1.2 Limitations

The following limitations apply to decontamination activities:

- Protective clothing worn by the personnel involved in decontamination activities as determined by the RSOR.
- 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 SOP 001, Radiation and Contamination Surveys.
- Release of equipment and tools from the decontamination area shall be performed in accordance with SOP 003, Release of Materials and Equipment from Radiologically Controlled Areas.

3.2 Pre-Decontamination Preparation

The following steps shall be used for pre-decontamination preparation:

1. The RSOR, 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.

3.3 Establishment of Decontamination Areas

The RSOR, working with the Project Manager, shall determine a location for setup of decontamination areas. As applicable to the specific decontamination activity being performed, a 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)

3.4 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 RSOR 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 RSOR.
- A HEPA vacuum cleaner may be used during the decontamination operation.

3.5 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 RSOR:

- 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.

3.6 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 RSOR.

3.6.1 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.

3.6.2 Power Tool Decontamination

Power tool decontamination shall be performed under the direction of the RCT, with concurrence from the RSOR.

3.6.2.1 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

3.6.2.2 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

3.6.2.3 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.

3.7 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 SOP 003, 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 RSOR and repeat the decontamination.
3. If the item remains contaminated, attempt a third decontamination only by direction of the RSOR.

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 SOP 001, Radiation and Contamination Surveys and SOP 003, Release of Materials and Equipment from Radiologically Controlled Areas.

4.0 RECORDS

The records generated by the use of this procedure are documented in accordance with the provisions of SOP 003, Release of Materials and Equipment from Radiologically Controlled Areas.

5.0 REFERENCES

Number	***Title***
SOP 001	*Radiation and Contamination Surveys*
SOP 003	*Release of Materials and Equipment from Radiologically Controlled Areas*

6.0 ATTACHMENTS

None.

Standard Operating Procedure

CONTROL OF RADIOACTIVE MATERIAL

SOP-008

Revision 0

Approved By:

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 CLASSIFICATION AND IDENTIFICATION OF RADIOACTIVE MATERIAL 5
4.1.1 Radioactive Material Limits 5
4.1.2 Identification of Radioactive Material 6
4.1.3 Mixed Waste 6
4.2 STORAGE OF RADIOACTIVE MATERIAL 6
4.2.1 Containerizing 7
4.2.2 Posting 7
4.2.3 Control 7
4.3 RADIOACTIVE WASTE INVENTORY MANAGEMENT 8
4.3.1 Container/Stockpile Inventory 8
4.3.2 Records 8
4.4 DISPOSITION OF RADIOACTIVE MATERIAL 8
4.4.1 Decontamination 8
4.4.2 Disposal 9
5.0 RECORDS 9
6.0 REFERENCES 9
7.0 ATTACHMENTS 9

1.0 PURPOSE

The purpose of this procedure is to specify methods and requirements for tracking and controlling radioactive material (RAM) collected or generated during survey, characterization and remediation activities at Navy facilities by Tetra Tech EC, Inc. (TtEC) and its subcontractors.

Through the use of the guidance in this procedure, TtEC and its subcontractors shall meet or exceed the requirements for its respective Nuclear Regulatory Commission or Agreement State Radioactive Materials License (RML), as applicable based on exclusive federal jurisdiction.

2.0 SCOPE

This procedure governs control of RAM on site and shall be implemented by TtEC staff and subcontractor personnel when handling RAM. The requirements given in this procedure are limited to RAM collected or generated during survey, characterization, and remediation activities.

Procedures for the preparation and labeling of RAM for shipment are beyond the scope of this document. Packaging, labeling, and shipment of RAM shall be conducted in accordance with the requirements of 49 Code of Federal Regulations (CFR) and other applicable regulations.

Radioactive waste will be packaged in an appropriate container. The waste containers will be maintained under TtEC's applicable RML, until transferred to the Navy's Low-level Radioactive Waste program.

3.0 DEFINITIONS AND ABBREVIATIONS

Container – Any package or barrier which is used to enclose RAM so that it can be easily handled and contained. Examples of containers include drums, roll-off boxes, conex boxes, fiber, metal, wooden or cardboard boxes, plastic or glass jars, metal cans, bags (ziplock or open top), plastic sheeting or any other package that meets the requirements of this definition.

Control - In relation to handling of RAM, control is defined as having physical custody, being in the immediate vicinity of, or in line-of sight of the RAM. Control also refers to being responsible for the securing of RAM to prevent unauthorized access.

Mixed Waste – Waste that contains a hazardous waste component and a RAM component.

Radioactive Material (RAM) – For purpose of activities at naval facilities, RAM is defined as any material (e.g. soil, demolition debris, etc.), solid samples or swipes, or equipment (tools, instruments, etc.), that has a radioactive component (fixed or

removable) at or above the levels specified in Table 6-1 or the project specific Sampling and Analysis Plan.

Radioactive Materials Area (RMA) – Any designated area where RAM is stored or used. Posting of an RMA is not required if the RAM is stored inside a posted, radiation area, contaminated area or airborne radioactivity area.

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.

Samples – Aliquots (portions) of material deposited on or placed within a container for the purposes of transferring and performing a quantitative or qualitative analysis of that material.

4.0 PROCEDURE DETAILS

4.1 Classification and Identification of Radioactive Material

4.1.1 Radioactive Material Limits

Table 4-1 identifies the limits of contamination for defining RAM. Activity concentrations defining RAM are the release criteria listed in the project-specific SAP.

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) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	20
Beta (β-) Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000	200
Beta-Gamma (β-γ) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others	5,000	1,000

noted above.		

Notes:

[1] These limits are based on AEC Regulatory Guide 1.86 (AEC, 1974)

Abbreviations and Acronyms:
AEC – Atomic Energy Commission
cm^2 – square centimeter
dpm – disintegrations per minute

4.1.2 Identification of Radioactive Material

Determination of whether or not to classify material or equipment as RAM waste is accomplished by surveying and/or sampling the material or equipment. In the absence of survey data, material originating from impacted areas or RCAs shall be classified as RAM and handled accordingly until proven otherwise by instrument survey or laboratory analysis.

4.1.3 Mixed Waste

Mixed waste may be encountered or generated during remediation or decontamination activities. If the radiological and chemical components in the waste can be easily separated by physical means, this shall be done to allow for each component to be handled separately. Work to be performed shall be conducted to minimize mixed waste. Chemicals used for chemical decontamination activities shall be selected to minimize the creation of mixed waste. When it is impossible to segregate hazardous and radioactive components of materials or equipment designated for disposal, then the item(s) must be handled as a mixed waste. Applicable precautions and guidance for handling both RAM and hazardous material must be used for mixed wastes.

4.2 Storage of Radioactive Material

Radioactive material must be stored in a posted area as specified below to communicate the material hazard present to personnel that may encounter the material. Posting will be done in accordance with SOP 012, *Radiologically Restricted Areas – Posting and Access Control*. RAM waste shall be containerized, whenever possible, or otherwise protected and stored in pre-authorized areas determined concurrently by the Radiological Affairs Support Office (RASO) and the Remedial Project Manager. Control must be maintained over all RAM to minimize personnel exposure and the spread of contamination. Requirements for containerizing, posting, and control of RAM are given below.

4.2.1 Containerizing

To the greatest extent possible, RAM waste should be containerized for storage. To facilitate containerization, equipment that can be disassembled should be broken down into the smallest number of components practical. Sharp edges or projections should be blunted, taped or otherwise secured to ensure that the package will maintain integrity during subsequent handling operations.

If object size does not allow for disassembly and containerization is not possible, then a plastic covering can be used to minimize the potential for the spread of contamination.

For bulk items, such as soil stockpiles, where containerization is not practicable, the materials will be placed on an impervious material and covered to prevent the spread of the material.

Items that exceed 100 times the limits in Table 4-1 should be packaged such that two barriers exist (i.e., double-wrapped or bagged inside a rigid container).

4.2.2 Posting

Posting will be done in accordance SOP 012, *Radiologically Restricted Areas - Posting and Access Control*

RAM waste that is stored in a building requires that the entrances to the building be posted as an RCA, and a cordoned off area within the building posted as the RMA. If RAM waste is stored in stockpiles or in large containers that are stored outdoors, the stockpiles or containers shall be located within an RCA. The immediate area around the stockpile or containers will be cordoned off and posted as an RMA.

4.2.3 Control

The control of RAM shall be performed in accordance with the provisions of 10 CFR 20, Standards for Protection Against Radiation; SOP 012, *Radiologically Restricted Areas – Posting and Access Control,* SOP 003, *Release of Materials and Equipment from Radiologically Controlled Areas*, SOP 0007, *Decontamination of Equipment and Tools*.

Radioactive material should be consolidated in common RMAs to the greatest extent possible to simplify the implementation of adequate materials control. RMAs posted because of potentially radiologically impacted material that has not been remediated need not have locked entrances Control of RMAs with containerized RAM will include security measures (i.e., locks, fencing, packaging, etc.) to preclude unauthorized access to or removal of RAM. Access shall also be controlled to prevent non-radiation workers from gaining entry to RMAs. RMAs with containerized RAM will be inspected at least once a week by an RCT. RCTs shall note the physical status of RMAs noting:

- Locked/secure status

- Labeling/posting
- Condition of containers

4.3 Radioactive Waste Inventory Management

A radioactive waste inventory (RWI) program will be used to track RAM waste generated during survey and remediation activities. The program includes the provision for regular inventory checks. The specific requirements for inventory management are given in the following sections.

4.3.1 Container/Stockpile Inventory

If material is not immediately transferred to a Low Level Radioactive Waste contractor, a running inventory of materials in a container will be kept on the container. Stockpile inventories will be kept in the TtEC site trailer. Inventories of material in a container or stockpile will be kept on the Stockpile/Container Inventory Log Sheet, or equivalent, (Attachment 1). The log sheet will be updated as material is added to containers or stockpiles.

4.3.2 Records

TtEC will maintain reports including the following information for RAM waste:

- Point of origin
- Storage location
- Removal Date
- Waste description
- Isotope and activity (If known)
- Other hazardous constituents (If known)
- Quantity or volume
- Waste packaging dates
- Any additional comments

TtEC will maintain a master RAM inventory at each project site. The RSOR will ensure the inventory is updated at least weekly.

4.4 Disposition of Radioactive Material

Disposition of RAM collected during remediation, surveys, or generated through site activities will either be disposal or reduction in volume by decontamination. The considerations for these two activities are discussed below.

4.4.1 Decontamination

In some instances, it may be possible to reduce the volume of RAM by decontaminating items contaminated with RAM to levels at which the item no longer needs to be

classified as RAM. The guidance for determining if decontamination is appropriate and for actually performing decontamination is given in SOP 007, *Decontamination of Equipment and Tools*.

Any former RAM that has been decontaminated to levels below those requiring classification as RAM shall have any RAM labels removed or otherwise defaced such that the wording and radiation symbol are no longer legible. Additionally, the status of any inventoried RAM that has been decontaminated shall be updated on the associated data sheets and in the RWI to indicate that it is no longer an actively tracked RWI item.

4.4.2 Disposal

Unwanted RAM will be disposed of as LLRW. Preparation of material for disposal and actual disposal shall be conducted under the approved procedures of a licensed waste broker through the Navy Low-Level Radioactive Waste Disposal Program. The status of RAM waste that has been disposed of and removed from the site shall be updated on inventory data sheets and in the RWI to indicate that the item is no longer in storage on site.

5.0 RECORDS

Weekly waste inventory reports will be retained as records. Additionally, an electronic RWI containing a master list of all RAM waste on site shall be maintained as part of the project files.

6.0 REFERENCES

Number	***Title***
AEC Regulatory Guide 1.86	*Termination of Operating Licenses for Nuclear Reactors*
10 CFR 20	*Standards for Protection Against Radiation*
SOP 012	*Radiologically Restricted Areas – Posting and Access Control*
SOP 003	*Release of Materials and Equipment from Radiologically Controlled Areas*
SOP 007	*Decontamination of Equipment and Tools*

7.0 ATTACHMENTS

Attachment 1 – Stockpile/Container Inventory Log Sheet

Attachment 2 – Radioactive Waste Inventory Log Sheet

ATTACHMENT 1

STOCKPILE/CONTAINER INVENTORY LOG SHEET

Drum ID #				Page of	
Description of Item	Item ID #	Date	Time (24 hr)	Contact Dose Rate - µR/hr	Initials

ATTACHMENT 2

RADIOACTIVE WASTE INVENTORY LOG SHEET

Point of Origin	Storage Location	Collection Date	Target Removal Date	Waste Description	Isotope and Activity Content	Other Hazardous/Regulated Constituents	Quantity or Volume	Waste Packaging Date(s)	Waste Shipping Date(s)	Additional Information

Standard Operating Procedure

AIR SAMPLING AND SAMPLE ANALYSIS

SOP-009

Revision 0

Approved By:

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 Precautions 6
4.2 Type of Air Samples 6
4.2.1 General Area Air Samples 6
4.2.2 Grab Samples 6
4.2.3 Breathing Zone Air Samples 7
4.3 Air Sampling Procedures 7
4.3.1 General 7
4.3.2 General Area Air Sampling 7
4.3.3 Breathing zone Air Sampling 9
4.3.4 Documentation 11
5.0 REFERENCES 11
6.0 ATTACHMENTS 11

1.0 PURPOSE

This procedure will be used by Tetra Tech EC, Inc. (TtEC) personnel and its subcontractors to perform air sampling and to 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 is 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 5 cubic feet per minute (cfm) to 30 cfm.

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 to 5 cfm.

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 to not 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 Radiation Safety Officer Representative (RSOR) (or qualified designee) immediately. Also, consideration should be given to isotopic analysis and area access restriction/posting.

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

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 (RCT), or as directed by the RSOR
- 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

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 or alternate method in which to take the sample form this location (e.g., extended tubing attached to a low volume air sampler).
- 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

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 an envelope or baggie. If the survey indicates the presence of contamination that exceeds background, appropriate steps will be taken to determine the source of contamination and to secure the area.

Samples will 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 the source of contamination and secure the area, and notify the RSOR. The RSOR 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 RSOR (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 RSOR (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 RSOR (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 project 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. Analyze and determine percent DAC.
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 RSOR (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 RSOR, 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 RSOR (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 RSOR (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 RSOR (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 RSOR, 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. Analyze and determine percent DAC.
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 RSOR (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

None

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 (☐C	Count Results ☐ (☐C	%DAC α / ☐	Counter ID

Notes:

α – alpha
β – beta
☐Ci/ml– microcurie per milliliter
DAC – derived air concentration
ID – identification number

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 (µCi/ml)	Activity β (µCi/ml)	Percent DAC α / β

cfm	cubic feet per minute	lpm	liters per minute
DAC	derived air concentration	µCi/ml	microcurie per milliliter
ft^3	cubic feet	α	alpha
ID	identification number	β	beta

Standard Operating Procedure

ISSUE AND USE OF RADIATION WORK PERMITS

SOP-010

Revision 0

Approved By:

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 GENERAL 5
4.1.1 Criteria for Initiating Radiation Work Permit 5
4.1.2 Planning and Prerequisites 5
4.2 PROCEDURE PROCESS 7
4.2.1 Specifying Worker and Work Site Requirements 7
4.2.2 Special Instructions 7
4.2.3 Review and Approvals 7
4.2.4 Using the Radiation Work Permit 8
4.2.5 Modifying the Radiation Work Permit 9
4.2.6 Terminating the Radiation Work Permit 9
5.0 RECORDS 9
6.0 REFERENCES 10
7.0 ATTACHMENTS 10

1.0 PURPOSE

This procedure is used to specify the general requirements for preparing, issuing, and using radiation work permits at field locations. The procedures presented below may be supplemented by 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 and issuance of radiation work permits used on site.

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, will be subject to the same review process as this document, and will have precedence over the guidelines in this document as appropriate.

A Radiation Work Permit (RWP) will be required for:

- Personnel entry into a Radiologically Controlled Area (RCA)
- Personnel entry into an area where air concentrations could exceed 10 percent of the derived air concentration (DAC) for a specific radionuclide.
- At the discretion of the Radiation Safety Officer Representative (RSOR) or representative

This procedure describes the radiological surveys required to generate an RWP and provides guidelines to specific protective measures required based upon the radiological conditions in the work area.

In addition to RWPs written to cober specific work tasks, general RWPs (GRWPs) may be created for tasks such as tours or survey/remediation activities in areas in which a worker is not expected to receive 100 mrem annual total effective dose equivalent. In such cases, the GRWP should not span a time period of greater than 6 months. GRWPs do not have the requirement for an Access Log (Attachment 2).

3.0 DEFINITIONS AND ABBREVIATIONS

Airborne Radioactivity Area (ARA) – A room, enclosure, or area in which radioactive material is dispersed in the air in the form of dusts, fumes, particulates, mists, vapors or gases, and where the concentration of the dispersed radioactive materials is in excess of:

- The derived air concentrations (DACs) specified in Table 1, Column 3 of Appendix B, Title 10 Part 20 of CFR.
- Concentrations such that an individual present in the area without respiratory protective equipment could exceed, during the hours the individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI).

Contaminated Area (CA) – Any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed 20 percent of the contamination limits provided in Attachment 1 (Table 1).

General Radiation Work Permit (GRWP) – A Radiation Work Permit created for tasks such as tours or surveys/remediation activities in areas in which a worker is not expected to receive in excess of 100 mrem annual total effective dose equivalent. These tasks are typically ongoing, for routine tasks and require minimal anti-contamination personal protection equipment.

Non-Workers – Any persons entering an area covered by a work specific RWP or a general RWP whose sole purpose is only for observation or other tasks, not directly related to the work outlined in the RWP. Individuals that are escorted inside an area covered by a job-specific RWP are exempt from the requirements of this procedure. The Radiation Safety Officer Representative (RSOR) has sole discretion in determining who qualifies to be a non-worker.

Radiation Area (RA) – Any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates.

Radiologically Controlled Area – 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.

Specific Radiation Work Permit *(SRWP)*– A Radiation Work Permit created for tasks in areas in which a worker could reasonably receive in excess of 100 mrem annual total effective dose equivalent (based on current radiological surveys) and/or contamination areas and/or airborne radioactivity areas. These tasks are typically finite in duration (less than one month), for non-routine tasks and require additional anti-contamination personnel protection equipment and/or monitoring.

Total Effective Dose Equivalent (TEDE) – TEDE is the sum of the DDE (external dose) and the committed effective dose equivalent (internal dose).

4.0 PROCEDURE DETAILS

4.1 General

4.1.1 Criteria for Initiating Radiation Work Permit

An RWP is required when entering radiologically impacted areas (i.e., RCAs, RMAs, radiation areas, contaminated areas, airborne radioactivity areas).

4.1.2 Planning and Prerequisites

4.1.2.1 Planning the RWP

The RSOR, or designee initiates the RWP process by filling in the General Information section of the RWP. The accepted form to use for an RWP is included as Attachment 4 of this document. The RSOR enters the effective date (date the RWP was initiated) and the expiration date that will correspond to the estimated completion date for the project.

The RSOR, or designee, completes the Task section of the RWP. This includes an estimate of the number of personnel required for each task and the number of personnel-hours that will be spent inside a RCA. A detailed description is encouraged but not required, and can be attached to the RWP. Work performed in areas with different radiological conditions should be listed as

different tasks. This may not become apparent until after the surveys performed to support preparing the RWP are completed.

The RSOR, or designee:

- Obtains and reviews any previous surveys performed in the work area.
- Obtains all information available on the identity, form, and quantities of radionuclides present in the work area.
- Reviews facility drawings, if available, to determine ventilation flows, component and equipment layouts, and building structures which can be used for contamination barriers.

The Site Superintendent meets with the RSOR, or designee, to discuss the nature of the work to be performed, the specific components or equipment to be worked on, the positions the personnel may take to perform the work, the possibility of releasing radioactive contamination during the work activities, and the potential for changing radiation exposure rates as work progresses.

The RSOR, or designee, selects the necessary instrumentation, equipment and protective clothing to perform surveys in the work area. If contamination is expected in the work area, equipment to be taken into the work area may be wrapped to prevent contamination of equipment.

If anticipated contamination levels are above the limits given in Table 1 (Attachment 1) for classification of an area as a contaminated area, contamination controls will be established before entry into the area to prevent the spread of contamination upon exiting.

4.1.2.2 The RWP Pre-job Survey

Safety hazards that may be encountered during the work are evaluated (confined space entry, electric equipment or mechanical equipment requiring lock-out tags, falling objects, bumping hazards, slippery surfaces, fire hazards, etc.). An analysis of each hazard and precautions to be taken shall be documented and provided to personnel prior to entry into the area.

RCTs obtain radiation exposure rates in the area where the personnel will be positioned during work activities as required. The adjacent area is surveyed to identify any locations where elevated readings are observed and a route to the work area is established. Readings are recorded on survey forms, as specified in procedure SOP 001, Radiation and Contamination Surveys.

Swipe samples are obtained from the work area, adjacent areas, and along the route to the work area in sufficient quantity to adequately design work controls to maintain exposures ALARA. RCTs will rely on their professional experience or consultation with the RSOR, or designee, to determine what constitutes “sufficient quantity.” Swipe samples and air samples collected in the area are then processed and recorded on survey forms, as specified in procedure SOP 001, Radiation and Contamination Surveys.

The issuance of an RWP for work in an ARA will require air sampling to be done as part of the RWP. Air sampling is conducted in accordance with SOP 009, Air Sampling and Sample Analysis.

The RCT who surveyed the work area and obtained information from prior surveys, when available, records the exposure rates measured during the survey of work area on survey forms, as specified in procedure SOP 001, Radiation and Contamination Surveys.

4.2 Procedure Process

4.2.1 Specifying Worker and Work Site Requirements

Based on and the data obtained from the pre-job survey and factoring in anticipated contamination conditions in the area, the RSOR, or designee, determines the quantities to specify in Radiological Limits section of the RWP. Limits should be specified as an order of magnitude bound (i.e., whole-body exposure < 10 mrem/ hour) that would not be expected to be exceeded under normal working conditions. Space is provided for clarifying remarks or other specific points of note. The radiological limits will govern the work to be done under the RWP. If, at any point during the work, the limits are known to be exceeded, then work must cease and the RWP must be modified or a new RWP must be issued to reflect the current radiological conditions. A well-selected limit will be one general enough to avoid unnecessary stoppages of work, while still protecting worker safety per the ALARA philosophy.

Next, the RSOR, or designee, determines the types of protective clothing required to be used by personnel performing prescribed tasks, the respiratory protection requirements, dosimetry requirements, and monitoring requirements and indicates them under the protection requirements section of the RWP. Finally, any additional training requirements for personnel and the need for ALARA briefings or reviews are noted on the RWP.

Determinations of protection requirements are to be performed by the RSOR, or designee, using their professional judgment and in accordance with industry standard practices and appropriate regulatory guidelines. Air monitoring is required if it is likely that airborne contamination may be present or created (i.e., during excavation and demolition) during work activities. Work activities will be stopped if the concentrations of airborne contaminants exceed 10 percent of the DAC.

4.2.2 Special Instructions

Special instructions associated with personal protective clothing, dosimetry, monitoring and inspection, respiratory protection, training or ALARA are indicated in this section of the RWP.

4.2.3 Review and Approvals

The RSOR and SHSS, or designees, as a minimum, shall approve the RWP prior to work. The SHSS shall verify that relevant non-radiological safety considerations are addressed. When the non-radiological concerns of the SHSS have been adequately addressed, the RSOR will approve the RWP.

RASO shall be notified if any of the following atypical work site conditions are anticipated:

- An individual TEDE exceeding 500 mrem
- The collective TEDE for the job exceeding 1 rem
- Individual airborne exposures exceeding 10 DAC-hours in a 7-day period
- General area exposure rates exceeding 200 mrem/hour

- Contamination levels exceeding 10 times the limits requiring classification of an area as a CA.

The check boxes in the approval section will be marked to indicate which of the approvers is required for each particular RWP. Any mandatory approver may prescribe changes to the draft RWP prior to final approval.

4.2.4 Using the Radiation Work Permit

A pre-job briefing is held with the individuals performing the work described in the RWP. The following topics are discussed in the pre-job briefing:

- Complete descriptions of the work tasks to be performed, and methods to minimize exposures to radiation and contamination while performing these work tasks.
- Discussions of the radiation, contamination, and airborne radioactive materials in the work area, and situations which could result in increased levels of these components.
- Health and safety issues which could be encountered during work activities.
- Emergency procedures and responsibilities.
- Discussions of the protective equipment requirements and the monitoring requirements.

The RSOR, or designee, compiles the current year dose for the individuals performing RWP work to verify that the radiation exposure received during the work activities will not result in the individuals' dose exceeding administrative limits. The individuals' current radiation exposures will be listed on Radiation Work Permit Authorization Log (Attachment 3).

Each individual entering the RWP work area is required to understand the RWP and to sign the Radiation Work Permit Authorization Log, indicating that the individual understands the provisions of the RWP, is aware of his/her current year dose, and will comply with the RWP requirements.

An RWP that covers work to be performed at a field site or in a building shall have an Access Log (Attachment 2) appended to the RWP. RWPs that cover general work areas are not required to have an access log, but an access log may be appended to the RWP if desired.

In cases where an Access Log is used, the RCT (or individual) logs the time the individual entered the work area, along with the reading on the individuals Pocket Ion Chamber (PIC) or Direct Reading Dosimeter (DRD), if worn. The RCT (or individual) also indicates if the individual wore a respirator during the work activities.

When an individual who signed in on a Radiation Work Permit Access Log exits the work area, the RCT (or individual) logs the time the individual leaves the area, and the individual's DRD reading, if worn. If the individual returns to the work area, another signature entry (and corresponding line entries) must be made on the Radiation Work Permit Access Log.

As previously noted, if the radiological limits listed on the RWP are exceeded at any point during a prescribed work task, then all work shall be stopped until the RWP can be modified to address the over-limit condition, or a new RWP is issued.

4.2.5 Modifying the Radiation Work Permit

In the event of changes to the conditions or scope of the work that do not justify the generation of a new RWP, modifications to the RWP may be made by the RSOR. No more than two modifications can be made to an RWP before a new RWP must be issued. Modifications to the RWPs will be reviewed and approved in accordance with the initial requirements, as specified in Section 4.2.3 above.

To modify the RWP, each change is made with a single line cross-out of the text or item. The RSOR, or designee, must initial and date adjacent to each change.

The RSOR, or designee, must communicate all changes to the individuals working under the RWP.

4.2.6 Terminating the Radiation Work Permit

The RWP is terminated when the end date of the RWP is reached, or can be terminated by one of the following reasons:

- The job has been completed.
- There is a significant change in the scope of work.
- There is a significant change in the radiological conditions.
- The RWP is revised.

When the RWP is terminated before the end date, a single line is drawn through the end date and a new end date recorded in its place. The person terminating the RWP initials adjacent to the change. Extension of the end date of the RWP must be done per the change procedure noted in the previous section. The RWP can be terminated by the RSOR or designee. As part of the termination of an RWP, the Post-job Radiological Conditions and Closeout Review sections of the RWP shall be completed.

To complete the Post-job Radiological Conditions section, the RCT shall conduct a survey of the work site governed by the RWP. This survey should be conducted in a manner similar to the pre-job survey and should include determination of the current measurements for all quantities obtained in the pre-job survey. In addition, if personnel monitoring was in effect during work under the RWP and/or an individual was found to have contamination above the monitoring limits, then the appropriate checkbox should be marked.

At a minimum, the closeout review will be conducted by the RSOR. As part of the closeout review, the reviewer(s) shall verify that associated records for the RWP are noted on the RWP form and that they are present in the project files. Reviewers shall also determine if there were any lessons learned that might be of value to future work to be performed on site. If so, then lessons learned synopsis shall be written and communicated/incorporated to project personnel.

5.0 RECORDS

Radiation Work Permit Access Log

Radiation Work Permit Authorization Log

Radiation Work Permit.

6.0 REFERENCES

Number	*Title*
AEC Regulatory Guide 1.86	*Termination of Operating Licenses for Nuclear Reactors*
SOP 001	*Radiation and Contamination Surveys*
SOP 009	*Air Sampling and Sample Analysis*

7.0 ATTACHMENTS

Forms provided in this section illustrate the minimum requirements for their respective subject matter. Alternative documents 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 – Table 1 Contamination Limits Table

Attachment 2 – Radiation Work Permit Access Log

Attachment 3 – Radiation Work Permit Authorization Log

Attachment 4 – Radiation Work Permit

ATTACHMENT 1

TABLE 1

CONTAMINATION LIMITS TABLE

Radiation Type	Release Limits[1] (Fixed) (dpm per 100 cm^2)	Release Limits[1] (Removable) (dpm per 100 cm^2)
Alpha (α) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	20
Beta (β-) Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000	200
Beta-Gamma (β-γ) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	1,000

Notes:

[1] These limits are based on AEC Regulatory Guide 1.86 (AEC, 1974)

Abbreviations and Acronyms:
AEC – Atomic Energy Commission
cm^2 – square centimeter
dpm – disintegrations per minute

ATTACHMENT 2 – RADIATION WORK PERMIT ACCESS LOG

RWP NUMBER: _____ **REVISION:** _____ **DATE:** _____

WORK LOCATION:
(Field Area or Bldg #) _____ **START DATE:** _____ **END DATE:** _____

Date In	Time In	Worker Name	Signature	Employee ID Number	PIC/DRD Number	DRD Reading		Date Out	Time Out	Resp (√)
						In	Out			

ATTACHMENT 3 – RADIATION WORK PERMIT AUTHORIZATION LOG

RWP NUMBER: _____ **REVISION:** _____ **DATE:** _____

WORK LOCATION: _____ **START DATE:** _____ **END DATE:** _____

Worker Name	Employee ID Number	Current year TEDE (mrem)	*Signature	RCT Authorization	Date

* By my signature, I indicate that I have read, understand, and will comply with all requirements of this RWP.

ATTACHMENT 4 – RADIATION WORK PERMIT

Tetra Tech EC, Inc.

RSOR USE ONLY	
Permit Number	
Effective Date	Expiration Date

RADIOLOGICAL WORK PERMIT

GENERAL INFORMATION (to be completed by the Requestor)				
Requested by (Name & Project)	Date	Phone No.	Site Mailing Address	
Work Location	Work Area	Building/Site	Extent	Room No.

Work Plan	Health & Safety Plan	Contract Number	Expected Start Date	Expected End Date

Tasks to be performed inside an RCA *(add attachment if necessary)*	Estimated No. Personnel	Estimated No. Personnel-hours

RADIOLOGICAL LIMITS (to be completed by the RCT)

☐ Anticipated radiological conditions ☐ See Attached Map

Surface Contamination (dpm/100 cm sq)

	Direct	Swipe	LAS (Large Area Swipe)
Alpha			
Beta/gamma			
Tritium			

External Dose Rate (mrem/hr in work area)

Beta + gamma	
Neutron	
Total (b + g + n)	

Airborne Radioactivity

Radionuclide(s) DAC ☐ Anticipated or ☐ Measured

Completed by	Name	Signature	ID Number	Date

ALARA/RADIOLOGICAL PROTECTION REQUIREMENTS (to be completed by RCT)

Protective Clothing Requirements
☐ None ☐ Rubber Overshoes ☐ Double Coveralls
☐ Lab Coat ☐ Skull Cap ☐ Hood ☐ Double Gloves ☐ Plastic Coverall
☐ Gloves ☐ Booties ☐ Single Coverall ☐ Double Booties ☐ Tape Openings
☐ Other: _____

Respiratory Requirements
☐ None ☐ Combination cartridge* ☐ Chemical cartridge*
☐ Powered Air Purifying Respirator ☐ Ventilation ☐ Air Line Respirator* ☐ SCBA*
☐ Negative Pressure Respirator ☐ Supplied air suit* ☐ Bubble Hood* **** Requires Health & Safety approval***
☐ Other: _____

Dosimetry Requirements
☐ None ☐ WB dosimeter ☐ Supplemental dosimeter
☐ TLD finger rings ☐ Special neutron dosimetry ☐ Pu access list ☐ Alarming dosimeter
☐ Bioassay sample ☐ Whole-body count ☐ Accident dosimeter ☐ Nasal swipes
☐ Other: _____

Monitoring Requirements
☐ None ☐ Notify RCT before job starts
☐ Intermittent coverage ☐ Personnel before leaving job ☐ Equipment and tools before removal
☐ Continuous coverage ☐ RCT monitor doffing of PCs ☐ Air monitoring
☐ Self-frisking ☐ Other: _____

Additional Training Requirements _____

☐ ALARA Pre-job briefing ☐ ALARA review (see attachments)

Completed by RCT Name Signature Employee ID Number Date
☐ Completed

SPECIAL INSTRUCTIONS (to be completed by the RCT)

Special Instructions:

Completed by RCT ☐ Completed	Name	Signature	ID Number	Date

APPROVALS

1. ***RSOR*** ☐	Name	Signature	ID Number	Date
2. ***SHSS*** ☐	Name	Signature	ID Number	Date
3. ☐	Names	Signatures	ID Numbers	Date
☐				

POST-JOB RADIOLOGICAL CONDITIONS (to be completed by the RCT/HPT)

Measured Radiological Conditions *(Record all readings as highest / general area)* ☐ See attached map

	Surface Contamination (dpm 100 sq cm) Direct	Swipe	LAS (large area swipe)	External Dose Rate (mrem/hr in work area)	
Alpha				Beta + gamma	
Beta/gamma				Neutron	
Tritium				Total (b + g + n)	

Airborne Radioactivity
DAC _____ ☐ Estimated or
Isotope ☐ Measured

Survey of Personnel Leaving Job Site
☐ Personnel contaminated above applicable limits
(If yes, attach the Radiological Incident Report)

Completed by RCT ☐ Completed	Name	Signature	ID Number	Date

REVIEW

Associated reports for this job *(indicate the ones that apply):*

☐ CAM Results	☐ Nasal swipe data	☐ RWP acknowledgement log
☐ Job-specific air monitoring	☐ Bioassay sample(s)	☐ Dose tracking report
☐ Pre-job survey data	☐ Whole Body Count(s)	☐ Radiological occurrence/incident report
☐ Post-job survey data	☐ Wound count	☐ ALARA Pre-job briefing
☐ Finger ring data	☐ Skin contamination	☐ Formal ALARA review
☐ Special dosimetry results	☐ Personal clothing survey	☐

☐ Other: _____

☐ Lessons Learned (If Yes, then briefly explain. Add attachment(s) if necessary)

Reviewed by RCT ☐ Reviewed	Name	Signature	ID Number	Date
Reviewed by RSOR (or designee)	Name	Signature	ID Number	Date

Standard Operating Procedure

GAMMA SCREENING OF TRUCKS USING THE STATIONARY PORTAL MONITOR AND USING PORTABLE SURVEY INSTRUMENTATION

SOP-011

Revision 0

Approved By:

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 4
4.1 GENERAL 4
4.1.1 Precautions 4
4.1.2 Limitations 4
4.2 PORTAL MONITORING SCREENING 5
4.3 HAND SCREENING 6
4.4 PROTOCOL FOR TRUCKS FAILING TO RECEIVE PORTAL MONITOR CLEARANCE 7
5.0 RECORDS 8
6.0 REFERENCES 9
7.0 ATTACHMENTS 9

1.0 PURPOSE

The purpose of this procedure is to provide guidelines for performing gamma radiation screening of trucks loaded with non-contaminated soils and debris leaving the site using a Ludlum Model 3500-1000RMW portal monitor or equivalent. The purpose of the portal scan is to protect against the inadvertent shipment of materials exhibiting elevated radiation levels. In other words, the scan serves only to release the contents of the truck and not the truck itself. This procedure also covers hand screening of trucks using portable survey instruments.

2.0 SCOPE

This procedure describes the appropriate methods for using the portal monitor and portable survey instruments to perform gamma radiation screening of trucks loaded with non-radioactive soils and debris that will be transported to recycling centers, landfills, and other licensed disposal facilities.

3.0 DEFINITIONS AND ABBREVIATIONS

None.

4.0 PROCEDURE DETAILS

4.1 General

4.1.1 Precautions

The following precautions will be used:

- The detector alarm set point will be set not to exceed the setting of 8.5 deviations above background at the location of the portal monitor at Alameda Point. Any change to this set point will directed by the site RSOR with the concurrence of RASO.

- Trucks should adhere to the required pauses and speed indicated in Section 4.2 of this procedure when passing through the detectors. Failure to carefully follow these requirements will result in invalid or incomplete screenings and will cause the screening to have to be repeated.

4.1.2 Limitations

The following limitations will be in place:

- Calibration shall be performed annually, after maintenance is performed or if the instrument fails the performance test or if proper operation is in question. Calibration is to be conducted by the manufacturer per the manufacturer's instruction manual.
- Setup and daily performance tests will be conducted in accordance with the operating manual for the Ludlum Model 3500-1000 portal monitor. Only one performance test need be performed per day if the monitor will be turned on and off throughout the day.

4.2 Portal Monitoring Screening

> ***NOTE*:** The system continuously monitors radiation when the portal is occupied and compares the readings to the alarm level determined by using an average of the background levels. If the alarm threshold is breached, the audible and visual alarms will be activated.

When using the Ludlum Model 3500-1000RMW for gamma screening surveys of trucks loaded with soils and/or debris, an RCT trained in the operation of the Model 3500-1000RMW will be present to monitor the instrumentation. The RCT's training on portal monitor must be officially documented and said documentation shall be verified by the RSOR before assigning an individual to operate the portal monitor.

The following steps will be used for portal monitor screening:

1. Turn the instrument to the "on" position if not already on.
2. Ensure that the green lights on the "Power OK" and "System OK" are illuminated. If both lights are not illuminated, contact the RSOR.
3. Record the date, time, type of material, material location (origin of material) and license plate of the vehicle on the Truck Survey Log (Attachment 1).
4. Have the truck advance toward the detector slowly until the occupancy sensor is tripped.
5. Inform the truck driver to proceed slowly through the detectors. The rate of travel should be as slow as possible (not to exceed 3 miles per hour). If the truck is traveling too fast, a red over speed light will illuminate on the instrument panel.
6. If the over speed light illuminates, request that the truck driver proceed forward and turn around to restart the screening process. Wait for the instrument to be manually reset before proceeding.
7. While the truck is passing through the detectors, a green "checking" light will illuminate to tell the operator that the infrared motion detectors are operating properly. When the truck completes its pass (indicated by the checking light going off), it is necessary for the driver to pause the truck until cleared by the RCT to proceed or return for a rescreen. If the checking light repeatedly does not illuminate while a truck is passing through, have the truck stop in a convenient location nearby. Notify the RSOR that the unit is not operational. At this point, the load contents have not been released and the portal monitor will have to be repaired and the truck re-scanned or a hand survey conducted. If a hand survey is to be used, proceed to Step 1 of Section 4.3 below.
8. If the checking light illuminates and the red alarm light does not illuminate when the truck has completed a pass, record the results (clean) under the Pass 1 column on Attachment 1 and proceed to Step 14. In the event that the red alarm light illuminates, let the truck continue through the detectors and record results (alarm) under the Pass 1 column on Attachment 1 and continue at Step 9.

9. Inform the truck driver that it will be necessary to pass through the detectors again to confirm the alarm. Direct the truck driver to reposition the truck for another pass through the detector.
10. Push the reset button (if necessary). If the checking light illuminates and the red alarm light illuminates, let the truck continue through the detectors and record results (alarm) under the Pass 2 column on Attachment 1 and proceed to Step 13. In the event that the red alarm light does not illuminate, let the truck continue through the detectors and record results (clean) under the Pass 2 column on Attachment 1 and continue at Step 11.
11. Inform the truck driver that it will be necessary to pass through the detectors again to confirm the alarm. Direct the truck driver to reposition the truck for another pass through the detector.
12. Push the reset button (if necessary). If the checking light illuminates and the red alarm light does not illuminate when the truck passes through, record the results (clean) under the Pass 3 column on Attachment 1 and proceed to Step 14. In the event that the red alarm light illuminates, let the truck continue through the detectors and record results (alarm) under the Pass 3 column on Attachment 1 and continue at Step 13.
13. Inform the truck driver that the load is not releasable and follow the steps in Section 4.4 below. Indicate “Ret.” under the Disposition header of the Truck Survey Log to indicate the load has been returned and initial the appropriate line on the Truck Survey Log. Have the truck driver initial the log as well. Subsequent truck surveys can now be conducted beginning at Step 1 above.
14. The truck load can be released. Indicate “Rel.” under the Disposition heading on the Truck Survey Log and sign next to the appropriate row. Have the truck driver initial the log as well. Subsequent truck surveys can now be conducted beginning at Step 1 above.

4.3 Hand Screening

In instances where the portal monitor malfunctions while a truck is being surveyed or if the portal monitor is inoperable, a hand survey will be required. Hand-held gamma instruments (Ludlum Model 2350-1 with Ludlum Model 44-10 2 inch by 2 inch sodium iodide (NaI) detector or equivalent) used to survey trucks should be operated in accordance with the requirements of Appendix SOP 002, Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use and any applicable requirements from work-specific documents. Surveys should be performed in an area that is convenient to the workplace traffic flow. The area should be sufficiently isolated from any potential sources of radiation and allow the technician to obtain easy access to all sides of the vehicle. It is anticipated that when hand surveys are necessary, they will be conducted adjacent to the location where the portal monitor has been installed; however, an alternate location may be used. The following steps will be performed for a hand survey:

1. In an area adjacent to where the trucks are being screened and known to be free of radioactive material, establish a background count rate and record it on the Radiological Truck Survey Form for Portable Instruments (Attachment 2). If multiple

surveys are to be performed in a single area, then the background only needs to be established once for that area.

2. The end of the detector should be held approximately 4 inches from the surface of the truck containing the load when performing surveys.
3. Move the detector over the surface of the truck or containers in a serpentine pattern at a rate of approximately 0.5 meter per second (m/sec) covering 100 percent of the surface of the sides, the undercarriage, and the rear portion of the truck where the load is contained. Extra scrutiny should be used for any areas that result in significant increase in the audible signal of the meter. For maximum readings as specified on Attachment 2, the technician performing the survey will use experience and judgment to take a meter level reading at the point of greatest audio response for the given side/area being surveyed.
4. When taking a reading for a maximum count-rate on a given side/area, read the meter after sufficient response time has elapsed (i.e., the meter needle is relatively stable and the audible count rate is relatively stable).
5. If radiation levels above 10,000 cpm are identified, the RSOR and Radiological Affairs Support Office (RASO) will be notified. Document the survey results on the appropriate survey form (Attachment 2). Inform the truck driver that the load is not releasable and follow the steps in Section 4.4 below.

4.4 Protocol for Trucks Failing to Receive Portal Monitor or Hand Survey Clearance

When a truck causes two or three portal monitor alarms in three passes, or fails a hand screening using portable survey instrumentation, the truck will not be released off-site. The RSOR shall be contacted immediately and apprised of the situation. The following steps shall then be taken in response to a truck that does not receive portal monitor clearance:

1. Copies of the portal monitor output for all passes resulting in an alarm shall be retained by the operators for inclusion with the truck survey log.

2. The offending truck, with load in place, shall initially be subjected to a hand survey per the procedures in Section 4.3. If a hand survey has already been completed and documented per the procedures in Section 4.2, proceed to step 4 below.

3. A hand survey log shall be completed and also appended to the truck survey log. The purpose of the hand survey is to identify if elevated areas of radiation exist that may indicate the presence of radioactive material. Particular attention should be given to the area of the truck that caused the alarm according the portal monitor (i.e. Alarm in back).

> ***NOTE*:** If a hand survey does locate an area of elevated activity, immediate notification should be given to the RSOR who will inform RASO.

4. All rejected trucks shall be directed to an appropriate rejected truck pile pad and dumped to further characterize and survey the material. Material should be placed on a visqueen liner or other surface to prevent the spread of potential contamination.

> ***NOTE*:** If multiple contractors exist on an installation, the truck will be sent to an area controlled by the contractor from which the load originated. More than one rejected truck pile pad may exist at each installation.

5. Rejected truckload piles must be kept segregated until the pile has been surveyed, sampled, and the results have been reviewed by the RSOR, with concurrence from RASO.

6. Trucks that dump their loads shall be scanned upon exiting the impacted area and the empty truck will be rerun through the portal monitor. If the truck does not alarm the portal monitor, it is free to return to service. If the empty truck alarms the portal monitor, RASO and the RSOR shall be notified and all portal monitor operations shall be temporarily halted pending resolution by RSOR and RASO concurrence.

> ***NOTE***: Trucks that have material removed due to elevated measurements during portal monitor or portable instrument surveys shall have truck tires surveyed for contamination in accordance with SOP 001, Radiation and Contamination Surveys.

7. The truckload pile will be rescanned by hand. The pile shall be spread into a 6" laydown and a hand survey shall be conducted. Any sources located during the rescan of a rejected truckload pile require notification to be given to the RSOR, who will notify RASO. Pile disposition will be determined by the RSOR or designee with RASO concurrence. If no sources are found, a minimum of two samples shall be taken from the pile and sent for gamma spectroscopic analysis. Samples will be collected at areas exhibiting radiation equal to or greater than 3 sigma plus background. If radiation measurements do not exceed 3 sigma plus background, the samples will be selected from two areas exhibiting the largest gamma readings. All areas exhibiting a gamma radiation count rate exceeding 10,000 cpm will be sampled.

8. If the sample results do not indicate the presence of any of the radionuclides of concern above the release limits, then the stockpile can be either reloaded and run through the portal monitor again or aggregated with an existing clean stockpile. If the sample results indicate one or more radionuclides above the release criteria, the entire load shall be placed into a waste bin for further characterization and offsite disposal.

5.0 RECORDS

A Truck Survey Log, provided as Attachment 1, will be generated and retained in the permanent project file as a result of using this procedure. Multiple entries can be made on the same survey form for trucks that do not set off the alarm on the detector.

If a hand survey is performed a separate survey form Attachment 2 will be used.

6.0 REFERENCES

Number	*Title*
SOP 001	Radiation and Contamination Surveys
SOP 002	Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use

7.0 ATTACHMENTS

The following form is attached to this procedure:

Attachment 1, Truck Survey Log
Attachment 2, Radiological Truck Survey Form for Portable Instruments

ATTACHMENT 1

TRUCK SURVEY LOG

Date	Time	Note	Type of Material	Material Location	License Plate No.	Pass 1		Pass 2[a]		Pass 3[b]		Hand Survey[c]		Disposition[d]		Technician Initials	Driver Initials
						Alarm	Clean	Alarm	Clean	Alarm	Clean	Reqd.	Comp.	Rel.	Ret.		

[a] Pass 2 and 3 not necessary if Pass 1 is clean
[b] Pass 3 not necessary if Pass 1 and Pass 2 are both alarm
[c] Indicate if hand survey required, if so initial upon completion
[d] Indicate release or return

Notes: 1 = Alarm 2 = Heavy Load 3 = Light Load 4 = Empty

Attachment 2

Radiological Truck Survey Form for Portable Instruments

Date:	Time:	Truck Identification (i.e. tag number):
Purpose of Survey: (include load origin)		

INSTRUMENTS USED

Model Number	Serial Number	Calibration Due Date	Background
1.			
2.			
3.			

Item Or Location	Count Rate Gross CPM	Distance or location
1. Max Reading on the sides of the vehicle		4”
2. Max Reading on the underside of the vehicle		4”
3. Max Reading on the rear of the vehicle		4”
4.		
5.		
6.		
7.		
8.		

Sketch/Diagram (optional):

Remarks:

Disposition (Released/Returned):

Surveyor (initials):	Reviewed by (signature):	Date:

Standard Operating Procedure

RADIOLOGICALLY CONTROLLED AREAS
POSTING AND ACCESS CONTROL

SOP-012

Revision 0

Approved By:

Erik J. Abkemeier

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 GENERAL 5
4.1.1 Precautions 6
4.1.2 Signage 6
4.1.3 Surveys 6
4.2 PROCEDURE PROCESS 6
4.2.1 Establishing and Posting Radiologically Controlled Areas 6
4.2.2 Posting Requirements for Radioactive Materials Areas 7
4.2.3 Establishing and Posting Radiation Areas 8
4.2.4 Establishing and Posting Contaminated Areas 8
4.2.5 Establishing and Posting Airborne Radioactivity Areas 9
4.2.6 Establishing and Posting Underground Radioactive Materials Areas 10
5.0 RECORDS 11
6.0 REFERENCES 11
7.0 ATTACHMENTS 11

1.0 PURPOSE

The purpose of this procedure is to specify methods and requirements for consistent posting and control of radiologically controlled areas. This procedure is intended to satisfy the posting requirements of 10 Code of Federal Regulations (CFR) 20 (1-92), Standards for Protection Against Radiation.

2.0 SCOPE

This procedure identifies the types of postings necessary and requirements to clearly identify radiological conditions in a specific area or location within an area. It also specifies the requirements for access into and egress from radiologically controlled areas. This procedure will be used by Tetra Tech EC, Inc. (TtEC) personnel and its subcontractors to control entry and egress from radiologically controlled areas (RCAs).

3.0 DEFINITIONS AND ABBREVIATIONS

Airborne Radioactivity Area – A room, enclosure or area in which radioactive material is dispersed in air in the form of dusts, fumes, particulates, mists, vapors, or gases, and the concentration of the dispersed radioactive materials is in excess of:

- The derived air concentrations (DACs) specified in Table 1, Column 3 of Appendix B, Title 10 Part 20 of CFR.
- Concentrations such that an individual present in the area without respiratory protective equipment could exceed, during the hours the individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI).

Annual Limit on Intake (ALI) – The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a 1-year period. ALI is the smaller value of intake of a given radionuclide by the reference man that would result in a committed effective dose equivalent of 5 rems (0.05 sievert [Sv]) or a committed dose equivalent of 50 rems (0.5 Sv) to any individual organ or tissue. (ALI values for intake by ingestion and by inhalation of selected radionuclides are given in Table 1, Columns 1 and 2 of Appendix B of 10 CFR 20.) One ALI is equivalent to 2,000 DAC-hrs.

As Low As Reasonably Achievable (ALARA) – An approach to radiation protection for the control and management of exposure (both individual and collective) to the workforce and the general public; thus ensuring a level of exposure as low as social, technical, economic, practical, and public policy considerations permit. The ALARA program is structured to increase worker awareness of exposure reduction techniques and the associated benefits of that reduction.

Contamination Area –Any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed the removable surface contamination values specified in Regulatory Guide 1.86, *Termination of Operating Licenses for Nuclear Reactors* in Table 1 (Attachment 1), but do not exceed 100 times those values.

Derived Air Concentration (DAC) – The concentration of a given radionuclide in air which, if breathed for a working year of 2,000 hours under conditions of light work (inhalation rate of 1.2 cubic meters of air per hour), results in an intake of one ALI. DAC values are given in Table 1, Column 3, of Appendix B of 10 CFR 20 (1-92), Standards for Protection Against Radiation.

Fixed Contamination –Surface contamination exceeding the contamination limits provided in Table 1 (Attachment 1) that can not be readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe, or masslin.

High contamination area - Any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed 100 times the removable surface contamination values specified in Regulatory Guide 1.86 (Table1, Attachment 1).

Radiation Area – Any area accessible to personnel in which there exists ionizing radiation at exposure rates such that an individual could receive a deep dose equivalent (DDE) in excess of 5millirem (mrem) in 1 hour at 30 centimeters (cm) from the radiation source or from any surface that the radiation penetrates.

Radiation Work Permit (RWP) – A document generated, in accordance with Appendix K-10, Issue and Use of Radiation Work Permits, to provide specific requirements for radiological activities.

Radioactive Materials Area (RMA) – Any area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in Appendix C, Title 10 Part 20 of the CFR.

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.

Underground Radioactive Materials (URM) –An underground area that is known to contain radioactive materials such as pipelines, tanks, cribs, covered ponds, covered ditches, catch basins, inactive burial grounds and sites of known, covered spills.

4.0 PROCEDURE DETAILS

4.1 General

This procedure will address establishing and posting:

- RCAs
- RMAs
- Radiation areas
- Contamination areas
- Airborne radioactivity areas
- Underground RMAs

4.1.1 Precautions

Personnel working in a RCA shall:

- Comply with all radiation protection instructions and postings.
- Refrain from eating, drinking, smoking or chewing while in a RCA.
- Perform jobs or tasks in such a manner that minimizes the creation or spread of contamination.
- Ensure that tools and equipment are surveyed prior to removing the items from a RCA.
- Refrain from loitering in radiation areas.
- Wear dosimetry in a manner required by the RWP.
- Perform a personal contamination survey upon exit from a RCA.
- Immediately report the loss, damage or unexpected exposure of dosimetry to the RSOR.
- Notify the RCT of any wounds, sores or rashes before entering any area where contamination exists.
- Exit immediately if a wound occurs in a RCA, notify the RCT and seek first aid.
- Follow any additional requirements dictated by the RSOR or RCT.

4.1.2 Signage

All radiologically controlled areas will be designated an RCA. Additional restricted areas (such as a CA, RA, RMA, ARA) may be posted within an RCA, as necessary, to identify additional precautions that may be required.

Signs identifying radiological hazards shall be posted on all entrances and accessible sides of the barrier surrounding the identified RCA. Signs identifying radiological hazards shall be firmly attached to the barrier or entrances with materials that will withstand the effects of adverse weather and normal use conditions. If signs with the exact wording are not readily available, alternative phrases may be used as long as the same requirements are clearly communicated by the posting. Signs may be be identified in English and Spanish.

4.1.3 Surveys

Radiation and contamination surveys for establishing and maintaining RCAs shall be performed in accordance with SOP 001, Radiation and Contamination Surveys.

4.2 Procedure Process

4.2.1 Establishing and Posting Radiologically Controlled Areas

RCAs shall be designated by clearly and conspicuously posting all entrances and all other accessible sides of the area with a sign bearing the following:

The sign will also list requirements for entering the RCA. To enter a RCA, a person must meet all posted requirements or be escorted by a trained individual.

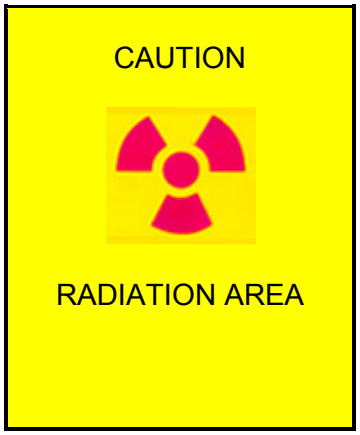
4.2.2 Posting Requirements for Radioactive Materials Areas

Radiation protection personnel shall post any area or room in which radioactive materials are stored or used with a sign or signs bearing the radiation symbol and the words “CAUTION, RADIOACTIVE MATERIALS AREA.”

When posting a room, a sign should be placed on each entrance door to the room. If the area to be posted is not a room, the area containing the radioactive material shall be bounded by signs fastened to stanchions, posts or other sturdy structures. The signs will be positioned such that they are conspicuous when the area is approached from any accessible direction. If signs with these exact words are not readily available, alternative phrases may be used as long as the same requirements are clearly communicated by the posting.

4.2.3 Establishing and Posting Radiation Areas

Radiation protection personnel shall post radiation areas with signs bearing the radiation symbol and the words “CAUTION, RADIATION AREA.”



If an entire room or most of a room is at or above the 5 millirem per hour (mrem/hr) level, a sign should be placed on each entrance door to the room. If the area to be posted is not a room, the area at or above the 5 mrem/hr level shall be bounded by signs fastened to stanchions, posts or other sturdy structures. The signs will be positioned such that they are conspicuous when the area is approached from any accessible direction. If a posting is placed on a door in a manner that would prevent the posting from being observed if the door is propped open, an additional posting shall be placed in the doorway.

A single entry/exit point shall be established to access the radiation area. Access into radiation areas shall be limited to radiation workers wearing dosimetry that are signed-in on an approved RWP.

4.2.4 Establishing and Posting Contamination Areas

4.2.4.1 Removable Surface Contamination

Radiation protection personnel shall post any contamination area or high contamination area with a sign or signs bearing the radiation symbol and the words “CAUTION, CONTAMINATION AREA”, or “CAUTION, HIGH CONTAMINATION AREA” as appropriate.

When posting a room, a sign should be placed on each entrance door to the room. If the area to be posted is not a room, the area containing the contamination shall be bounded by signs fastened to stanchions, posts or other sturdy structures. The signs will be positioned such that they are conspicuous when the area is approached from any accessible direction.

A single entry/exit point shall be established to access the contamination area. A step-off pad is placed at the entry/exit point that provides a defined boundary between contaminated and non-contaminated areas. Each contamination area that is to be entered shall have a step-off pad maintained in an uncontaminated condition located at the access/egress point.

Contamination areas, which require personnel access on a daily basis, should have a frisking station located as close to the access/egress point as is reasonably possible, taking background radiation levels and work processes into consideration. All personnel exiting a contamination area shall perform personnel contamination monitoring in accordance with the applicable RWP.

4.2.4.2 Fixed Contamination

If the area of contamination is within a RCA, the boundaries of the contamination area will be delineated in such a way to identify it for future characterization.

If the area of contamination is not within a RCA, then the area will be posted as a contamination area, as described in Section 4.2.4.1.

4.2.5 Establishing and Posting Airborne Radioactivity Areas

TtEC policy is to minimize the amount of radioactive materials taken into a worker's body. In order to accomplish this, Airborne Radioactivity Areas are posted at 10 percent DAC, as specified in Table 1, Column 3 of Appendix B of 10 CFR 20. Maintaining the airborne activity below these limits will eliminate any posting requirements.

To verify that the limits for airborne radioactivity are not exceeded, air sampling will be performed continuously during each work activity. The results of the air samples are compared with the limits above to verify that the limits are not exceeded. If the limits are exceeded, immediately contact the RSOR or designee.

Radiation protection personnel shall post any Airborne Radioactivity Area or room with a sign or signs bearing the radiation symbol and the words “CAUTION, AIRBORNE RADIOACTIVITY AREA.”

When posting a room, a sign should be placed on each entrance door to the room. If the area to be posted is not a room, the area containing the airborne radioactivity shall be bounded by signs fastened to stanchions, posts or other sturdy structures. The signs will be positioned such that they are conspicuous when the area is approached from any accessible direction.

4.2.6 Establishing and Posting Underground Radioactive Materials Areas

The entrance to any area (normally outside areas) shall be posted to indicate the presence of identified underground items that are known to contain radioactive materials such as pipelines, tanks, cribs, covered ponds, covered ditches, catch basins, inactive burial grounds and sites of known, covered, spills.

The entrances to the areas shall be clearly and conspicuously posted:

Underground radioactive material areas shall also be posted “Authorized Personnel, RWP Required for Entry.” If signs with these exact words are not readily available, alternative

phrases may be used as long as the same requirements are clearly communicated by the posting.

5.0 RECORDS

Documentation generated by the implementation of this procedure shall consist of recording the date and location of any radiologically controlled, radioactive material, radiation, contaminated or airborne radioactivity areas established in the project logbook. Include a sketch of the area and area boundary on survey forms.

6.0 REFERENCES

Number	***Title***
SOP 010	*Issue and Use of Radiation Work Permits*
SOP 011	*Radiation and Contamination Surveys*
NRC Reg. Guide 1.86	*Termination of Operating Licenses for Nuclear Reactors*

7.0 ATTACHMENTS

Table 1

ATTACHMENT 1

TABLE 1

CONTAMINATION LIMITS TABLE

Radiation Type	Release Limits[1] (Fixed) (dpm per 100 cm^2)	Release Limits[1] (Removable) (dpm per 100 cm^2)
Alpha (α) Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	20
Beta (β-) Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000	200
Beta-Gamma (β-γ) Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000	1,000

Notes:

[1] These limits are based on AEC Regulatory Guide 1.86 (AEC, 1974)

Abbreviations and Acronyms:
AEC – Atomic Energy Commission
cm^2 – square centimeter
dpm – disintegrations per minute

Standard Operating Procedure

VEHICLE TOWED ARRAY (VTA)

SOP-013

Revision 0

Approved By:

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 TRAINING REQUIREMENTS 4
4.0 GENERAL REQUIREMENTS FOR VEHICLE TOWED ARRAY 4
4.1 GENERAL 4
4.1.1 Equipment Required 5
4.1.2 Initial Set-up of the Vehicle Towed Array (VTA) 5
4.1.3 Initial QA/QC Setup 6
4.1.4 Operation of the VTA System 7
4.1.5 Data Collection, Storage and Processing 7
4.1.6 System Shutdown and Temporary Storage 8
5.0 SPECIFICATIONS AND LIMITATIONS 8
6.0 REFERENCES 10

1.0 PURPOSE

The purpose of this SOP is to specify methods and requirements for conducting consistent radiological surveys and ensuring the proper documentation of acquired data. This standard operating procedure (SOP) has been developed to conduct radiological surveys using a vehicle towed array (VTA). The VTA is used to identify surface areas (within the top 4 to 6 inches of soil depending on the gamma energy emission of the radionuclide being surveyed) that represent anomalies from local background areas. The VTA will be used to survey to generate real-time maps illustrating radioactivity responses.

The VTA is composed of off-the-shelf components and includes TSA gamma scintillation detectors, Leica Global Positioning System (GPS), TSA control system, trailer, and a small tractor. The system is capable of storing data collected, and producing site maps to illustrate instrument responses.

Adherence to this SOP will ensure that the surveys performed have reproducible results. The guidance for control of radiation exposures provided in this SOP is in accordance with the as low as reasonably achievable (ALARA) philosophy.

2.0 SCOPE

This procedure will be used by Tetra Tech EC, Inc. (TtEC) personnel and its subcontractors when conducting VTA surveys for radiological contaminants.

3.0 TRAINING REQUIREMENTS

All personnel using the VTA will be trained in their task specific duties in the operation of the equipment. For example, the driver of the tractor must be trained on the operation of the detectors, and the data handler must be trained on transferring the detector data with the GPS coordinates to usable files.

4.0 GENERAL REQUIREMENTS FOR VEHICLE TOWED ARRAY

4.1 General

VTA surveys are performed to identify areas with measurable radiation, and assess the intensity and shape of areas of observed elevated radiation.

Survey results will be provided as a file of geospatially positioned data, and MS-Excel spreadsheet of the X-Y position with measurement data, and an X-Y plot of the relative intensity of the measurement results. The GPS component of the VTA system can replicate the location of gamma scintillation detector results to an accuracy of 12 inches.

4.1.1 Equipment Required

- Three dual frequency, high resolution Leica GPS (or equivalent) with real-time kinematic (RTK) positioning capabilities that provides fixed solution accuracy (1 to 5 cm). One GPS is for the detector positioning, one GPS is for the swath guidance system, and one GPS is for the RTK base station.
- Two TSA DA372 gamma scintillation detector assemblies
- TSA SC-770 data controller
- One Kawasaki Mule (or equivalent) with a trailer capable of mounting the detectors evenly over a variety of heights
- One swath guidance system to provide Kawasaki Mule operator ability to drive parallel lines five to six feet apart.
- Laptop computer (Tough Book equivalent)

4.1.2 Initial Set-up of the Vehicle Towed Array (VTA)

Instruments used to perform radiation and contamination surveys shall be calibrated, operated, and maintained in accordance with their manufacturer's procedures. Steps to be completed during the initial set-up phase include the following:

1. Remove the detectors, SC-770 data controller, detector cables, GPS, laptop, and power connectors from packaging.
2. Visually inspect all equipment for damage
3. Connect the detectors to the framework of the trailer in the indicated locations. The exact locations for the detectors are clearly marked on the trailer framework.
4. The detectors should be mounted in the correct position and verified using measuring tape.
5. The detectors should be mounted in a position so that the bottom of the detector is 4 inches from the ground surface.
6. The data controller and batteries will be secured in the vehicle bed or vehicle cab with provided mounting brackets and fasteners. All items in the trailer will also be secured using the appropriate safety cording.
7. Connect all the power sources and ensure they are securely connected from the detectors, data controller and GPS to the supplied power sources.
8. Connect data cables from data controller and GPS to laptop.
9. Ensure all batteries are fully charged.
10. Verify all connections are tightened.

If any of the above conditions are unsatisfactory, the instrument shall be tagged as out of service and will not be used.

4.1.3 Initial QA/QC Setup

An initial QA/QC check is required prior to daily use of the VTA at the project site. The initial check is to verify proper systems operations.

The initial QA/QC check will be conducted as follows:

1. Ensure the system is fully operational and all of the detectors and GPS unit are powered on.
2. Perform the initial start up of the GPS unit
    a. Go to the main menu of the GPS unit and ensure the unit is receiving base station corrections and has a fixed solution.
    b. Check GPS configuration to ensure the unit is exporting a GGA NMEA message from appropriate port.
3. Confirm antenna height to ensure proper elevations will be recorded
4. Perform initial background setup
    a. Find a location suitable for conducting the initial test. This location should be free from elevated radioactivity and flat. Background locations will be determined by recommendation of the RSOR and the concurrence of the RASO.
    b. Layout the boundary of the initial background test area.
    c. Ensure there are no radioactive sources in the immediate vicinity of the test area.
    d. Set up the data unit to collect data on a 1 second interval, with input from the GPS unit.
    e. Check the file input to ensure the radiation data and GPS data are both streaming.
    f. Drive the system over the entire area at a rate not to exceed 0.5 meters per second (1.8 km/hr), with a detector height of 4 inches. Begin logging data to the GPS unit.
    g. Calculate the average background using the data collected.
    h. Calculate one, two and three standard deviations above the mean background using the data collected. If necessary, calculate further

deviations above mean background.

Note: In the event that the mean of the survey unit plus a specified number of standard deviations is used for investigation or remediation decisions, follow the previous "initial background set up" steps; however, perform the steps on the survey unit to be surveyed. These steps will be performed in conjunction with the VTA survey of the survey unit.

5. Perform the initial check source measurements
    a. Ensure all sources, with the exception of the check source, have been removed from the immediate area where the initial test is being performed.
    b. Ensure the same check source is used throughout the project.
    c. As above, collect data as specified in Initial Background Setup with the exception of remaining stationary.
    d. Calculate the average over 1 minute with the source under the detectors in a static condition and + or – 20 % acceptance criteria.

4.1.4 Operation of the VTA System

1. The unit will be source checked daily using a check source. The geometry should be the same, and the results should be within +/- 20% of the values calculated in Section 4.1.3.
2. The survey area will be determined in the field prior to beginning the survey.
3. The operator will drive the vehicle at a rate not to exceed 0.5 meters per second (1.8 km/hr), with detectors at a height of no more than 4 inches above the surface.
4. Data logging and GPS measurements will be collected concurrent with the detectors being towed across the surface.
5. The scan data will be collected at 1 second time intervals to obtain measurements required for sample density, and to preclude any time circuitry errors within the data controller.
6. Ensure all measurement results are recorded in total counts (counts per second).

4.1.5 Data Collection, Storage and Processing

1. The data collected by the SC-770 data control unit and GPS unit will be collected and stored on the laptop.
2. The operator transmits the data to the TtEC GIS technician

3. The TtEC GIS technician correlates the data using a simple in-house program to assign GPS position data to each of the DA372 detectors. The TtEC GIS technician provides the data in the required grid coordinates (State Plane Colorado Central NAD83 feet, or as otherwise directed.)
4. The TtEC GIS technician provides a map corresponding radiological data to physical position in increasing sigma ranges.
5. RSOR (or designated individual) interprets data, delivers data to the RASO for review and makes field decisions based on relevant work documents and in coordination with RASO.

4.1.6 System Shutdown and Temporary Storage

At the conclusion of each day's activities the unit will be shutdown as follows:

1. Visually inspect the unit by doing a careful walk around. Note any items of significance, and report them to the RSOR (or designated individual).
2. Power down the GPS unit.
3. Power down the laptop.
4. Power down the data logging unit.
5. Visually inspect the detectors to ensure they are free from dirt/dust/grime. Clean as needed and in accordance with SOP 007, Decontamination of Equipment and Tools.
6. Remove the VTA electronics and properly store in an enclosed space or park the Kawasaki Mule including electronics in an enclosed space (e.g., conex).
7. Visually inspect the tractor and ensure there is no damage. Ensure all tires are properly inflated. Fill the tractor with gas, and store in the designated area.
8. Charge all electronics batteries.

5.0 SPECIFICATIONS AND LIMITATIONS

<u>TSA Detector System</u>

Detectors:

Two 12" x 39" x 1.5" (30.5 x 99 x 3.8 cm) organic plastic scintillators in each cabinet, for a total detector volume of 2808 in^3 (46016 cm^3) per system

Sensitivity:

0.2µCi of ^{137}Cs with a 60 second Count Time

Power:

100 - 240V, 50 - 60Hz power at 0.5 amp

Count Time:

Adjustable

Serviceability:

Self-checking routines and easily performed tests simplify board level trouble shooting. The modular design allows quick and easy repair and maintenance.

Weight:

Approximately 47 lb (21.3 kg) per cabinet

Dimensions:

Two, 36.3" long x 8.25" wide x 8.25" deep cabinets (92.7 x 21 x 21 cm)

Leica GPS Specifications:

GPS1200+ receivers	GX1230+ (GNSS)/ GX1220+ (GNSS)	GX1210+	ATX1230+ GNSS
Ports	1 power port, 3 serial ports, 1 controller port, 1 antenna port		1 power/controller port, *Bluetooth*® Wireless-Technology port
Supply voltage, Consumption	Nominal 12 VDC 4.6 W receiver + controller + antenna		Nominal 12 VDC 1.8 W
Event input and PPS	Optional: 1 PPS output port 2 event input ports	Optional: 1 PPS output port 2 event input ports	
Standard antenna Built-in groundplane	SmartTrack+ AX1203+ GNSS Built-in groundplane	SmartTrack AX1201 Built-in groundplane	SmartTrack+ ATX1230+ GNSS Built-in groundplane

The following apply to all receivers except where stated.

Power supply	Two Li-Ion 4.4 Ah/7.4 V plug into receiver. One Li-Ion 2.2 Ah/7.4 V plugs into ATX1230+ GNSS and RX1250.
Plug-In Li-Ion batteries Same for GNSS and TPS	Power receiver + controller + SmartTrack antenna for about 17 hours (for data logging).
	Power receiver + controller + SmartTrack antenna + low power radio modem or phone for about 11 hours (for RTK/DGPS).
	Power SmartAntenna + RX1250 controller for about 6 hours (for RTK/DGPS)
External power	External power input 10.5 V to 28 V.
Weights	Receiver 1.20 kg. Controller 0.48 kg (RX1210) and 0.75 kg (RX1250). SmartTrack antenna 0.44 kg. SmartAntenna 1.12 kg. Plug-In Li-Ion battery 0.11 kg (2.2 Ah) and 0.2 kg (4.4 Ah)
	Carbon fiber pole with SmartTrack antenna and RX1210 controller: 1.80 kg.
	All on pole: carbon fiber pole with SmartAntenna, RX1250 controller and plug-in batteries: 2.74 kg.

Temperature ISO9022 MIL-STD-810F	Operation:	Receiver	−40° C to +65° C
	Antennas		−40° C to +70° C
	Controllers		−30° C to +65° C
	Controller RX1250c		−30° C to +50° C
	Storage:	Receiver	−40° C to +80° C
	Antennas		−55° C to +85° C
	Controllers		−40° C to +80° C
	Controller RX1250c		−40° C to +80° C
Humidity ISO9022, MIL-STD-810F	Receiver, antennas and controllers Up to 100 % humidity.		
Protection against water, dust and sand IP67, MIL-STD-810F	Receiver, antennas and controllers: Waterpoof to 1 m temporary submersion. Dust tight		
Shock/drop onto hard surface	Receiver: withstands 1 m drop onto hard surface. Antennas: withstand 1.5 m drop onto hard surface.		
Topple over on pole	Receiver, antennas and controllers: withstand fall if pole topples over.		
Vibrations ISO9022 MIL-STD-810F	Receiver, antennas and controllers: withstand vibrations on large construction machines. No loss of lock.		

6.0 REFERENCES

- 10 CFR 20 Standards for Protection Against Radiation
- NUREG-1507 Minimum Detectable Concentration/Activities for Typical Radiation Survey Instruments for Various Contaminants and Field Conditions
- GPS Standard Operating Procedure – Setting Up the Leica Base Station
- TSA Model GPRS-TT Operating and Service Manual

Standard Operating Procedure

STANDARD OPERATING PROCEDURE (SOP) 14
TRANSFER OF LOW LEVEL RADIOACTIVE WASTE TO ANOTHER CONTRACTOR FOR WASTE DISPOSAL
SOP-014

Revision 0

Approved By:

Erik J. Abkemeier

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 4
4.1 General 4
4.2 Transfer Requirements 4
5.0 RECORDS 5
6.0 REFERENCES 5
7.0 ATTACHMENTS 5

1.0 PURPOSE

The purpose of this procedure is to provide guidelines for transfer of Low Level Radioactive Waste (LLRW) items, material and soil to a contractor designated by the Navy to accept LLRW.

2.0 SCOPE

This procedure describes the requirements for transfer of LLRW to the onsite LLRW contractor. This procedure covers the documents and information required for an LLRW transfer.

3.0 DEFINITIONS AND ABBREVIATIONS

None.

4.0 PROCEDURE DETAILS

4.1 General

All LLRW transferred from Tetra Tech control to an LLRW waste contractor will be documented on the attached LLRW Transfer Form (Attachment 1) (or equivalent).

4.2 Transfer Requirements

LLRW that is transferred to another contractor will be documented on Attachment 1 (or equivalent). The information provided will be at a minimum:

a. Discrete items will have a survey on file that includes the isotope/s of concern, gamma dose rate on contact and at 30 centimeters, the fixed and removable alpha and beta/gamma dpm/100 cm^2. This information will be recorded on the LLRW Transfer Form along with the item number and estimated activity. The Site Radiation Safety Officer Representative (RSOR) will be informed prior to the transfer of discrete items to ensure that the site inventory is updated.

b. Material and equipment will be documented with the same information as indicated above, with the exception of estimated activity and will include pertinent information about the material or equipment in the comment box.

c. The information required in item 1 above will not be required to be filled out on the Transfer Form for trash and debris disposed of as LLRW. The number of cubic yards of material and the type of material disposed of will be documented on the Transfer Form. The comment box will indicate trash and debris. Note that an estimate of activity will not be included.

d. Soil data documented on the Transfer Form will include the estimated volume of soil in cubic yards. The bin number that the soil is placed into will be recorded in the comment box of the Transfer Form.

The following steps will be used for transferring material, equipment and soil:

1. The Tetra Tech representative and the waste contractor representative will meet prior to transfer to agree that the LLRW is acceptable for disposal in the LLRW

contractors shipping container. As an example, liquids should not be placed in a container that is not approved for liquids.

2. If both contractor representatives agree that the material is acceptable for transfer both individuals will sign the Transfer Form prior to the release of the LLRW.

3. Once the LLRW is placed into the shipping container, it becomes the responsibility of the waste contractor and will be removed from the Tetra Tech inventory.

4. If the material has to be transferred back to Tetra Tech, such as when a bin is overweight, a new entry will be made in the LLRW Transfer Form to correct the previous entry, i.e., for the soil that is placed into a new container.

If radioactive items are removed from the Tetra Tech Radioactive Materials Area (RMA) a new weekly survey of the container/storage area will be completed to document the exposure rate levels at the perimeter of the RMA.

5.0 RECORDS

The Transfer Form provided as Attachment 1, will be generated and retained in the permanent project file as a result of using this procedure.

6.0 REFERENCES

None.

7.0 ATTACHMENTS

The following form is attached to this procedure:

Attachment 1, LLRW Transfer Form

ATTACHMENT 1

LLRW TRANSFER FORM

Date	Time	Item Number[a]	Type of Material	Isotope/ Activity uCi	Cubic Yards	Dose Rate mrem/hr[a]		Fixed dpm/100cm^2[a]		Loose dpm/100cm^2[a]		Tetra Tech Initials	LLRW Rep. Initials	Comment[b]
						Contact	30 cm	Alpha	Beta Gamma	Alpha	Beta Gamma			

[a] Not required for trash and debris or soil.
[b] Include the bin number for soil.

Standard Operating Procedure

USE OF THE BERKELEY NUCLEONICS CORPORATION SAM-940-3G RADIOISOTOPE IDENTIFIER

SOP-015

Revision 0

Approved By:

Erik J. Abkemeier

11/15/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/15/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 PROCEDURE DETAILS 4
3.1 CALIBRATION 4
3.2 GENERAL CONSIDERATIONS 4
3.3 DETERMINATION OF INSTRUMENT BACKGROUND 5
3.4 INSTRUMENT OPERATION 5
3.5 MAINTENANCE 6
4.0 RECORDS 6
5.0 REFERENCES 7
6.0 ATTACHMENTS 7

1.0 PURPOSE

This procedure is used to specify the requirements for operation of the Berkeley Nucleonics Corporation (BNC) SAM-940-3G radioisotope identifier connected to a Model 6998, 3-inch by 3-inch sodium iodide scintillation detector. The procedures presented below will be used for survey of elevated field locations and radioactive devices discovered as a part of TtEC contract operations at Navy sites. Results of surveys will be used to assist in radionuclide identification, particularly for radionuclide identification and waste characterization.

2.0 SCOPE

This procedure will be used by TtEC personnel and its subcontractors for use of the SAM-940-3G to identify isotopes associated with elevated field locations and radiological devices discovered during contract operations including, but not limited to, survey of discrete items found during excavation operations as well as surveying contaminated locations in the field. This procedure is intended to provide general instructions for setup, gross calibration, background determination and sample analysis of the SAM-940-3G.

In certain instances the requirements of this procedure may need to be added to or modified for specific field operations. Any changes required will be approved by the site RSOR prior to operation of the SAM-940. This procedure is developed only for the use of the SAM-940. Personnel assigned to use the SAM-940 must be trained by the Radiation Safety Officer Representative (RSOR) or their designee prior to using the instrument. **Refer to the SAM-940 Instruction Manual for specific information on the operation of the instrument.**

3.0 PROCEDURE DETAILS

3.1 Calibration

Instrument calibration 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 manufacturer's manuals or a subcontractor's TtEC-approved procedure. Properly calibrated instruments shall include a 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 RSOR, or designee. 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.

3.2 General Considerations

The compact flash card unique to the instrument must be inserted in the SAM-940 prior to operation. The instrument will not operate without the compact flash card installed. The compact flash card contains operational information for the SAM-940; therefore, the card cannot be interchanged with any other instrument's compact flash card. Assure that the compact flash card has the correct SAM-940 and detector serial number that match the

instrument. Prior to operation of the instrument, the date and time should be set in accordance with the user's manual.

Pre-operational setup of the instrument will be done in accordance with the BNC Model 940 Instruction Manual. Pre-operational setup of the SAM-940 includes an auto calibration process that must be performed in a low background location such as an office location. After the instrument is operational, a coarse calibration should be done using a 0.5 to 5 microcurie (uCi) Cs-137 check source. The coarse calibration requires the use of the Cs-137 check source to verify that the instrument is identifying gamma peaks in the proper energy channels. The instrument should be allowed to warm up/stabilize for 30 minutes prior to conducting any gamma analyses.

The SAM-940 is most efficient for identifying isotopes at a range of 3,000 to 5,000 counts per second (cps). When possible, discrete radioactive items should be removed from the field and surveyed in a low background Radioactive Materials Area (RMA). The SAM-940 should be positioned at an optimum distance from the item being surveyed to achieve a count within this range (nominally 4,000 cps). As a result, the count rate and dose rate identified in the SAM-940 analysis results reports may be similar for the majority of the reports. Some of the items may not have sufficient activity to generate counts greater than 3,000 cps; therefore, these items should be counted at the maximum contact count rate achievable.

When surveying a location, such as an excavation in the field, the instrument will be taken to that location. Once the highest area of radiation has been located, the instrument will be positioned at a distance above the soil to obtain a count rate of approximately 4,000 cps. In cases where this count rate cannot be reached, a measurement may still be taken with the understanding that the statistical quality of the data is not ideal.

3.3 Determination of Instrument Background

The SAM-940 subtracts the background reading from the survey; therefore, background determination must be performed in an area with similar characteristics to the area the survey is to be conducted. For controlled environments where devices will be surveyed, the background location may be the same location as the survey location. A five minute background and count time should be sufficient for accurate detection of isotopes commonly encountered. For field identification, the background measurement should be performed in a location near the area to be surveyed to eliminate effects from naturally occurring radiation.

The background should always be measured for the same period as the count time. The background and coarse calibration analysis reports will be saved and included with the analysis reports for the devices or locations evaluated.

3.4 Instrument Operation

The following is a detailed discussion of the operation of the SAM-940-3G. **The BNC SAM-940 Instruction Manual must be referenced to determine how a specific operation is to be performed.** Personnel using the instrument must be trained in its operation prior to use. Attachment 1 should be used to document all survey information required below:

- If using the instrument in the field, ensure that the battery is charged prior to operation.

- For bench type operations, the instrument may be operated using the AC power adapter.
- Insert the compact flash card. The instrument will not operate unless the compact flash card is installed.
- Turn on the SAM-940 and wait for the “autocal” process to complete.
- Check to ensure that the date and time are correct.
- Conduct the coarse calibration using a Cs-137 check source and document the analysis report number on the survey log.
- Proceed to the background location and measure a background gamma spectrum. The standard background gamma spectrum collection time is five minutes, but this time may be altered in order to obtain better results with RSOR approval. Document the analysis report number on the survey log.
- Set the SAM-940 to the count time. The standard gamma spectrum collection time is five minutes, but this time may be altered in order to obtain better results with RSOR approval.
- Place the SAM-940 in front of the item or location being analyzed at a distance that generates approximately 4,000 cps.
- Some locations and devices may not have sufficient activity to generate 4,000 cps. If 4,000 cps cannot be generated, put the SAM-940 as close to contact as possible with the item or location, and start the count. If the count rate drops below 300 cps, the analysis report may not be statistically reliable for radionuclide identification.
- After the count has finished, review the analysis report to determine if the report is acceptable
- A recount may be necessary if the analysis report has extraneous information (e.g., radionuclides that logically cannot be present due to short half-lives).
- Record the required information of the survey in Attachment 1 (or equivalent), and recount if necessary, or continue to the next item or location and follow the steps indicated above.
- Provide the survey log and the analysis reports to the RSOR or designee for evaluation.

3.5 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 shall be performed by the manufacturer or an approved vendor.

4.0 RECORDS

Records that result from this procedure may include forms that document background analysis reports, coarse calibration analysis reports, item analysis reports, and survey logs.

5.0 REFERENCES

BNC Model 940 Instruction Manual.

6.0 ATTACHMENTS

Attachment 1 – Example SAM-940 Survey Log

ATTACHMENT 1

SAM-940 SURVEY LOG

Instrument Model # SAM-940 Serial # 40858
Detector Model # 6998 Serial # 44220

Date	Time	Analysis Report #	Analysis Type/ Item #[a]	Count Time (sec)	Analysis Acceptable	Major Isotope	Count Rate (cps)	Initials	Comment

a – Background Count; Cs-137 Count; Item Number; Location Number

ATTACHMENT 1

SAMPLING AND ANALYSIS PLAN

This page intentionally left blank.

SAP Worksheet #1 – Title and Approval Page

ATTACHMENT 1

FINAL

SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
April 2013

NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION INSTALLATION RESTORATION SITE 12 NAVAL STATION TREASURE ISLAND SAN FRANCISCO, CALIFORNIA

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

Prepared by:
Tetra Tech EC, Inc.
1230 Columbia Street, Suite 750
San Diego, California 92101
(619) 234-8696

Prepared under:
Contract No. N62473-10-D-0809
DCN: RMAC-0809-0013-0007
CTO No. 0013

Review Signature: Lisa A. Bienkowski for Greg Joyce, TtEC Quality Control Program Manager — 04/01/13 Date

Approval Signature: Joseph Michalowski, NAVFAC SW Quality Assurance Officer — April 1, 2013 Date

This page intentionally left blank.

EXECUTIVE SUMMARY

The Department of the Navy (DON) has contracted with Tetra Tech EC, Inc. (TtEC) to perform a non-time-critical removal action (NTCRA) involving the removal of two radiological hot spots identified in the California Department of Public Health (CDPH) Site 12 Gamma Survey Report (CDPH 2011) and the demolition of Buildings 1121 and 1323 within Installation Restoration (IR) Site 12, Naval Station Treasure Island (NAVSTA TI), San Francisco, California. This work will be conducted under Contract No. N62473-10-D-0809, Contract Task Order (CTO) No. 0013 and under TtEC's State of California Agreement State Radioactive Materials License No. 7909-01.

This Sampling and Analysis Plan (SAP) (Attachment 1 of the NTCRA Work Plan) has been prepared by TtEC to provide guidance on sampling, analysis, and quality control (QC) in support of remediation activities under this CTO. The quality assurance (QA)/QC elements in this SAP were prepared in accordance with the U.S. Environmental Protection Agency (EPA) Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005) and Requirements for Quality Assurance Project Plans, EPA QA/R-5, QAMS (EPA 2006a) to ensure that all data collected are precise, accurate, representative, complete, and comparable to meet their intended use.

TtEC will use two laboratories to perform the analyses required for the remediation activities at IR Site 12. The primary laboratory used to perform radiological analyses for screening, as well as definitive data, is located at Hunters Point Naval Shipyard and is managed by Curtis and Tompkins, Ltd. as a subcontractor to TtEC. (This facility is a satellite laboratory for Curtis and Tompkins, Ltd., as their main laboratory is located in Berkeley, California.) This satellite laboratory (hereinafter referred to as Curtis and Tompkins) has received accreditation by the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) and the CDPH National Environmental Laboratory Accreditation Program (NELAP) for gamma spectroscopy (which includes radium-226 [Ra-226]) and gross alpha/gross beta analysis of solid and swipe samples. Radiological analyses not listed in Curtis and Tompkins' DoD ELAP and CDPH NELAP accreditation and any chemical analyses discussed in this SAP will be performed by TestAmerica-St. Louis laboratory. TestAmerica-St.Louis has DoD ELAP and CDPH NELAP accreditation for all the radiological and chemical methods listed in this SAP. Further details on each laboratory are provided in SAP Worksheet #30.

BACKGROUND

NAVSTA TI is located in San Francisco Bay, midway between San Francisco and Oakland, California. The former naval station consists of two contiguous islands: Treasure Island, which is approximately 403 acres, and Yerba Buena Island, which is approximately 147 acres. Treasure Island is a manmade island constructed of materials dredged from the bay. Military activities at the former NAVSTA TI date back to 1866, before the construction of Treasure Island, when the U.S. government took possession of Yerba Buena Island for defensive fortifications. In 1993, NAVSTA TI was designated for closure under the Base Closure and Realignment Act of 1990. The naval station was closed on September 30, 1997, and is currently in the transfer process.

IR Site 12 is located on the northwest portion of NAVSTA TI on a relatively flat 93-acre area as illustrated on Figure 1. The site consists of multiplex housing units with private backyards and common area front yards, side yards, and surrounding greenbelts. The area was originally used as a parking lot during the 1939–1940 Golden Gate International Exposition. After Navy occupation of the island in 1940, the area was developed for bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields, and disposal or burning of solid waste. Beginning in the1960s, areas of IR Site 12 were incrementally developed into housing for Navy personnel and their dependents. Former residential Buildings 1121 and 1323 are located within IR Site 12 near Westside Drive.

An NTCRA was implemented in May 2006 to remediate chemicals in soil associated with chemical/fuel storage and disposal or burning of solid waste in four Solid Waste Disposal Areas (SWDAs) (SWDA A & B, SWDA 1231/1233, SWDA 1207/1209, and SWDA Bigelow Court) located within IR Site 12. A Historical Radiological Assessment (HRA) (Weston 2006) identified the radiological contamination potential for the SWDAs as "unlikely" and recommended radiation monitoring during excavation of identified SWDAs. During the initial stages of this NTCRA, a radiation survey and sample analysis identified radium-226 (Ra-226)-impacted debris and soil in some of the SWDAs. Subsequently, an Action Memorandum (DON 2007) summarizing the site characteristics identified the chemicals of potential concern (COPCs) and the horizontal extent of the SWDAs. Generally, the radiological contamination in IR Site 12 SWDAs is colocated with chemical contaminants. The NTCRAs at IR Site 12 determined that some of the SWDAs were contaminated with radiological items or soil containing Ra-226. Elevated gamma readings were also detected along the northern and southern fence lines (two areas) of SWDA A & B by the CDPH Radiologic Health Branch (RHB) during a gamma survey conducted in April 2011. The work described herein will investigate and remediate these two areas with elevated gamma readings.

PROJECT SCOPE

The Westside Drive SWDA, also known as SWDA A & B, is an approximately 4.5-acre area on the west side of IR Site 12 abutting Perimeter Road. Two radiological hot spots were identified in the Westside Drive SWDA during the 2011 CDPH survey of this area. The source of radioactivity is believed to be near-surface radiological commodities containing Ra-226 (deck markers, foils containing radium powder, instrument gauges) but may include limited pockets of soil contamination. Based on CDPH's report, there is one area of elevated activity north of the currently established Radiologically Controlled Area (RCA) (Northern Hot Spot) and four locations of elevated activity south of the RCA (Southern Hot Spot). This NTCRA focuses only on radiological contamination in the two radiological hot spots. The ongoing NTCRA activities in the center of SWDA A & B are currently being performed by another contractor under a separate contract.

Also included in this CTO is the demolition of Buildings 1121 and 1323, which are located within SWDA A & B near Westside Drive. The scope for building demolition will include asbestos abatement of these structures by a TtEC subcontractor; radiological surveys of the buildings to determine radiological impact (if any) using AEC Regulatory Guide 1.86 established

in the IR Site 12 NTCRA Work Plan (Shaw 2007) and as described in the DON-approved TSP and technical support from the DON's RASO; demolition of the structures; disposal of debris characterized below the radiological release limit for NAVSTA TI into a California landfill or appropriate out-of-state landfill; and transfer of debris above the radiological release limit to the DON's low-level radioactive waste (LLRW) contractor for disposal.

REMOVAL ACTION OBJECTIVES

Based on past site history and results from ongoing NTCRAs, the DON has determined that chemical contamination present in soil and debris at the four SWDAs at IR Site 12 requires a response action. This decision was documented in the AM (DON 2007) and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan requirements in Title 40 *Code of Federal Regulations*, Part 300.415(b)(2). The removal action objectives for remediation activities are to implement the AM Alternative 3 and protect public health and welfare and the environment by physically removing and disposing of contaminated soil and debris that exceed the criteria for the COPCs presented in Section 2.1.4 of the AM (DON 2007). This work is being performed by another contractor under a separate contract.

After the results of ongoing NTCRAs and the CDPH gamma survey report (CDPH 2011) identified radiological contamination in SWDA A & B, the DON initiated an NTCRA, which TtEC will conduct under this CTO. This NTCRA includes 1) performing hot spot removal in two areas until the release criterion of 1 picocurie per gram above background for Ra-226 is achieved and then performing an FSS for free release of these two hot spots; and 2) demolishing Buildings 1121 and 1323. Prior to demolition of Buildings 1121 and 1323, radiological surveys of the interiors and exteriors will be performed to determine whether radiologically contaminated soil has been tracked into the buildings or whether the wind has deposited radiologically contaminated soil onto the exterior surfaces. Any areas exceeding the surface release criteria of 20 disintegrations per minute (dpm)/100 square centimeters (cm^2) alpha or 200 dpm/100 cm^2 beta removable contamination, or 100 dpm/100 cm^2 alpha or 1,000 dpm/100 cm^2 beta fixed contamination will be remediated and transferred to the DON's LLRW contractor for disposal.

REGULATORY OVERSIGHT

Environmental investigation and remediation activities are being conducted at NAVSTA TI under the DoD IR Program in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act and the NCP. Under Executive Order 12580, the DON is the lead agency responsible for implementation of the IR Program and any removal actions. The California Department of Toxic Substances Control is the lead regulatory agency. The CDPH and the Regional Water Quality Control Board San Francisco Bay Region will provide additional state regulatory oversight.

This page intentionally left blank.

SAP Worksheets

Page

#1 – Title and Approval Page 1
#2 – SAP Identifying Information 13
#3 – Distribution List 17
#4 – Project Personnel Sign-Off Sheet 21
#5 – Project Organizational Chart 23
#6 – Communication Pathways 25
#7 – Personnel Responsibilities and Qualifications Table 29
#8 – Special Personnel Training Requirements Table 35
#9 – Project Scoping Session Participants Sheet 37
#10 – Problem Definition 39
#11 – Project Quality Objectives/Systematic Planning Process Statements 41
#12 – Measurement Performance Criteria Table for Soil Samples 47
#13 – Secondary Data Criteria and Limitations Table 49
#14 – Summary of Project Tasks 51
#15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples 57
#15.2 – Reference Limits and Evaluation Table for Water Samples 71
#16 – Project Schedule / Timeline Table 79
#17 – Sampling Design and Rationale 81
#18 – Sampling Locations and Methods/SOP Requirements Table 87
#19 – Analytical SOP Requirements Table 89
#20 – Field Quality Control Sample Summary Table 93
#21 – Project Sampling SOP References Table 95
#22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table 97
#23 – Analytical SOP References Table 99
#24 – Analytical Instrument Calibration Table 101
#25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table 107
#26 – Sample Handling System 111
#27 – Sample Custody Requirements Table 113
#28.1 – Laboratory QC Samples Table – Soil 117
#28.2 – Laboratory QC Samples Table – Water 127
#29 – Project Documents and Records Table 135
#30 – Analytical Services Table 143
#31 – Planned Project Assessments Table 147
#32 – Assessment Findings and Corrective Action Responses 149
#33 – QA Management Reports Table 151
#34 – Verification (Step I) Process Table 153
#35 – Validation (Steps IIa and IIb) Process Table 155
#36 – Analytical Data Validation (Steps IIa and IIb) Summary Table 157
#37 – Usability Assessment 159
References 161

FIGURES

Figure 1 Site Location Map

APPENDICES (on CD only)

Appendix A TtEC Standard Operating Procedures
Appendix B DoD QSM TestAmerica-St. Louis Limits
Appendix C Analytical Laboratory Standard Operating Procedures
Appendix D Example of Chain-of-Custody, Sample Label, and Custody Seal

Abbreviations and Acronyms

°C	degrees Celsius
%D	percent difference
%R	percent recovery
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
AA	atomic absorption
AES	atomic emission spectrometer
AM	Action Memorandum
Am-241	americium-241
ASCII	American Standard Code for Information Interchange
BHC	benzene hexachloride
Bi-214	bismuth-214
BRAC	Base Realignment and Closure
CA	corrective action
Cal/EPA	California Environmental Protection Agency
CAS	Chemical Abstracts Service
CCB	continuing calibration blank
CCV	continuing calibration verification
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm^2	square centimeter
Co-60	cobalt-60
COC	chain of custody
COPC	chemical of potential concern
Cs-137	cesium-137
CSO	Caretaker Site Office
CTO	Contract Task Order
CV	calibration verification
DCC	daily calibration check
DCN	Document Control Number
4,4′-DDD	4,4′-dichlorodiphenyldichloroethane
4,4′-DDE	4,4′-dichlorodiphenyldichloroethene
4,4′-DDT	4,4′-dichlorodiphenyltrichloroethane

Abbreviations and Acronyms
(Continued)

DL	detection limit
DoD	Department of Defense
DON	Department of the Navy
dpm	disintegrations per minute
DQA	data quality assessment
DQO	Data Quality Objective
DTSC	Department of Toxic Substances Control
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
EWI	Environmental Work Instruction
FCR	Field Change Request
FSS	Final Status Survey
FWHM	full width at half maximum
g	gram
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
HNO_3	nitric acid
HRA	Historical Radiological Assessment
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively coupled plasma
ICS	interference check sample
ICV	initial calibration verification
IR	Installation Restoration
keV	kiloelectron volt
L	liter
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LDC	Laboratory Data Consultants
LLRW	low-level radioactive waste
LNO_2	nitrolinoleic acid
LOD	limit of detection

Abbreviations and Acronyms
(Continued)

LOQ	limit of quantitation
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
MDL	method detection limit
mg/kg	milligrams per kilogram
mL	milliliter
mm	millimeter
MS	matrix spike
MSD	matrix spike duplicate
N_2	nitrogen gas
N/A	not applicable
NaI	sodium-iodide
NAVFAC SW	Naval Facilities Engineering Command Southwest
NAVSTA TI	Naval Station Treasure Island
NEDD	Navy Electronic Data Deliverable
NELAP	National Environmental Laboratory Accreditation Program
NIRIS	Naval Installation Restoration Information Solution
NIST	National Institute of Standards and Technology
NTCRA	non-time-critical removal action
OOS	out of service
OSHA	Occupational Safety and Health Administration
oz	ounce
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PDF	portable document format
PjM	Project Manager
PMO	Program Management Office
PQCM	Project Quality Control Manager
PT	proficiency testing
QA	quality assurance

Abbreviations and Acronyms
(Continued)

QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QCPM	Quality Control Program Manager
QL	quantitation limit
QSM	Quality Systems Manual
Ra-226	radium-226
RASO	Radiological Affairs Support Office
RCA	radiologically controlled area
RER	relative error ratio
RHB	Radiologic Health Branch
RL	reporting limit
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
RSL	Regional Screening Level
RSO	Radiation Safety Officer
RSOR	Radiation Safety Officer Representative
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SOP	Standard Operating Procedure
SVOC	semivolatile organic compound
SWDA	solid waste disposal area
TBD	to be determined
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
TSP	Task-specific Plan
TtEC	Tetra Tech EC, Inc.
UFP	Uniform Federal Policy
VOA	volatile organic analysis
VOC	volatile organic compound
VSP	Visual Sampling Plan

SAP Worksheet #2 – SAP Identifying Information

Site Name/Number: Non-Time-Critical Removal Action for Solid Waste Disposal Area (SWDA) – Radiological Hot Spot Removal and Building Demolition, Installation Restoration (IR) Site 12, Naval Air Station Treasure Island (NAVSTA TI)
Contractor Name: Tetra Tech EC, Inc. (TtEC)
Contract Number: N62473-10-D-0809
Contract Title: Radiological Environmental Multiple Award Contract

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005) and U.S. Environmental Protection Agency (EPA) Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS (EPA 2002).

2. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held.

Scoping Session	Date
None	

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Title	Date
None	

6. List organizational partners (stakeholders) and connection with lead organization: The California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC), California Department of Public Health (CDPH), Regional Water Quality Control Board San Francisco Bay Region, Radiological Affairs Support Office (RASO), and United States Fish and Wildlife Service (for sensitive species) will provide regulatory oversight and guidance.

7. Lead organization: the DON

8. If any required SAP elements or required information is not applicable to the project or is provided elsewhere, then note the omitted SAP elements and provide an explanation for its exclusion below:

    - SAP Worksheet #8 (Special Personnel Training Requirements Table) is not applicable for this project as there are no special training requirements.
    - SAP Worksheet #12 (Measurement Performance Criteria Table) is applicable to the collection of field QC samples such as the following: rinsate blank sample collection

SAP Worksheet #2 – SAP Identifying Information (Continued)

from nondisposable sampling equipment to ensure that decontamination procedures are sufficiently adequate so that cross-contamination between samples is not occurring; field duplicate sample collection to document variability of the matrix being sampled. Rinsate blanks and field duplicates are not applicable to radiological projects since 1) radiological contaminants are not mobile like chemical contaminants; therefore, rinsate blanks are not needed to verify adequacy of decontamination procedures; and 2) variability of matrices such as soil are not required to meet the project objectives.

- SAP Worksheet #13 (Secondary Data Criteria and Limitations Table) is not applicable for this project as secondary data evaluation is not required.

SAP elements and required information that are not applicable to the project are noted below. An explanation is provided above and in the appropriate SAP worksheet(s), as necessary.

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
Documentation		
1	Title and Approval Page	
2	Table of Contents SAP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
Project Organization		
5	Project Organizational Chart	
6	Communication Pathways	
7	Personnel Responsibilities and Qualifications Table	
8	Special Personnel Training Requirements Table	Not applicable
Project Planning/Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	
10	Problem Definition, Site History, and Background Site Maps (historical and present)	
11	Site-Specific Project Quality Objectives	
12	Measurement Performance Criteria Table for Samples	Not applicable
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	Not applicable
14	Summary of Project Tasks	
15	Reference Limits and Evaluation Table	
16	Project Schedule/Timeline Table	
B. Measurement Data Acquisition		

SAP Worksheet #2 – SAP Identifying Information (Continued)

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
Sampling Tasks		
17	Sampling Design and Rationale	
18	Sampling Locations and Methods/ SOP Requirements Table Sampling Location Map(s)	
19	Analytical Methods/SOP Requirements Table	
20	Field Quality Control Sample Summary Table	
21	Project Sampling SOP References Table	
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	
24	Analytical Instrument Calibration Table	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	
Data Management Tasks		
29	Project Documents and Records Table	
30	Analytical Services Table Analytical and Data Management SOPs	
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	
32	Assessment Findings and Corrective Action Responses Table	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

This page intentionally left blank

SAP Worksheet #3 – Distribution List

The following distribution list represents the recipients of the final version of this SAP.

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Mailing and E-mail Address
Mr. Dave Clark	Lead Remedial Project Manager (RPM)	Base Realignment and Closure (BRAC) Program Management Office (PMO)	(619) 532-0973	1455 Frazee Road, Suite 900 San Diego, CA 92108-4310 dave.j.clark2@navy.mil
Mr. Tony Konzen	RPM	BRAC PMO	(619) 532-0924	1455 Frazee Road, Suite 900 San Diego, CA 92108-4310 anthony.konzen.ctr@navy.mil
Mr. Zachary Edwards	Radiological Environmental Protection Manager	RASO	(757) 887-7762	NAVSEA DET RASO P.O. Drawer 260, Building 1971 NWS Yorktown, VA 23691-0260 zachary.edwards@navy.mil
Mr. Joseph Michalowski	Quality Assurance Officer (QAO)	Naval Facilities Engineering Command Southwest (NAVFAC SW)	(619) 532-4125	1220 Pacific Coast Highway San Diego, CA 92132 joseph.michalowski@navy.mil
Ms. Diane Silva	Administrative Record Manager	NAVFAC SW	(619) 556-1280	1220 Pacific Highway Code EV33, NBSD Bldg. 3519 San Diego, CA 92132 diane.silva@navy.mil
Mr. Doug DeLong	Caretakers Support Office (CSO)	BRAC PMO West CSO San Francisco Bay Area	(415) 743-4713	410 Palm Ave, Building 1, Ste.161 San Francisco, CA 94130-1806 douglas.delong@navy.mil
Ms. Remedios (Medi) Sunga	Lead RPM	Cal/EPA DTSC	(510) 540-3840	700 Heinz Ave., Bldg. F, Suite 200 Berkeley, CA 94710-2721 rsunga@dtsc.ca.gov
Ms. Myriam Zech	RPM	Regional Water Quality Control Board San Francisco Bay Region	(510) 622-5684	1515 Clay Street, Suite 1400 Oakland, CA 94612 mzech@waterboards.ca.gov
Mr. David Stensby	RPM	EPA	(415) 972-3246	75 Hawthorne Street, SFD-8-1 San Francisco, CA 94105-3901 stensby.david@epa.gov

SAP Worksheet #3 – Distribution List (Continued)

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Mailing and E-mail Address
Mr. Larry Morgan	Project Manager (PjM)	CDPH	(916) 449-5921	Environmental Management Branch 1616 Capital Avenue; MS 7402 P.O. Box 997413 Sacramento, CA 95899-7377 larry.morgan@cdph.ca.gov
Mr. Gene Forrer	Health Physicist	CDPH	(510) 620-3744	Radiologic Health Branch 850 Marina Way Pkwy, Bldg P, 1st Floor Richmond, CA 94804-6403 eugene.forrer@cdph.ca.gov
Mr. Gary Munekawa	Resident Officer in Charge of Construction (ROICC)	NAVFAC SW	(650) 603-9834	NAVFAC SW P.O. Box 68, Building 107 Moffett Field, CA 94035 gary.munekawa@navy.mil
Mr. David Smith	ROICC	NAVFAC SW	(650) 603-9836	NAVFAC SW P.O. Box 68, Building 107 Moffett Field, CA 94035 david.r.smith2@navy.mil
Mr. Bill Dougherty	Project Manager (PjM)	TtEC	(415) 216-2731	200 Fisher Avenue San Francisco, CA 94124 bill.dougherty@tetratech.com
Mr. Erik Abkemeier	Radiation Safety Officer (RSO)	TtEC	(757) 466-4906	Twin Oaks, Suite 309 5700 Lake Wright Drive Norfolk, VA 23502 erik.abkemeier@tetratech.com
Mr. Adam Berry	Radiation Safety Officer Representative (RSOR)	TtEC	(713) 410-7928	200 Fisher Avenue San Francisco, CA 94124 adam.berry@tetratech.com

SAP Worksheet #3 – Distribution List (Continued)

Mr. Greg Joyce	Quality Control Program Manager (QCPM)	TtEC	(360) 780-0371	1230 Columbia St., Suite 750 San Diego, CA 92101 greg.joyce@tetratech.com
Mr. Richard Kanaya	Project Quality Control Manager (PQCM)	TtEC	(415) 216-2759	200 Fisher Avenue San Francisco, CA 94124 rich.kanaya@tetratech.com
Ms. Lisa Bienkowski	Program Chemist	TtEC	(949) 809-5028	17885 Von Karman Ave., Suite 500 Irvine, CA 92614 lisa.bienkowski@tetratech.com
Ms. Sabina Sudoko	Project Chemist	TtEC	(949) 809-5022	17885 Von Karman Ave., Suite 500 Irvine, CA 92614 sabina.sudoko@tetratech.com
Mr. Richard Weingarz	Laboratory Coordinator	TtEC	(415) 216-2733	200 Fisher Avenue San Francisco, CA 94124 richard.weingarz@tetratech.com
Mr. Phil Smith	Laboratory Supervisor	Curtis and Tompkins	(415) 216-2768	201A & 201B Fisher Avenue San Francisco, CA 94124 phil.smith@ctberk.com
Ms. Erika Starman	Laboratory Project Manager	TestAmerica-St. Louis	(314) 298-8566	13715 Rider Trail North Earth City, MO 63045 erika.starman@testamericainc.com
Ms. Linda Rauto	Data Validator Project Manager	Laboratory Data Consultants (LDC)	(760) 634-0437	7750 El Camino Real, Suite 2L Carlsbad, CA 92009 lrauto@lab-data.com

This page intentionally left blank.

SAP Worksheet #4 – Project Personnel Sign-Off Sheet

The key personnel listed below will read the final version of this SAP. Their signature and date will be filled in below and included in the project file.

Name	Organization/Title/Role	Signature/E-mail Receipt	SAP Section Reviewed	Date SAP Read
Mr. Bill Dougherty	TtEC/PjM		Entire document	
Mr. Adam Berry	TtEC/RSOR		Entire document	
Mr. Richard Kanaya	TtEC/PQCM		Entire document	
Ms. Sabina Sudoko	TtEC/Project Chemist		Entire document	
Mr. Richard Weingarz	TtEC/Laboratory Coordinator		Entire document	
Mr. Phil Smith	Curtis and Tompkins/Laboratory Supervisor		Entire document	
Ms. Erika Starman	TestAmerica-St. Louis / Laboratory Project Manager		Entire document	
Ms. Linda Rauto	LDC/Data Validator Project Manager		Entire document	
TBD [a]	TtEC/Field Crews		Entire document	

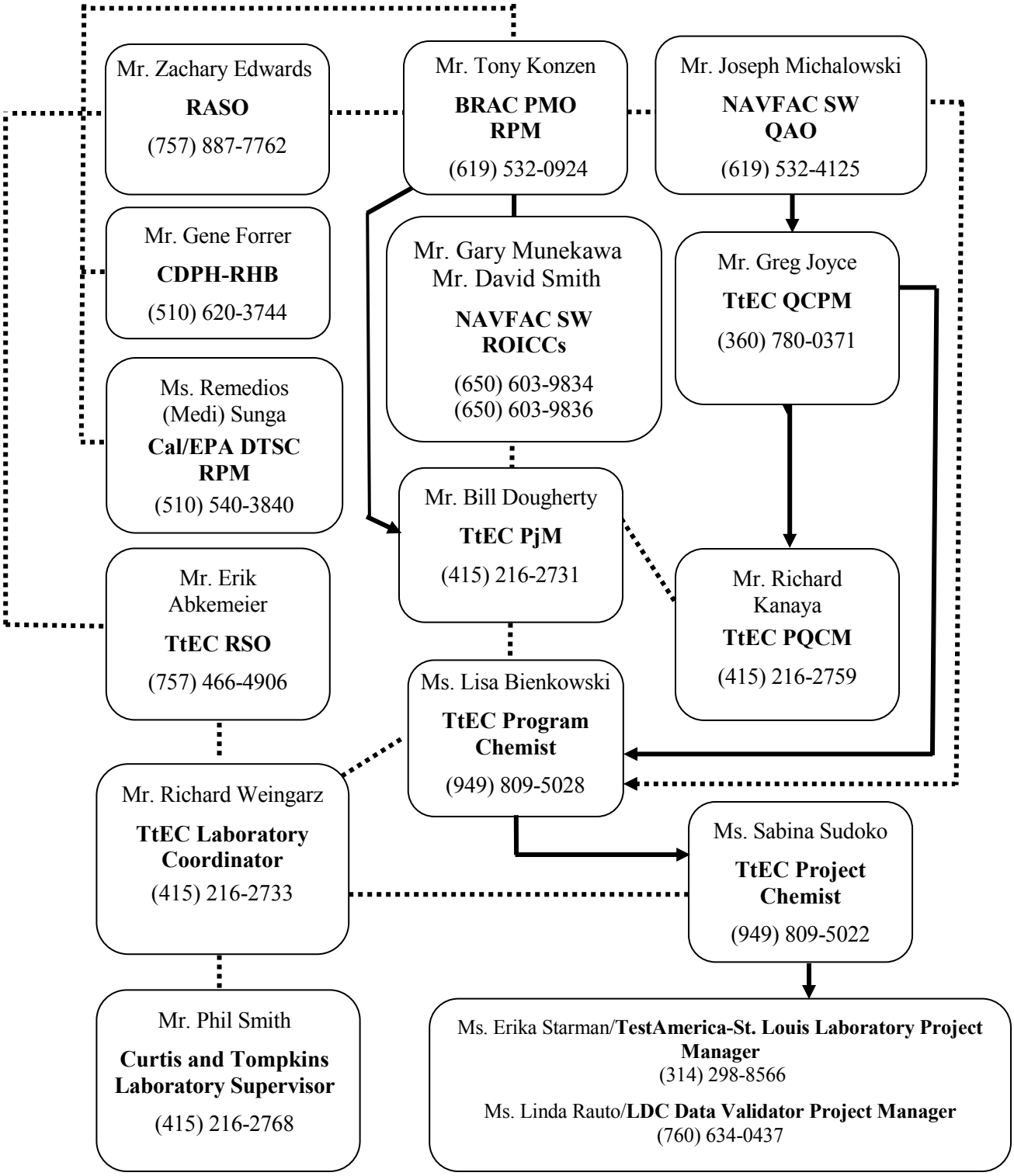
Notes:

[a] Field crews include multiple persons and vary from project to project. Therefore, persons identified by the PQCM will read the SAP and sign this worksheet as required.

This page intentionally left blank.

SAP Worksheet #5 – Project Organizational Chart

Lines of Authority ——— Lines of Communication



This page intentionally left blank.

SAP Worksheet #6 – Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Point of contact for DON quality issues	NAVFAC SW QAO	Mr. Joseph Michalowski	(619) 532-4125	SAP and its addendum (if applicable) will be approved by the QAO prior to start of sampling. If during sampling, a major change in sampling procedures or strategy is required, the QAO will be notified via e-mail and give concurrence to issue a field change request or SAP addendum. In addition, the QAO has the authority to suspend project execution if quality assurance requirements are not adequately followed.
Point of contact for contractor quality issues	TtEC QCPM	Mr. Greg Joyce	(360) 780-0371	The QCPM is responsible for overseeing program quality control (QC), including construction and analytical data acquisition. The QCPM has the authority to suspend project activities if quality standards are not maintained.
Project management	TtEC PjM	Mr. Bill Dougherty	(415) 216-2731	If changes are necessary, the PjM is responsible for communicating the changes via phone and/or e-mail to the project staff and is authorized to stop work, if necessary.
SAP review and radiological concurrence	RASO	Mr. Zachary Edwards	(757) 887-7762	The RASO will review and concur with the SAP as related to the radiological aspects of NAVSTA TI.
SAP review	TtEC Program Chemist TtEC QCPM	Ms. Lisa Bienkowski Mr. Greg Joyce	(949) 809-5028 (360) 780-0371	The SAP will be written by the Program Chemist and reviewed by the QCPM prior to submittal to the NAVFAC SW QAO for review.
Notification of nonusable analytical results	TtEC Program Chemist	Ms. Lisa Bienkowski	(949) 809-5028	If significant problems are identified by the laboratories or the project team that impact the usability of the analytical results (i.e., the result is rejected or data quality objectives are not met), the Program Chemist will notify the NAVFAC SW RPM and QAO within 24 hours.

SAP Worksheet #6 – Communication Pathways (Continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Coordination of laboratory supplies for field sampling activities	TtEC Project Chemist or TtEC Laboratory Coordinator	Ms. Sabina Sudoko Mr. Richard Weingarz	(949) 809-5022 (415) 216-2733	The Project Chemist will contact TestAmerica-St. Louis to provide any 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. The Laboratory Coordinator will ensure that Curtis and Tompkins provides necessary sample containers for analyses that they will perform.
Submittal of samples to the laboratories	TtEC Laboratory Coordinator	Mr. Richard Weingarz	(415) 216-2733	The samplers will either transfer samples to Curtis and Tompkins or ship samples to TestAmerica-St. Louis at the end of each day. These activities will be overseen by the Laboratory Coordinator. For any samples shipped to TestAmerica-St. Louis, the Laboratory Coordinator will inform the Project Chemist.
Reporting laboratory data quality issues or analytical corrective actions	Curtis and Tompkins Laboratory Supervisor TestAmerica-St. Louis Laboratory Project Manager	Mr. Phil Smith Ms. Erika Starman	(415) 216-2768 (314) 298-8566	All Curtis and Tompkins data quality issues will be reported in writing by the Laboratory Supervisor to the RSO and Program Chemist within 24 hours. All TestAmerica-St. Louis data quality issues will be reported in writing by the Laboratory Project Manager to the Project Chemist and Program Chemist within 24 hours. Any corrective actions will be documented and verified by the Program Chemist who will notify in writing the QCPM, RSO, and PjM. The PjM will notify the BRAC PMO RPM and RASO.
Field corrective actions	TtEC PQCM	Mr. Richard Kanaya	(415) 216-2759	All field corrective actions will be documented in writing by the PQCM who will notify in writing the QCPM, RSO, and PjM. The PjM will notify the BRAC PMO RPM and RASO.

SAP Worksheet #6 – Communication Pathways (Continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Release of Curtis and Tompkins analytical results	TtEC RSO	Mr. Erik Abkemeier	(757) 466-4906	The RSO (or designee) will review Curtis and Tompkins analytical results to verify that the requirements in this SAP have been met prior to releasing the data to the project team for evaluation.
Release of TestAmerica-St. Louis analytical results	TtEC Project Chemist	Ms. Sabina Sudoko	(949) 809-5022	The Project Chemist will review TestAmerica-St. Louis analytical results to verify that the requirements in this SAP have been met prior to releasing the data to the project team for evaluation.
Review of radiological data and concurrence on radiological actions	RASO	Mr. Zachary Edwards	(757) 887-7762	The RASO will review all appropriate radiological data provided by the RSO (or designee) and will provide concurrence with actions proposed.
SAP procedure revision during field activities	TtEC Program Chemist	Ms. Lisa Bienkowski	(949) 809-5028	The Program Chemist (or designee) will prepare a Field Change Request (FCR) for any minor changes in sampling procedures that occur due to conditions in the field.
SAP addendums	TtEC Program Chemist	Ms. Lisa Bienkowski	(949) 809-5028	Significant changes to the SAP such as additional scope of work that is not covered in this SAP will require that the Program Chemist prepare a SAP addendum, which will be reviewed and approved by the NAVFAC SW QAO prior to initiating the affected field activities.

This page intentionally left blank.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Joseph Michalowski	QAO	NAVFAC SW	• Reviewing and approving this SAP • Providing DON oversight of TtEC's Quality Assurance (QA) Program • Providing technical and administrative oversight of TtEC's surveillance audit activities • Acting as point of contact for matters concerning QA and the Department of Defense's (DoD) Laboratory QA Program • Coordinating training on matters pertaining to generation and maintenance of quality of data • Authorizing the suspension of project execution if QA requirements are not adequately followed
Mr. Greg Joyce	QCPM	TtEC	• Establishing and maintaining the Quality Program • Overseeing program QC, including construction and analytical data acquisition • Working directly with the PjM and the DON to ensure implementation of the program QC Plans • 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 NAVFAC SW QAO, on quality-related items • Conducting field QC audits to ensure project plans are being followed • Performing reviews of audit and surveillance reports conducted by others • Implementing the DON technical direction letters related to quality topics • Approving any FCRs and reviewing addendums to the SAP
Mr. Tony Konzen	RPM	BRAC PMO	• 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
Mr. Bill Dougherty	PjM	TtEC	• Coordinating work activities of subcontractors and TtEC personnel, and ensuring that

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
			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 RPM of any changes that may require administrative 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-Specific Safety and Health Plan, United States Army Corps of Engineers' Safety and Health Requirements (Engineer Manual 385-1-1), 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 including appropriate TtEC technical personnel in the decision-making • Coordinating satisfactory resolution and completion of evaluation and acceptance report for nonconformance reports • Suspending project activities if standards are not maintained

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Zachary Edwards	Radiological Environmental Protection Manager	RASO	• Reviewing radiological laboratory data on a routine basis • Reviewing and approving all radiological management plans and final reports • Providing review and concurrence on data for proposed radiological actions • Ensuring that all necessary sample results are provided and are consistent with proposed radiological actions • Comparing radiological data with the requirements of the NTCRA Work Plan, Task-specific Plans, and SAP to ensure that all proper conditions have been met to implement the action requested
Mr. Erik Abkemeier	RSO	TtEC	• Overseeing overall radiological operations and documentation for the project • Supporting projects as the technical lead for radiological data collection and analysis • Ensuring that RSOR and field sampling personnel have adequate training in radiological sample collection • Receiving and reviewing radiological data from the laboratories to ensure the data quality objectives have been met • Reviewing and evaluating scan survey data and requiring additional scan data, as necessary The RSO (or designee) will also perform the following: • Concurring on the identification of elevated areas for collection of biased samples and the locations of systematic samples including plotting of those samples on maps • Overseeing the preparation of a remediation plan and the performance of remediation activities (including evaluating biased sampling data) when sampling activities indicate the presence of radioactive materials at levels above the release criteria • Recommending radiological activities to the RASO for concurrence including additional sampling, backfilling of trenches, identification of material that can be used as backfill, etc. • Identifying samples to be forwarded to TestAmerica-St. Louis laboratory for additional radiological testing not performed by Curtis and Tompkins

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Adam Berry	RSOR	TtEC	• Supervising day-to-day radiological operations • Ensure site activities are in compliance with State of California Agreement State Radioactive Materials License No. 7909-01. • Overseeing performance of radiological static surveys
Ms. Lisa Bienkowski	Program Chemist	TtEC	• Developing the SAP and any addendums to the SAP • Implementing contract requirements for data collection • Supporting projects as the technical lead for data collection and analysis • Evaluating and selecting qualified laboratories and third-party data validation subcontractor • Providing oversight of the laboratories with regards to deliverable requirements for samples representing definitive data • Monitoring performance of the laboratories and data validator • Overseeing preparation of the Navy Electronic Data Deliverable (NEDD) deliverable to the Naval Installation Restoration Information Solution (NIRIS) website of the analytical results • Coordinating submittal of hard-copy analytical data packages with DON Administrative Record
Mr. Richard Weingarz	Laboratory Coordinator	TtEC	• Overseeing submittal of samples to Curtis and Tompkins or TestAmerica-St. Louis laboratories. • Prioritizing sample analyses, as necessary • Coordinating shipment of samples to TestAmerica-St. Louis for analysis with the Project Chemist

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Ms. Sabina Sudoko	Project Chemist	TtEC	• Tracking samples sent to TestAmerica-St. Louis to ensure laboratory receipt of samples and proper login of samples for analysis • Tracking receipt of analytical results from TestAmerica-St. Louis • Reviewing TestAmerica-St. Louis analytical results against requirements in this SAP prior to distribution to the project team • Coordinating with Laboratory Coordinator regarding deliverables for Curtis and Tompkins results that represent definitive data • Coordinating third-party data validation of all definitive laboratory data • Reviewing data validation reports • Coordinating upload of electronic data to database
Mr. Phil Smith	Laboratory Supervisor	Curtis and Tompkins	• Providing day-to-day technical and administrative oversight of the laboratory including sample login, preparation, and analysis • Performing periodic source checks, background checks and detector calibrations. • Reviewing sample analytical results prior to release to project team to ensure the SAP requirements are met • Ensuring that reporting requirements are in conjunction with SAP Worksheets #15.1, 28.1, and 29

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Ms. Erika Starman	Laboratory Project Manager	TestAmerica-St. Louis	• Coordinating with the Project Chemist regarding sample receipt and discrepancies • Ensuring samples are logged in according to the chain of custody (COC) • Checking that analytical results are produced in accordance with this SAP and providing those results to the Project Chemist at the expected turnaround time • Ensuring that analytical data packages and electronic deliverable requirements are in accordance with SAP Worksheet #29
Ms. Linda Rauto	Data Validator Project Manager	LDC	• Coordinating with Project Chemist regarding data validation requirements in accordance with this SAP • Providing data validation reports and electronic deliverables to the Project Chemist in accordance with this SAP

SAP Worksheet #8 – Special Personnel Training Requirements Table

Special personnel training is not required for this project.

This page intentionally left blank.

SAP Worksheet #9 – Project Scoping Session Participants Sheet

The kickoff meeting with the DON has not occurred as of the publishing of this SAP.

This page intentionally left blank.

SAP Worksheet #10 – Problem Definition

The main problem defined for this project is: Based on the site's operational history and site-specific investigative data, the DON has determined that radiological contamination present in soil at two hot spots within SWDA A & B at IR Site 12 at NAVSTA TI requires a response action. Additionally, although there is no evidence that Buildings 1121 and 1323 were radiologically contaminated, they are located within a Class 1 survey unit in IR Site 12. The buildings may have been radiologically contaminated by track-in of radiologically contaminated soil by former residents and by windblown soils that might have resulted in the deposition of removable contamination on the exterior surfaces. Therefore, the DON has initiated remedial actions for the removal and disposal of radiologically contaminated materials at the two hot spots and the radiological clearing and demolition of Buildings 1121 and 1323 to protect the public health and welfare and the environment from actual or potential releases of radiological contamination. These removal actions will substantially eliminate the potential threat posed by future migration and/or off-site releases of radiologically contaminated material potentially present at these two hot spots and Buildings 1121 and 1323 into the surrounding environment.

Chemical contamination, also present at SWDA A & B within IR Site 12, is being addressed by another contractor through the IR Program process, consistent with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan. The chemicals of potential concern (COPCs) for soil at IR Site 12 are polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dioxins, and lead. Therefore, any chemical analyses discussed in the SAP from this point forward are applicable only to the following: 1) waste characterization of excavated soil or debris prior to disposal; 2) characterization of import backfill material prior to use; or 3) waste characterization of decontamination water generated during field activities prior to disposal.

BACKGROUND

NAVSTA TI is located in San Francisco Bay, midway between San Francisco and Oakland, California. The former naval station consists of two contiguous islands: Treasure Island, which is approximately 403 acres, and Yerba Buena Island, which is approximately 147 acres. Treasure Island is a manmade island constructed of materials dredged from the bay. Military activities at the former NAVSTA TI date back to 1866, before the construction of Treasure Island, when the U.S. government took possession of Yerba Buena Island for defensive fortifications. In 1993, NAVSTA TI was designated for closure under the Base Closure and Realignment Act of 1990. The naval station was closed on September 30, 1997, and is currently in the transfer process.

IR Site 12 is located on the northwest portion of NAVSTA TI on a relatively flat 93-acre area. The site consists of multiplex housing units with private backyards and common area front yards, side yards, and surrounding greenbelts. The area was originally used as a parking lot during the 1939–1940 Golden Gate International Exposition. After Navy occupation of the island in 1940, the area was developed for bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields, and disposal or burning of solid waste. Beginning in the1960s, areas of IR Site 12 were incrementally developed into housing for Navy personnel and

SAP Worksheet #10 – Problem Definition (Continued)

their dependents. Former residential Buildings 1121 and 1323 are located within IR Site 12 near Westside Drive.

An NTCRA was implemented in May 2006 to remediate chemicals in soil associated with chemical/fuel storage and disposal or burning of solid waste in four SWDAs (SWDA A & B, SWDA 1231/1233, SWDA 1207/1209, and SWDA Bigelow Court) located within IR Site 12. A Historical Radiological Assessment (HRA) (Weston 2006) identified the radiological contamination potential for the SWDAs as "unlikely" and recommended radiation monitoring during excavation of identified SWDAs. During the initial stages of this NTCRA, a radiation survey and sample analysis identified radium-226 (Ra-226)-impacted debris and soil in some of the SWDAs. Subsequently, an Action Memorandum (DON 2007) summarizing the site characteristics identified the chemicals of potential concern (COPCs) and the horizontal extent of the SWDAs. Generally, the radiological contamination in IR Site 12 SWDAs is colocated with chemical contaminants. The NTCRAs at IR Site 12 determined that some of the SWDAs were contaminated with radiological items or soil containing Ra-226. Elevated gamma readings were also detected along the northern and southern fence lines (two areas) of SWDA A & B by the CDPH RHB during a gamma survey conducted in April 2011. The work described herein will investigate and remediate these two areas with elevated gamma readings.

SCOPE

The Westside Drive SWDA, also known as SWDA A & B, is an approximately 4.5-acre area on the west side of IR Site 12 abutting Perimeter Road. Two radiological hot spots were identified in the Westside Drive SWDA during the 2011 CDPH survey of this area. The source of radioactivity is believed to be near-surface radiological commodities containing Ra-226 (deck markers, foils containing radium powder, instrument gauges) but may include limited pockets of soil contamination. Based on CDPH's report, there is one area of elevated activity north of the currently established Radiologically Controlled Area (RCA) (Northern Hot Spot) and four locations of elevated activity south of the RCA (Southern Hot Spot). This NTCRA focuses only on radiological contamination in the two radiological hot spots. The ongoing NTCRA activities in the center of SWDA A & B are currently being performed by another contractor under a separate contract.

Also included in this CTO is the demolition of Buildings 1121 and 1323, which are located within SWDA A & B near Westside Drive. The scope for building demolition will include asbestos abatement of these structures by a TtEC subcontractor; radiological surveys of the buildings to determine radiological impact (if any) using the Atomic Energy Commission Regulatory Guide 1.86 established in the IR Site 12 NTCRA Work Plan (Shaw 2007) and as described in the DON-approved Task-specific Plan (TSP) and technical support from the RASO; demolition of the structures; disposal of debris characterized to be below the radiological release limit for NAVSTA TI into a California landfill or appropriate out-of-state landfill; and transfer of debris above the radiological release limit to the DON's low-level radioactive waste (LLRW) contractor for disposal.

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

The Data Quality Objectives (DQOs) specify project objectives, data collection boundaries and limitations, the most appropriate type of data to collect, and the level of acceptable decision error. The quality and quantity of data required to implement environmental removal actions are also defined.

The DQOs, as defined through the seven-step process (EPA 2006b), address Buildings 1121 and 1323 as well as the hot spot removals. The DQOs for each are as follows:

1. State the problem

Based on the site's operational history and site-specific investigative data, the DON has determined that radiological contamination present in soil at two hot spots within SWDA A & B at IR Site 12 at NAVSTA TI requires a response action. Additionally, although there is no evidence that Buildings 1121 and 1323 were radiologically contaminated, they are located within a Class 1 survey unit in IR Site 12. They may have been radiologically contaminated by track-in of radiologically contaminated soil by former residents and by windblown soils that might have resulted in the deposition of removable contamination on the exterior surfaces. Therefore, the DON has initiated remedial actions for the removal and disposal of radiologically contaminated materials at the two hot spots and the radiological clearing and demolition of Buildings 1121 and 1323 to protect the public health and welfare and the environment from actual or potential releases of radiological contamination. These removal actions will substantially eliminate the potential threat posed by future migration and/or off-site releases of radiologically contaminated material potentially present at these two hot spots and Buildings 1121 and 1323 into the surrounding environment.

2. Identify the goal of the study

a) Buildings 1121 and 1323 – TtEC will develop TSPs for Buildings 1121 and 1323 that identify the type of survey required and potential remedial actions necessary to ensure that residual radioactivity is below the media-specific release criteria.

   1. For a scoping survey, the decision is, "Does the survey information defined in the TSP identify the Ra-226 and assess general levels and extent of contamination?"
   2. For a characterization survey, the decision is, "Does the survey information defined in the TSP identify the nature and extent of the contamination that may lead to remediation?"
   3. For a remedial action support survey, the decision is, "Does the remedial action support survey indicate that the remediation is complete as defined in the TSP?"
   4. For an FSS, the decision is, "Does the survey performed provide sufficient data to develop an FSS that demonstrates compliance with the release criteria?"

b) Hot Spot Removals – CDPH's April 2011 survey identified two radiological hot spots outside the currently established RCA in IR Site 12. One area of elevated activity is north of the RCA (Northern Hot Spot), and four locations of elevated activity are south of the RCA (Southern Hot Spot). The source of radioactivity is believed to be near-surface radiological

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

commodities containing Ra-226 (deck markers, foils containing radium powder, instrument gauges) but may include limited pockets of soil contamination.

Following removal of these elevated locations, any residual radioactivity in the excavations will be identified and removed, and the excavated soil will be characterized for subsequent transportation and disposal.

1. Is radioactivity detected above 3 sigma of the mean background area level in the soil during gamma scans of the survey unit excavation areas or radiological screening pads?
2. Are any of the soil sample results above the release criterion of 1 picocurie per gram (pCi/g) above background for Ra-226 for the survey unit excavation areas or the excavated material on the screening pads?

3. Identify information inputs

a) Buildings 1121 and 1323 – Inputs for the survey of the buildings will vary depending on the information provided in the HRA (Weston 2006) and specific survey requirements detailed in the TSPs. Typically, the following data will be collected:

1. Identification of a representative reference background area
2. Gamma scan survey readings
3. Alpha/beta scan survey readings
4. Systematic and biased static alpha, beta, and gamma static measurements
5. Systematic and biased solid or swipe measurements
6. Systematic and biased exposure rate measurements

In addition:

For a scoping survey, additional inputs to the decision are the information in the HRAs and the radiological survey data collected during the implementation phase.

For a characterization survey, additional inputs are again the information in the HRAs and the radiological survey data collected during the implementation phase.

For a remedial action support survey, additional inputs are the results of prior surveys and the specific remediation plans.

For an FSS, additional inputs are the radiological survey results and the release criteria.

b) Hot Spot Removals – The following information will be collected:

1. 100 percent gamma scan surveys of accessible excavation surfaces and screening pad excavated soil
2. Biased and characterization soil sampling results

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

3. Postremediation sample analytical results from excavation
4. Systematic FSS sampling results
5. Chemical analytical results for non-LLRW excavated soils
6. Statistical analysis to determine sampling sufficiency of collected data
7. Wastewater classification sampling results

4. Define the boundaries of the study

Field activities will not be affected by seasonal (rainy) variations and/or breeding times of on-site animals and species.

a) Buildings 1121 and 1323 – Study boundaries for the buildings will depend on the particular class of survey performed and will be presented, on a case-by-case basis, in each TSP. The maximum surface area for a Class 1 survey unit is 100 square meters. The maximum surface area for a Class 2 survey unit is 1,000 square meters.

b) Hot Spot Removals – Spatial boundaries for hot spot excavation FSSs will be determined by the area that is excavated during the hot spot removal activities. The boundary area will extend, at a minimum, 2 feet beyond any excavated area and is limited to a maximum surface area of 1,000 square meters. The final excavated boundary of each excavation survey unit is calculated after the laboratory analytical results indicate that the excavation has met the release criterion of 1 pCi/g above background for Ra-226 for soils and no further excavation activities are anticipated. The excavated soil is transported to a soil screening pad, which is also limited to a maximum surface area of 1,000 square meters.

5. Develop the analytic approach

a) Buildings 1121 and 1323

1. For a scoping survey, the decision rule is, "If the survey results identify the Ra-226 and assess general levels and extent of contamination as defined in the TSP, then design and perform an optimized characterization survey. Otherwise, prepare an FSS report."
2. For a characterization survey, the decision rule is, "If the survey results identify the nature and extent of the contamination that may lead to remediation as defined in the TSP, then design and perform an optimized remedial action survey. Otherwise, prepare an FSS report."
3. For a remedial action support survey, the decision rule is, "If the survey results indicate that the remediation is complete as defined in the TSP, then design and perform an optimized FSS. Otherwise, reevaluate the remedial alternative and continue remediation, as necessary."

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

4. For an FSS, the decision rule is, "If the survey results provide sufficient data to develop an FSS that demonstrates compliance with the release criteria, then document the results in the FSS report. Otherwise, evaluate whether additional assessment and/or remediation are necessary."

b) Hot Spot Removals – The iterative process for radiologically clearing hot spot excavations and excavated soils involves using a combination of field instrument survey data and the analytical results from the laboratory to confirm that a survey unit meets the release criterion of 1 pCi/g above background for Ra-226.

1. If radioactivity is detected above 3 sigma of the mean background area level in the soil during gamma scans of the survey unit excavation areas or screening pads, then one biased sample will be collected at each area exceeding 3 sigma of the background area and analyzed for Ra-226. Otherwise, FSS systematic sampling will commence for the excavation areas and a minimum of two biased samples (from the two highest scan readings on the pad) will be collected and analyzed for Ra-226.
2. If any of the soil sample results are above the release criterion of 1 pCi/g above background for Ra-226 for the survey unit excavation areas or the excavated material on the screening pads, then excavation of the area and additional surveys and sampling will continue as necessary or until otherwise directed by the DON and RASO. Otherwise, no further action will be required.

6. Specify performance or acceptance criteria

In evaluating the results (unless otherwise indicated in the TSP for the buildings), Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (DoD et al. 2000) Scenario A will be applied. In Scenario A, the null hypothesis (H_o) is tested to verify whether residual contamination exceeds the release criterion; also, the alternative hypothesis (H_a) is tested to determine whether the residual contamination meets the release criterion. A 95 percent confidence level for detecting radioactivity above the release criteria will be assumed with Type I and II errors limited to 5 percent, except when double sampling is used. Then the Type I error rate will be set to a maximum of 2.5 percent.

For both the buildings and the hot spot removals, actions to minimize decision errors will be instituted during the data collection phase of the radiological survey. Qualified radiation survey personnel will perform the surveys and record the data. Automated recording of survey data will be used where possible to minimize errors. Data transcribing is the second phase where errors may arise. To avoid data errors for manual surveys, experienced personnel will record and transcribe data.

The ongoing evaluation of survey results from gamma scans and analytical results will provide a final check for errors which, if detected, can be corrected. The Radiation Safety Officer (RSO) (or designee), who is not involved in the direct data collection process, will review and evaluate

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

the survey data. This ongoing review and evaluation will ensure an independent review for consistency of all survey data collected.

Field crews will review this SAP prior to collection of samples and sign off on SAP Worksheet #4. Sampling and analytical performance or acceptance criteria are specified in SAP Worksheets #12, 15, and 28. Third-party data validation will be performed on samples as described in SAP Worksheets #29 and 36.

7. Develop the plan for obtaining data

For both the buildings and the hot spot removals, radioactive source readings will be used to check instruments for consistency prior to use in each daily shift. The instrument will be used only after readings are compared and agree within +/- 20 percent of predetermined responses. The Radiation Safety Officer Representative (RSOR) will review the information each day to verify that equipment is operating satisfactorily. MARSSIM (DoD et al. 2000) guidelines will then be used to conduct surveys and determine the appropriate number of samples to be collected in each survey unit. The data collecting design alternatives may change slightly if assumptions are reviewed based on conditions in the field being different than the furnished information derived from historical research and current knowledge. Sampling design and rationale are detailed in SAP Worksheet #17.

The following types of analytical data will be generated during this project:

- **Swipe sample data:** Swipe samples will be collected from the building surfaces as described in the TSP and analyzed for gross alpha and gross beta to determine the amount of removable contamination. Swipe sample data will be used along with radiological survey data of these surfaces to determine whether remediation is required and/or final disposition of the material.
- **Radiological screening data:** To confirm that soil left in place is below release criteria, samples will be collected from the excavated soil from remediation activities and soil remaining after remediation activities are performed. When these types of samples are analyzed by gamma spectroscopy, the data will be considered screening data because: 1) the samples will be analyzed using the 186.2 kiloelectron-volt (keV) Ra-226 gamma energy peak, which is difficult to definitively separate from the Uranium-235 185.7 keV gamma energy peak but is used for expedited analysis; 2) it will be used to make decisions on further remediation or not; and 3) Curtis and Tompkins will only produce EPA Level II-equivalent data packages for this type of sample analysis such that the data will not undergo third-party data validation.
- **Radiological definitive data:** Once the soil screening data represent sample results that are below the release criteria, definitive sample results (i.e., results that are legally defensible as well as suitable for final decision-making) will be produced either by: 1) reanalyzing the samples by gamma spectroscopy after an in-growth period (so Ra-226 daughter products can approach secular equilibrium) by using the 609 keV bismuth-214

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

(Bi-214) gamma energy peak to quantify Ra-226 results; or 2) recalculating the screening data using a Bi-214 in-growth correction factor. Once the reanalyzed or recalculated results are below the release criteria, those results will be considered definitive data such that: 1) the data represent a final decision that the material is not contaminated and no further remediation is required; 2) Curtis and Tompkins will produce an EPA Level III- or IV-equivalent data package that will undergo third-party data validation.

- **Chemical soil or water data:** Chemical analyses for this project will be performed only for: 1) import material to determine use as backfill or 2) waste characterization purposes. All chemical analyses performed by TestAmerica-St. Louis will be considered definitive data such that: 1) final decisions will be made on the final disposition of the material; 2) TestAmerica-St. Louis will produce EPA Level III-equivalent data packages; 3) third-party data validation will be performed on chemical analyses that represent material that will be reused or used on-site as backfill material.

SAP Worksheet #12 – Measurement Performance Criteria Table for Samples

Field quality control (QC) samples are not required for this project because samples will be collected using disposable equipment (and thus blank samples are not required) and variability associated with field duplicate samples is not required to meet the project objectives. Therefore, measurement performance criteria for field QC sample collection are not applicable.

This page intentionally left blank.

SAP Worksheet #13 – Secondary Data Criteria and Limitations Table

For this project, secondary data are not applicable.

This page intentionally left blank.

SAP Worksheet #14 – Summary of Project Tasks

PROJECT TASKS

Tasks applicable to radiological activities performed by TtEC for this project at NAVSTA TI will include the following:

- Preparation of project-specific plans
- Preparatory activities and meetings
- Preconstruction environmental surveying (Environmental Conditions Report)
- Site survey (prior to start of fieldwork) by licensed California land surveyor
- Clearing of vegetation and/or pavement
- Conduct of geophysical surveys as required
- Excavation of radiologically contaminated soils and associated material
- Operation of a soil screening pad
- Stormwater, sediment, and erosion control
- Asbestos abatement
- Radiological surveys and sampling
- Material and equipment surveys
- Conduct of FSSs of buildings, hot spot excavations, and excavated soils
- Backfill placement and compaction
- Building demolition
- Transport and disposal of non-LLRW
- Site restoration
- Survey and decontamination of equipment
- Site survey (upon completion of fieldwork) by licensed California land surveyor
- Waste classification and storage
- Preparation of closure reports

Sampling design and rationale are detailed in SAP Worksheet #17. Sample collection and data management procedures are described in this worksheet (Worksheet #14).

SAMPLE COLLECTION PROCEDURES

The following sections provide the sampling procedures for collection of samples associated with remediation activities for this project. All samples will be labeled, documented, and packaged according to procedures in SAP Worksheets #27 and 29.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

Radiological Surveys

Surveys will be conducted in accordance with Standard Operating Procedures (SOPs) discussed in SAP Worksheet #21 and included in Appendix A. The SOPs include procedures for screening swipe samples using a Protean WPC 1050 gas-flow proportional gross alpha and beta radiation counter (or equivalent), which features a low-background counting chamber. (A microprocessor allows for data processing, and the unit provides a full range of simultaneous gross alpha and beta analysis at levels required for environmental release surveillance.) If the Protean is inoperable or unavailable for use, swipe samples may also be screened using a Ludlum 2929 or 3030 scaler with a Ludlum 43-10-1 detector (or equivalent). Data are reported in units of disintegrations per minute (dpm) per 100 square centimeters (cm^2).

Soil/Sediment/Swipe Sampling

Soil/sediment/swipe samples for radiological analyses will be collected in accordance with the SOP listed in SAP Worksheet #21 and included in Appendix A.

Import Backfill Material Sampling

Imported material to be used as backfill material at NAVSTA TI will be evaluated in accordance with the guidelines established by DTSC in the Information Advisory on Clean Imported Fill Material (DTSC 2001).

For verification sampling of any necessary import backfill material sources, unless already certified clean, a minimum of 20 radiological samples per source will be collected in accordance with the SOP listed in SAP Worksheet #21 for radiological analyses and as follows for chemical analyses:

1. Only soil and fine materials will be sampled. A minimum of four samples per source will be collected for chemical analyses.
2. Random sample locations will be chosen.
3. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting soil samples at each location.
4. A disposable scoop or equivalent will be used to access each location and collect the sample. Soil will be placed into sample containers that will be filled completely. Sample containers are listed in SAP Worksheet #19. For VOC analysis, En Core samples will be collected as follows directly from the soil:
    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.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

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 sample 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 sample will be placed in its aluminum sealed bag.

g. This procedure will be performed until three En Core samples are collected for each sample. All three En Core samples for volatile organic compound (VOC) analysis may be placed in one aluminum bag for consolidation purposes.

h. Following completion of the sample label on the outside of the aluminum bag, the aluminum bag will be placed in a resealable bag, a custody seal will be placed over the resealable bag, that bag will be placed in another resealable bag, and then that bag will immediately be placed on ice.

Waste Sampling

Excavated soil that exceeds the radiological release criteria will be disposed of under the direction of the DON LLRW disposal program as directed by the RASO. Non-LLRW soil will be sampled for radiological analyses as detailed in SAP Worksheet #17 and in accordance with the SOP listed in SAP Worksheet #21.

Non-LLRW soil will also be sampled for chemical analyses at a rate of one sample for every 500 cubic yards (with a minimum of two samples for soil less than 1,000 cubic yards) to determine waste classification for disposal using the following procedure:

1. The volume (in cubic yards) of the excavated soil will be calculated using the following formula:

$$V = A \times H/27$$

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

SAP Worksheet #14 – Summary of Project Tasks (Continued)

2. The excavated soil will be divided into the number of sections equivalent to the number of samples to be collected.
3. Random sample locations within each section will be chosen.
4. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting soil samples at each location.
5. A disposable scoop or equivalent will be used to access each location and collect the sample. Soil will be placed into sample containers that will be filled completely. Sample containers are listed in SAP Worksheet #19. For VOC analysis, three 5-gram En Core® samples will be collected from the sample container or from the soil directly as described in Step 2b above under Import Backfill Material Sampling section.

Wastewater will be generated during various field activities and stored on-site in appropriate containers. Sampling procedures are as follows:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting wastewater samples.
2. Wastewater samples will be collected using a disposable bailer or equivalent as needed. Samples will be transferred into containers for appropriate analysis as described in SAP Worksheet #19.

In the event other wastes are encountered during field activities under this project that the DON directs TtEC to sample and dispose of, TtEC will collect samples and analyze them according to the disposal facility's requirements. For any waste analyses not discussed in this SAP, standard laboratory quantitation limits and QC criteria will be used.

DATA MANAGEMENT PROCEDURES

Field surveying data, logbooks, and chain-of-custody (COC) records will be maintained in the TtEC project file.

Curtis and Tompkins will provide analytical results as an American Standard Code for Information Interchange (ASCII) file and as a portable document format (PDF) file of the ASCII file (as detailed in SAP Worksheet #29) to the RSO (or designee) for review prior to release of the results to the project team. When sample results are identified by the RSO (or designee) as representing definitive data (as described in SAP Worksheet #11 Step 7), the Laboratory Coordinator will notify the Project Chemist which sample IDs represent definitive data. Curtis and Tompkins will then be required to submit an EPA Level III- or IV-equivalent data package and electronic deliverable to the Project Chemist as described in SAP Worksheet #29. The Laboratory Coordinator (or designee) will then ensure that these deliverable requirements are produced by Curtis and Tompkins and sent to the Project Chemist within 30 business days of the sample collection date.

The Laboratory Coordinator (or designee) will e-mail a copy of the COC records to the Project Chemist the day any samples are shipped to TestAmerica-St. Louis. The Project Chemist will maintain a copy of the COC form until submitted to the DON Administrative Record along with

SAP Worksheet #14 – Summary of Project Tasks (Continued)

the hard-copy packages as described in SAP Worksheet #29. TestAmerica-St. Louis will e-mail analytical results within the turnaround time to the Project Chemist. This submittal will include analytical results and basic QC results (method blanks, laboratory control sample [LCS], surrogates, and matrix spike/matrix spike duplicates [MS/MSDs]). The Project Chemist will review prior to distribution to the project team. Following this submittal, TestAmerica-St. Louis will be required to submit an EPA Level III- or IV-equivalent data package within 30 business days of the sample collection date as described in SAP Worksheet #29.

Information from the COC records for samples analyzed by Curtis and Tompkins or TestAmerica-St. Louis will be uploaded into a database. Curtis and Tompkins and TestAmerica-St. Louis will provide electronic data deliverables (EDD) in order to upload analytical results into the database. The EDD will be checked for required values and project-specific requirements. Any discrepancies in the EDD will be corrected by the laboratory. The database will be backed up on electronic media or an independent server.

All analytical results that represent definitive data (such as FSS or backfill samples) will be validated by a third-party data validation company. The validation report is described in SAP Worksheet #29, and the validation qualifiers will be entered electronically in the laboratory EDD by the validator. This validated data will then be uploaded into the database.

Survey data will be recorded by on-site personnel for all samples locations. Horizontal control information for upload into the database will be captured in the State Plane Coordinate System in feet and vertical control standards will be in mean sea level. Survey data for upload into the Naval Installation Restoration Information Solution (NIRIS) will be in accordance with Environmental Work Instruction (EWI) EVR.6, Environmental Data Management and Required Electronic Delivery Standards (SWDIV 2005).

The analytical results from trench survey units for elevated readings that required further remediation and for FSS samples will be submitted to NIRIS also in accordance with EWI EVR.6, Environmental Data Management and Required Electronic Delivery Standards (SWDIV 2005).

EPA Level III-equivalent and Level IV-equivalent hard-copy data packages will be stored until subsequent submittal to the DON Administrative Record as described in SAP Worksheet #29.

This page intentionally left blank.

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples

Matrix: Soil

Analytical Group: Ra-226 (Curtis and Tompkins)

Analyte	CAS Number	Project Action Limit (pCi/g)	Project Action Limit Reference	Project MDA (pCi/g)	Laboratory-specific	
					MDA (pCi/g)	LOD/DL (pCi/g)
Radium-226	13982-63-3	1.0 above background	Release criterion [a]	1.3 / 0.2 [b]	1.3 / 0.2 [b]	Not applicable [c]

When a rapid turnaround time is required for samples collected for gamma spectroscopy and the samples have not undergone a prescribed in-growth period, Ra-226 will be reported based on the 186 keV Ra-226 gamma energy peak. These results will be considered screening data. For in-growth samples or samples that are recounted based on an in-growth correction factor (definitive data), Ra-226 will be reported based on the 609 keV Bi-214 gamma energy peak.

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Matrix: Swipe
Analytical Group: Gross Alpha/Gross Beta (Curtis and Tompkins)

Analyte	CAS Number	Project Action Limit (dpm/100 cm^2)	Project Action Limit Reference	Project MDA (dpm/100 cm^2)	Laboratory-specific	
					MDA (dpm/100 cm^2)	LOD/DL (dpm/100 cm^2)
Gross Alpha	12587-46-1	20	Regulatory Guide 1.86 [d]	20	20	Not applicable [c]
Gross Beta	12587-47-2	200	Regulatory Guide 1.86 [d]	200	200	Not applicable [c]

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Matrix: Soil
Analytical Group: VOCs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific limits		
					LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
1,1,1-Trichloroethane	71-55-6	8,700,000	Residential RSL [e]	5	5	1	0.431
1,1,2,2-Tetrachloroethane	79-34-5	560	Residential RSL [e]	5	5	2	0.401
1,1,2-Trichloroethane	79-00-5	1,100	Residential RSL [e]	5	5	1	0.573
1,1-Dichloroethane	75-34-3	3,300	Residential RSL [e]	5	5	1	0.392
1,1-Dichloroethene	75-35-4	240,000	Residential RSL [e]	5	5	5	1.61
1,2-Dichloroethane	107-06-2	430	Residential RSL [e]	5	5	1	0.867
1,2-Dichloropropane	78-87-5	940	Residential RSL [e]	5	5	1	0.383
2-Butanone	78-93-3	28,000,000	Residential RSL [e]	20	20	5	1.92
4-methyl-2-pentanone	108-10-1	5,300,000	Residential RSL [e]	20	20	5	0.732
Acetone	67-64-1	61,000,000	Residential RSL [e]	20	20	10	6.47
Benzene	71-43-2	1,100	Residential RSL [e]	5	5	1	0.253
Bromodichloromethane	75-27-4	270	Residential RSL [e]	5	5	1	0.254
Bromoform	75-25-2	62,000	Residential RSL [e]	5	5	1	0.366
Bromomethane	74-83-9	7,300	Residential RSL [e]	10	10	5	1.1
Carbon tetrachloride	56-23-5	610	Residential RSL [e]	5	5	1	0.513
Chlorobenzene	108-90-7	290,000	Residential RSL [e]	5	5	1	0.382
Chloroethane	75-00-3	15,000,000	Residential RSL [e]	10	10	1	0.516
Chloroform	67-66-3	290	Residential RSL [e]	5	5	1	0.376
Chloromethane	74-87-3	120,000	Residential RSL [e]	10	10	5	0.65

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific limits		
					LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
cis-1,2-Dichloroethene	156-59-2	160,000	Residential RSL [e]	5	5	1	0.597
cis-1,3-Dichloropropene	10061-01-5	1,700	Residential RSL [e]	5	5	1	0.595
Dibromochloromethane	124-48-1	680	Residential RSL [e]	5	5	1	0.406
Ethylbenzene	100-41-4	5,400	Residential RSL [e]	5	5	1	0.299
Methyl tert-butyl ether	1634-04-4	43,000	Residential RSL [e]	5	5	1	0.476
Methylene chloride	75-09-2	56,000	Residential RSL [e]	10	10	5	1.58
Styrene	100-42-5	6,300,000	Residential RSL [e]	5	5	1	0.347
Tetrachloroethene	127-18-4	22,000	Residential RSL [e]	5	5	1	0.322
Toluene	108-88-3	5,000,000	Residential RSL [e]	5	5	1	0.7
trans-1,2-Dichloroethene	156-60-5	150,000	Residential RSL [e]	5	5	1	0.943
trans-1,3-Dichloropropene	10061-02-6	1,700	Residential RSL [e]	5	5	1	0.349
Trichloroethene	79-01-6	910	Residential RSL [e]	5	5	1	0.385
Vinyl chloride	75-01-4	60	Residential RSL [e]	10	10	1	0.428
Xylenes, Total	1330-20-7	630,000	Residential RSL [e]	10	10	5	0.854

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Matrix: Soil
Analytical Group: SVOCs including PAHs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific limits		
					LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
1,2,4-Trichlorobenzene	120-82-1	22,000	Residential RSL [e]	330	330	99	33.3
1,2-Dichlorobenzene	95-50-1	1,900,000	Residential RSL [e]	330	330	99	33.3
1,4-Dichlorobenzene	106-46-7	2,400	Residential RSL [e]	330	330	99	33.3
2,4,5-Trichlorophenol	95-95-4	6,100,000	Residential RSL [e]	330	330	99	33.3
2,4,6-Trichlorophenol	88-06-2	44,000	Residential RSL [e]	330	330	99	33.3
2,4-Dichlorophenol	120-83-2	180,000	Residential RSL [e]	330	330	99	33.3
2,4-Dimethylphenol	105-67-9	1,200,000	Residential RSL [e]	330	330	99	33.3
2,4-Dinitrophenol	51-28-5	120,000	Residential RSL [e]	1,600	1,600	660	330
2,4-Dinitrotoluene	121-14-2	1,600	Residential RSL [e]	330	330	99	33.3
2,6-Dinitrotoluene	606-20-2	61,000	Residential RSL [e]	330	330	99	33.3
2-Chloronaphthalene	91-58-7	6,300,000	Residential RSL [e]	330	330	99	33.3
2-Chlorophenol	95-57-8	390,000	Residential RSL [e]	330	330	99	33.3
2-Methylnaphthalene	91-57-6	230,000	Residential RSL [e]	330	330	99	33.3
2-Methylphenol (o-cresol)	95-48-7	3,100,000	Residential RSL [e]	330	330	99	33.3
2-Nitroaniline	88-74-4	610,000	Residential RSL [e]	1,600	1,600	660	330
3,3′-Dichlorobenzidine	91-94-1	1,100	Residential RSL [e]	1,600	1,600	99	33.3
3- and 4-Methylphenol (m/p-cresol)	108-39-4/106-44-5	3,100,000	Residential RSL [e]	660	660	99	66.6
4,6-Dinitro-2-methylphenol	534-52-1	4,900	Residential RSL [e]	1,600	1,600	660	330

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific limits		
					LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
4-Chloro-3-methylphenol	59-50-7	6,100,000	Residential RSL [e]	330	330	99	33.3
4-Chloroaniline	106-47-8	2,400	Residential RSL [e]	330	330	99	33.3
4-Nitroaniline	100-01-6	24,000	Residential RSL [e]	1,600	1,600	660	330
bis(2-Chloroethoxy)methane	111-91-1	180,000	Residential RSL [e]	330	330	99	33.3
bis(2-Chloroethyl)ether	111-44-4	210 **	Residential RSL [e]	330	330	99	33.4
bis(2-Chloroisopropyl)ether	108-60-1	4,600	Residential RSL [e]	330	330	99	33.3
bis(2-Ethylhexyl)phthalate	117-81-7	35,000	Residential RSL [e]	330	330	99	45.3
Butylbenzylphthalate	85-68-7	260,000	Residential RSL [e]	330	330	99	33.3
Dibenzofuran	132-64-9	78,000	Residential RSL [e]	330	330	99	33.3
Diethylphthalate	84-66-2	49,000,000	Residential RSL [e]	330	330	99	33.3
Di-n-butylphthalate	84-74-2	6,100,000	Residential RSL [e]	330	330	99	33.3
Hexachlorobenzene	118-74-1	300 **	Residential RSL [e]	330	330	99	33.3
Hexachlorobutadiene	87-68-3	6,200	Residential RSL [e]	330	330	99	33.3
Hexachlorocyclopentadiene	77-47-4	370,000	Residential RSL [e]	1,600	1,600	660	330
Hexachloroethane	67-72-1	12,000	Residential RSL [e]	330	330	99	33.3
Nitrobenzene	98-95-3	4,800	Residential RSL [e]	330	330	99	33.3
n-Nitrosodiphenylamine	86-30-6	99,000	Residential RSL [e]	330	330	99	33.3
n-Nitrosodinpropylamine	621-64-7	69 **	Residential RSL [e]	330	330	99	33.3
Pentachlorophenol	87-86-5	890	Residential RSL [e]	1600	1600	330	330
Phenol	108-95-2	18,000,000	Residential RSL [e]	330	330	99	33.3
Pyridine	110-86-1	78,000	Residential RSL [e]	660	660	99	66.6
Acenaphthene *	83-32-9	3,400,000	Residential RSL [e]	330	330	99	33.3

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific limits		
					LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
Anthracene *	120-12-7	17,000,000	Residential RSL [e]	330	330	99	33.3
Benzo(a)anthracene *	56-55-3	150 **	Residential RSL [e]	330	330	99	33.3
Benzo(a)pyrene *	50-32-8	620 ***	Residential RSL [e]	330	330	99	33.3
Benzo(b)fluoranthene *	205-99-2	150 **	Residential RSL [e]	330	330	99	33.3
Benzo(k)fluoranthene *	207-08-9	1,500	Residential RSL [e]	330	330	99	33.3
Chrysene *	218-01-9	15,000	Residential RSL [e]	330	330	99	33.3
Dibenzo(a,h)anthracene *	53-70-3	15 **	Residential RSL [e]	330	330	99	33.3
Fluoranthene *	206-44-0	2,300,000	Residential RSL [e]	330	330	99	33.3
Fluorene *	86-73-7	2,300,000	Residential RSL [e]	330	330	99	33.3
Indeno(1,2,3-cd)pyrene *	193-39-5	150 **	Residential RSL [e]	330	330	99	33.3
Naphthalene *	91-20-3	3,600	Residential RSL [e]	330	330	99	33.3
Pyrene *	129-00-0	1,700,000	Residential RSL [e]	330	330	99	33.3

Notes:

* These analytes are the PAHs.

** The project action limit listed is less than the project quantitation limit goal, which is the lowest value the laboratory can report for this method. Therefore, the project quantitation limit goal will be used as the evaluation criteria instead of the residential RSL.

*** The value listed from the AM corresponds to the benzo(a)pyrene (BaP) equivalent calculation. This calculation is performed by multiplying the concentration of the following polynuclear aromatic hydrocarbons (PAHs) by their corresponding BaP equivalency factor and then adding those results together. That total result will be compared to the BaP AM action level of 620 µg/kg.

(0.1) benzo(a)anthracene + (1.0)benzo(a)pyrene + (0.1)benzo(b)fluoranthene + (0.01) benzo(k)fluoranthene + (0.001)chrysene + (0.1) indeno(1,2,3cd)pyrene = total BaP equivalent.

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Matrix: Soil
Analytical Group: Pesticides (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific limits		
					LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
4,4′-DDD	72-54-8	2,000	Residential RSL [e]	1.7	1.7	0.34	0.221
4,4′-DDE	72-55-9	1,400	Residential RSL [e]	1.7	1.7	0.67	0.39
4,4′-DDT	50-29-3	1,700	Residential RSL [e]	1.7	1.7	0.67	0.628
alpha-BHC	319-84-6	77	Residential RSL [e]	1.7	1.7	0.34	0.185
Aldrin	309-00-2	29	Residential RSL [e]	1.7	1.7	0.34	0.306
beta-BHC	319-85-7	270	Residential RSL [e]	1.7	1.7	0.67	0.3
Chlordane (technical)	12789-03-6	1,600	Residential RSL [e]	17	17	6.7	3.73
Dieldrin	60-57-1	30	Residential RSL [e]	1.7	1.7	0.34	0.215
Endosulfan sulfate	1031-07-8	370,000	Residential RSL [e]	1.7	1.7	0.67	0.34
Endosulfan I	959-98-8	370,000	Residential RSL [e]	1.7	1.7	0.67	0.57
Endosulfan II	33213-65-9	370,000	Residential RSL [e]	1.7	1.7	0.34	0.235
Endrin	72-20-8	18,000	Residential RSL [e]	1.7	1.7	0.34	0.158
gamma-BHC (Lindane)	58-89-9	520	Residential RSL [e]	1.7	1.7	0.34	0.168
Heptachlor	76-44-8	110	Residential RSL [e]	1.7	1.7	0.34	0.204
Heptachlor epoxide	1024-57-3	53	Residential RSL [e]	1.7	1.7	0.67	0.429
Methoxychlor	72-43-5	310,000	Residential RSL [e]	3.3	3.3	1.7	0.719
Toxaphene	8001-35-2	440	Residential RSL [e]	67	67	34	15.16

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Matrix: Soil
Analytical Group: PCBs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific limits		
					LOQ (µg/kg)	LOD (µg/kg)	DL (µg/kg)
Aroclor 1016	12674-11-2	1,000 *	AM Action Level [f]	33	33	16	8.72
Aroclor 1221	11104-28-2	1,000 *	AM Action Level [f]	33	33	16	8.72
Aroclor 1232	11141-16-5	1,000 *	AM Action Level [f]	33	33	16	8.72
Aroclor 1242	53469-21-9	1,000 *	AM Action Level [f]	33	33	16	8.72
Aroclor 1248	12672-29-6	1,000 *	AM Action Level [f]	33	33	16	8.72
Aroclor 1254	11097-69-1	1,000 *	AM Action Level [f]	33	33	10	5.5
Aroclor 1260	11096-82-5	1,000 *	AM Action Level [f]	33	33	10	5.5

* Level of 1,000 µg/kg is from the AM (DON 2007) and is assumed to represent total PCBs. Therefore, individual PCB results will be added and that total will be evaluated against the level of 1,000 µg/kg.

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Matrix: Soil

Analytical Group: Dioxins (TestAmerica-St. Louis will subcontract to TestAmerica-West Sacramento)

Analyte	CAS Number	Project Action Limit (pg/g)	Project Action Limit Reference	Project Quantitation Limit Goal (pg/g)	Laboratory-specific		
					LOQ (pg/g)	LOD (pg/g)	DL (pg/g)
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	12 pg/g *	AM Action Level [f]	1	1	0.15	**
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6			1	1	0.15	**
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6			5	5	0.75	**
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4			5	5	0.75	**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4			5	5	0.75	**
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9			5	5	0.75	**
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9			5	5	0.75	**
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5			5	5	0.75	**
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9			5	5	0.75	**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6			5	5	0.75	**
1,2,3,6,7,8- Hexachlorodibenzo -p-dioxin	57653-85-7			5	5	0.75	**
1,2,3,7,8,9- Hexachlorodibenzo -p-dioxin	19408-74-3			5	5	0.75	**
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4			5	5	0.75	**
1,2,3,4,7,8,9- Heptachlorodibenzofuran	55673-89-7			5	5	0.75	**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9			5	5	0.75	**
Octachlorodibenzofuran	39001-02-0			10	10	1.5	**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9			10	10	1.5	**

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

* In order to compare the dioxin results to the AM action level of 12 pg/g, each result will be multiplied by its corresponding toxicity equivalency factor (TEF) listed below and then added together. That total result will then be compared to the AM action level of 12 pg/g.

** DL is not applicable to dioxin analysis. Instead, for each analyte that is not detected, an estimated detection limit is reported. This is an estimate made by the laboratory of the concentration of a given chemical that would have to be present to produce a signal with a peak height of at least 2.5 times the background signal level.

Dioxins	Toxic Equivalency Factor (TEF)
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,6,7,8- Hexachlorodibenzo -p-dioxin	0.1
1,2,3,7,8,9- Hexachlorodibenzo -p-dioxin	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	0.0001
2,3,7,8-Tetrachlorodibenzofuran	0.1
1,2,3,7,8-Pentachlorodibenzofuran	0.05
2,3,4,7,8-Pentachlorodibenzofuran	0.5
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01
1,2,3,4,7,8,9- Heptachlorodibenzofuran	0.01
Octachlorodibenzofuran	0.0001

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Matrix: Soil
Analytical Group: Metals (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific limits		
					LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Antimony	7440-36-0	31	Residential RSL [e]	0.50	0.50	0.48	0.164
Arsenic	7440-38-2	10	Ambient Level [g]	1.0	1.0	0.78	0.26
Barium	7440-39-3	15,000	Residential RSL [e]	2.0	2.0	0.28	0.094
Beryllium	7440-41-7	160	Residential RSL [e]	0.10	0.10	0.078	0.026
Cadmium	7440-43-9	70	Residential RSL [e]	0.06	0.06	0.048	0.016
Chromium	7440-47-3	120,000	Residential RSL [e]	1.9	1.9	1.0	0.45
Cobalt	7440-48-4	23	Residential RSL [e]	0.20	0.20	0.13	0.043
Copper	7440-50-8	3,100	Residential RSL [e]	1.0	1.0	0.30	0.101
Lead	7439-92-1	400	AM Action Level [f]	0.30	0.30	0.30	0.10
Mercury	7439-97-6	10	Residential RSL [e]	0.04	0.04	0.03	0.011
Molybdenum	7439-98-7	390	Residential RSL [e]	0.50	0.50	0.36	0.124
Nickel	7440-02-0	1,500	Residential RSL [e]	0.50	0.50	0.33	0.107
Selenium	7782-49-2	390	Residential RSL [e]	0.50	0.50	0.48	0.158
Silver	7440-22-4	390	Residential RSL [e]	0.20	0.20	0.072	0.024
Thallium	7440-28-0	0.78	Residential RSL [e]	0.45	0.45	0.20	0.152
Vanadium	7440-62-2	390	Residential RSL [e]	1.0	1.0	1.0	0.735
Zinc	7440-66-6	23,000	Residential RSL [e]	5.0	5.0	4.0	1.33

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Matrix: Soil
Analytical Group: TPH-extractable (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific limits		
					LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Diesel (C_{10}-C_{24})	-3527 [h]	Not applicable	Not applicable	25	25	0.5	0.333
Motor oil (C_{24}-C_{36})	-3528 [h]	Not applicable	Not applicable	25	25	0.5	0.333

Matrix: Soil
Analytical Group: Asbestos (TestAmerica-St. Louis will subcontract to AmeriSci)

Analyte	CAS Number	Project Action Limit (percent)	Project Action Limit Reference	Project Quantitation Limit Goal (percent)	Laboratory-specific	
					LOQ (percent)	LOD/DL (percent)
Asbestos	132207-33-1	0.25	Bay Area Air Quality Management District	0.25	0.25	Not applicable [c]

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil/Swipe Samples (Continued)

Notes:

Analytical results detected between the DL and LOD will be reported by the laboratory with a "J" qualifier indicating estimated for all chemical analyses except TPH-extractable.

[a] Release criterion for Ra-226 is from the statement of work provided by the DON for this project.

[b] MDAs are calculated on a per sample per analysis basis and take into account instrument background, sample size, and count time. Therefore, the MDA value listed in this worksheet for the radiological analyses is the minimum MDA value that the laboratory will achieve. However, laboratory reports will list the actual MDA value calculated for each isotope. In addition, the MDA requirement for Ra-226 at 1.3 pCi/g is used for screening data and 0.2 pCi/g is used for definitive data.

[c] LODs/DLs are not applicable to radiological and asbestos analyses.

[d] Value listed is from the U.S. Atomic Energy Commission (AEC) Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors (AEC 1974).

[e] Values listed are from the Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites for residential use dated April 2012.

[f] Values listed are from the AM (DON 2007).

[g] Values listed are the 95th percentile ambient levels from Table 1-2 (Ambient Metals Concentrations in Soil) from the Final Remedial Investigation Report for Installation Restoration Site 12, Old Bunker Area at NAVSTA TI (TriEco-Tt 2012).

[h] The value listed is from the NEDD valid value list since a CAS number is not available for this analyte.

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples

Matrix: Water
Analytical Group: Radium-226 (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (pCi/L)	Project Action Limit Reference	Project MDA (pCi/L)	Laboratory-specific	
					MDA (pCi/L)	LOD/DL (pCi/L)
Radium-226	13982-63-3	5	Release criterion [a]	2.5 [b]	2.5 [b]	Not applicable [c]

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: PAHs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific		
					LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Acenaphthene	83-32-9	TBD *	TBD *	10	10	3	1
Anthracene	120-12-7	TBD *	TBD *	10	10	3	1
Benzo(a)anthracene	56-55-3	TBD *	TBD *	10	10	3	1
Benzo(a)pyrene	50-32-8	TBD *	TBD *	10	10	3	1
Benzo(b)fluoranthene	205-99-2	TBD *	TBD *	10	10	3	1
Benzo(k)fluoranthene	207-08-9	TBD *	TBD *	10	10	3	1
Chrysene	218-01-9	TBD *	TBD *	10	10	3	1
Dibenzo(a,h)anthracene	53-70-3	TBD *	TBD *	10	10	3	1
Fluoranthene	206-44-0	TBD *	TBD *	10	10	3	1
Fluorene	86-73-7	TBD *	TBD *	10	10	3	1
Indeno(1,2,3-cd)pyrene	193-39-5	TBD *	TBD *	10	10	3	1
Naphthalene	91-20-3	TBD *	TBD *	10	10	3	1
Pyrene	129-00-0	TBD *	TBD *	10	10	3	1

* COPCs include PAHs, and it is assumed the Department of Public Works will require PAH results for evaluation prior to approving wastewater discharge. Therefore, PAH analysis has been included in this worksheet, and the evaluation criteria are to be determined by the Department of Public Works.

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: PCBs (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific limits		
					LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Aroclor 1016	12674-11-2	TBD *	TBD *	1	1	0.30	0.241
Aroclor 1221	11104-28-2	TBD *	TBD *	1	1	0.30	0.241
Aroclor 1232	11141-16-5	TBD *	TBD *	1	1	0.30	0.241
Aroclor 1242	53469-21-9	TBD *	TBD *	1	1	0.30	0.241
Aroclor 1248	12672-29-6	TBD *	TBD *	1	1	0.30	0.241
Aroclor 1254	11097-69-1	TBD *	TBD *	1	1	0.30	0.166
Aroclor 1260	11096-82-5	TBD *	TBD *	1	1	0.30	0.166

* COPCs include PCBs, and it is assumed the Department of Public Works will require PCB results for evaluation prior to approving wastewater discharge. Therefore, PCB analysis has been included in this worksheet, and the evaluation criteria are to be determined by the Department of Public Works.

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: Dioxins (TestAmerica-St. Louis subcontract to TestAmerica-West Sacramento)

Analyte	CAS Number	Project Action Limit (pg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (pg/L)	Laboratory-specific		
					LOQ (pg/L)	LOD (pg/L)	DL (pg/L)
2,3,7,8-TCDF	51207-31-9	TBD *	TBD *	10	10	2.5	**
2,3,7,8-TCDD	1746-01-6	TBD *	TBD *	10	10	2.5	**
1,2,3,7,8-PeCDF	57117-41-6	TBD *	TBD *	50	50	6.5	**
2,3,4,7,8-PeCDF	57117-31-4	TBD *	TBD *	50	50	6.5	**
1,2,3,7,8-PeCDD	40321-76-4	TBD *	TBD *	50	50	6.5	**
1,2,3,4,7,8-HxCDF	70648-26-9	TBD *	TBD *	50	50	6.5	**
1,2,3,6,7,8-HxCDF	57117-44-9	TBD *	TBD *	50	50	12.5	**
2,3,4,6,7,8-HxCDF	60851-34-5	TBD *	TBD *	50	50	6.5	**
1,2,3,7,8,9-HxCDF	72918-21-9	TBD *	TBD *	50	50	6.5	**
1,2,3,4,7,8-HxCDD	39227-28-6	TBD *	TBD *	50	50	12.5	**
1,2,3,6,7,8-HxCDD	57653-85-7	TBD *	TBD *	50	50	12.5	**
1,2,3,7,8,9-HxCDD	19408-74-3	TBD *	TBD *	50	50	12.5	**
1,2,3,4,6,7,8-HpCDF	67562-39-4	TBD *	TBD *	50	50	6.5	**
1,2,3,4,7,8,9-HpCDF	55673-89-7	TBD *	TBD *	50	50	12.5	**
1,2,3,4,6,7,8-HpCDD	35822-46-9	TBD *	TBD *	50	50	12.5	**
OCDF	39001-02-0	TBD *	TBD *	100	100	25	**
OCDD	3268-87-9	TBD *	TBD *	100	100	50	**

* COPCs include dioxins, and it is assumed the Department of Public Works will require dioxin results for evaluation prior to approving wastewater discharge. Therefore, dioxin analysis has been included in this worksheet, and the evaluation criteria are to be determined by the Department of Public Works.

** DL is not applicable to dioxin analysis. Instead, for each analyte that is not detected, an estimated detection limit is reported. This is an estimate made by the laboratory of the concentration of a given chemical that would have to be present to produce a signal with a peak height of at least 2.5 times the background signal level.

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: Metals (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific limits		
					LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Arsenic	7440-38-2	4,000	Wastewater Discharge Permit	10	10	3.5	1.18
Cadmium	7440-43-9	500	Wastewater Discharge Permit	0.50	0.50	0.30	0.10
Chromium	7440-47-3	5,000	Wastewater Discharge Permit	10	10	9.8	3.26
Copper	7440-50-8	4,000	Wastewater Discharge Permit	3.0	3.0	1.4	0.451
Lead	7439-92-1	1,500	Wastewater Discharge Permit	3.0	3.0	0.51	0.173
Mercury	7439-97-6	50	Wastewater Discharge Permit	0.18	0.18	0.15	0.06
Nickel	7440-02-0	2,000	Wastewater Discharge Permit	5.0	5.0	1.2	0.40
Silver	7440-22-4	600	Wastewater Discharge Permit	2.0	2.0	1.59	0.15
Zinc	7440-66-6	7,000	Wastewater Discharge Permit	12	12	10	8.29

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Matrix: Water
Analytical Group: Phenols (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific limits		
					LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Phenols	64743-03-9	23,000	Wastewater Discharge Permit	50	50	30	14.054

Matrix: Water
Analytical Group: Cyanide (TestAmerica-St. Louis)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific limits		
					LOQ (µg/L)	LOD (µg/L)	DL (µg/L)
Cyanide	57-12-5	1,000	Wastewater Discharge Permit	10	10	6.0	1.5

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Water Samples (Continued)

Notes:

Analytical results detected between the DL and LOD will be reported by the laboratory with a "J" qualifier indicating estimated for all chemical analyses except for phenol and cyanide results.

[a] Release criteria have been derived from Radionuclides Notice of Data Availability Technical Document (EPA 2000) by comparing the limits from two criteria and using the most conservative limit.

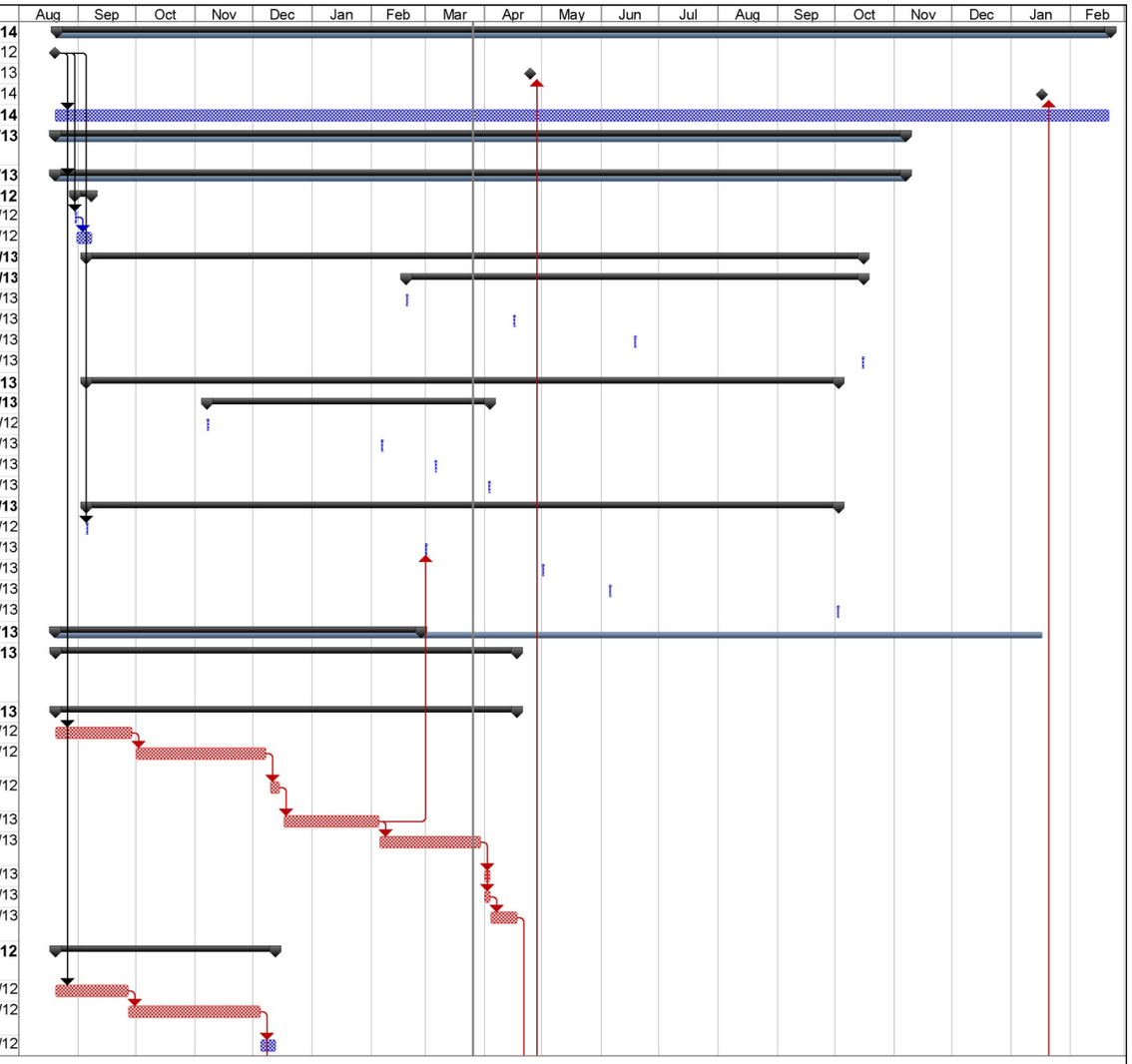
[b] MDAs are calculated on a per sample per analysis basis and take into account instrument background, sample size, and count time. Therefore, the MDA value listed in this worksheet for the radiological analyses is the minimum MDA value that the laboratory will achieve. However, laboratory reports will list the actual MDA value calculated for each isotope.

[c] LODs/DLs are not applicable to radiological analyses.

This page intentionally left blank.

SAP Worksheet #16 – Project Schedule / Timeline Table

ID	Task Name	Duration	Start	Finish
1	**GENERAL**	**386 days**	**Tue 8/21/12**	**Fri 2/21/14**
2	Contract Award	0 days	Mon 8/20/12	Mon 8/20/12
3	Field Work Notice to Proceed	0 days	Wed 4/24/13	Wed 4/24/13
4	Project Complete	0 days	Thu 1/16/14	Thu 1/16/14
5	**Project Management/Administrative Support**	**550 edays**	**Mon 8/20/12**	**Fri 2/21/14**
6	**PTO X002 NTCRA for SWDA - Radiological Hot Spot Removal and Building Demolition IR 12**	**311 days**	**Mon 8/20/12**	**Wed 11/6/13**
7	**Project Meetings**	**311 days**	**Mon 8/20/12**	**Wed 11/6/13**
8	**Kick off meeting**	**6 days**	**Thu 8/30/12**	**Fri 9/7/12**
9	Attend Meeting (Meeting date TBD by the RPM)	1 day	Thu 8/30/12	Thu 8/30/12
10	Meeting minutes (within 10 days of meeting)	5 days	Fri 8/31/12	Fri 9/7/12
11	**Community Relations and Regulatory Interaction**	**284 days**	**Wed 9/5/12**	**Tue 10/15/13**
12	**RAB Meetings (3rd Tues pm, Every other Month)**	**168 days**	**Tue 2/19/13**	**Tue 10/15/13**
13	RAB Meeting 1 - Present Draft Work Plan and RTCs	1 day	Tue 2/19/13	Tue 2/19/13
14	RAB Meeting 2 - Update on field activities	1 day	Tue 4/16/13	Tue 4/16/13
15	RAB Meeting 3 - Update on field activities	1 day	Tue 6/18/13	Tue 6/18/13
16	RAB Meeting 4 - Present Draft RACR and RTCs	1 day	Tue 10/15/13	Tue 10/15/13
17	**BCT Meetings (1st Wed every month)**	**275 days**	**Wed 9/5/12**	**Wed 10/2/13**
18	**BCT Monthly Meetings**	**103 days**	**Wed 11/7/12**	**Wed 4/3/13**
19	BCT Monthly Meeting 1 (San Francisco)	1 day	Wed 11/7/12	Wed 11/7/12
20	BCT Monthly Meeting 2 (San Francisco)	1 day	Wed 2/6/13	Wed 2/6/13
21	BCT Monthly Meeting 3 (San Francisco)	1 day	Wed 3/6/13	Wed 3/6/13
22	BCT Monthly Meeting 4 (San Francisco)	1 day	Wed 4/3/13	Wed 4/3/13
23	**BCT Technical Meetings**	**275 days**	**Wed 9/5/12**	**Wed 10/2/13**
24	BCT Technical Meeting 1 - Work Plan Scoping	1 day	Wed 9/5/12	Wed 9/5/12
25	BCT Technical Meeting 2 - Work Plan RTC Meeting	1 day	Fri 3/1/13	Fri 3/1/13
26	BCT Technical Meeting 3 - TBD by Navy	1 day	Wed 5/1/13	Wed 5/1/13
27	BCT Technical Meeting 4 - TBD by Navy	1 day	Wed 6/5/13	Wed 6/5/13
28	BCT Technical Meeting 5 - RACR RTC Meeting	1 day	Wed 10/2/13	Wed 10/2/13
29	**Prepare NTCRA Work Plan and Supporting Documents**	**133 days**	**Mon 8/20/12**	**Tue 2/26/13**
30	**Work Plan w/SAP, RPP, EPP (DMP and SWMP), CQCP, Demolition Work Procedure, RMP, Project Management, WMP, Traffic Plan, Data Management Plan**	**169 days**	**Mon 8/20/12**	**Wed 4/17/13**
31	**Work Plan**	**169 days**	**Mon 8/20/12**	**Wed 4/17/13**
32	Prepare Internal Draft Work Plan	29 days	Mon 8/20/12	Fri 9/28/12
33	Navy Review of Internal draft Work Plan (60 days per SMP for RASO Review)	49 days	Mon 10/1/12	Fri 12/7/12
34	Prepare Draft Work Plan (7 days after Navy comments per SMP)	5 days	Mon 12/10/12	Fri 12/14/12
35	Regulator Review of Draft Work Plan (30 days per SMP)	34 days	Mon 12/17/12	Mon 2/4/13
36	Develop/Submit Internal Final Work Plan and RTCs/Participate in Working Meeting w Navy/Agencies (33 days per SMP)	39 days	Tue 2/5/13	Fri 3/29/13
37	Navy Review of Internal Final Work Plan (14 days per SMP)	3 days	Mon 4/1/13	Wed 4/3/13
38	Develop/Submit Final Work Plan to Agencies (14 days per SMP)	3 days	Mon 4/1/13	Wed 4/3/13
39	Agency Review of Final Work Plan (14 days per SMP; Plan finalized if no comments received within 14 days per SMP)	10 days	Thu 4/4/13	Wed 4/17/13
40	**Site Safety and Health / Accident Prevention Plan (SSHP/APP)**	**81 days**	**Mon 8/20/12**	**Wed 12/12/12**
41	Prepare Internal Draft SSHP/APP	27 days	Mon 8/20/12	Wed 9/26/12
42	NMPHC / RPM / NAVFAC SW Safety Office Review Draft SSHP/APP	48 days	Thu 9/27/12	Tue 12/4/12
43	Prepare Final SSHP/APP Plan	6 days	Wed 12/5/12	Wed 12/12/12

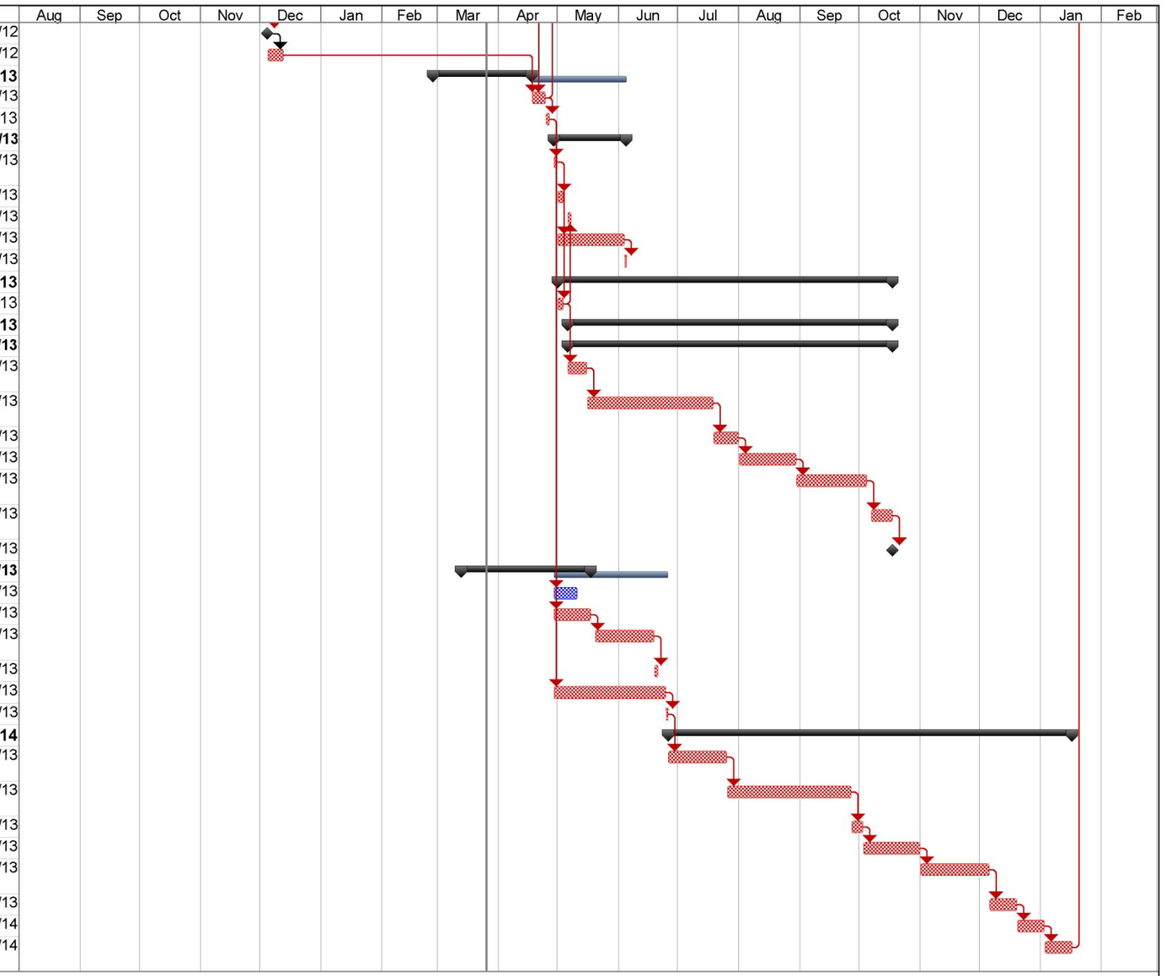


Project: CTO 0013 Draft NAVSTA TI I
Date: Tue 3/26/13

Task		Rolled Up Task		Inactive Task		Manual Task		Start-only	
Critical Task		Rolled Up Critical Task		Inactive Task		Duration-only		Finish-only	
Milestone		Rolled Up Progress		Inactive Milestone		Manual Summary Rollup		Progress	
Summary		Group By Summary		Inactive Summary		Manual Summary			

Figure 1-4 Project Schedule
NTCRA Work Plan
Naval Station Treasure Island, San Francisco, CA

ID	Task Name	Duration	Start	Finish
44	Submit RTC's for Navy Review/Approval	0 days	Tue 12/4/12	Tue 12/4/12
45	Issue Final SSHP/APP Plan	6 days	Wed 12/5/12	Wed 12/12/12
46	**Field Work "Implement the NTCRA Work Plan"**	**36 days**	**Wed 2/27/13**	**Wed 4/17/13**
47	**Receive Notice to Proceed**	5 days	Thu 4/18/13	Wed 4/24/13
48	**Mobilization**	2 days	Thu 4/25/13	Fri 4/26/13
49	**Site Work - Removal Activities**	**26 days**	**Mon 4/29/13**	**Tue 6/4/13**
50	Radiological Soil Screening / Excavation of Hot Spots / Remediate / Spread Material on Pad	2 days	Mon 4/29/13	Tue 4/30/13
51	Scan / Sample Pad Material / Remediate	3 days	Wed 5/1/13	Fri 5/3/13
52	Backfill Excavations / Site Restoration	2 days	Mon 5/6/13	Tue 5/7/13
53	Waste Characterization and Disposal	23 days	Wed 5/1/13	Mon 6/3/13
54	Scan Ground Surface after Pad Removal	1 day	Tue 6/4/13	Tue 6/4/13
55	**Implement Final Status Survey at Westside Drive Hotspots**	**119 days**	**Wed 5/1/13**	**Thu 10/17/13**
56	Survey / Sample Excavated Hot Spots	3 days	Wed 5/1/13	Fri 5/3/13
57	**Final Status Survey Report**	**116 days**	**Mon 5/6/13**	**Thu 10/17/13**
58	**FSS Report for Hot Spots**	**116 days**	**Mon 5/6/13**	**Thu 10/17/13**
59	Prepare Internal Draft FSS (no later than 60 days after FSS confirmation results received)	8 days	Mon 5/6/13	Wed 5/15/13
60	Navy Review of Internal Draft FSS (60 day RASO Review per SMP)	44 days	Thu 5/16/13	Thu 7/18/13
61	Prepare Draft FSS (14 days after Navy comments)	9 days	Fri 7/19/13	Wed 7/31/13
62	Agency Review of Draft FSS (30 days per SMP)	21 days	Thu 8/1/13	Thu 8/29/13
63	Develop Final FSS and RTCs/Participate in Working Meeting w Navy/Agencies (33 days per SMP)	25 days	Fri 8/30/13	Fri 10/4/13
64	Final FSS (14 days after Regulatory/Public Concurrence on RTCs)	9 days	Mon 10/7/13	Thu 10/17/13
65	Issue Final FSS	0 days	Thu 10/17/13	Thu 10/17/13
66	**Demolition of Buildings 1121 and 1323**	**48 days**	**Wed 3/13/13**	**Fri 5/17/13**
67	Asbestos and Lead Abatement	10 days	Mon 4/29/13	Fri 5/10/13
68	M&E / Building Surveys	15 days	Mon 4/29/13	Fri 5/17/13
69	Navy and CDPH Review of Survey Data / CDPH Perform Confirmatory Survey	21 days	Mon 5/20/13	Tue 6/18/13
70	Building Demolition	2 days	Wed 6/19/13	Thu 6/20/13
71	Waste Management and Disposal	40 days	Mon 4/29/13	Mon 6/24/13
72	Demobilization	1 day	Tue 6/25/13	Tue 6/25/13
73	**Removal Action Completion Reports (RACR)**	**144 days**	**Wed 6/26/13**	**Thu 1/16/14**
74	Prepare Internal Draft RACR (no later than 60 days after building demolition/debris disposed)	21 days	Wed 6/26/13	Thu 7/25/13
75	Navy Review of Internal draft RACR (60 day RASO Review per SMP)	44 days	Fri 7/26/13	Thu 9/26/13
76	Prepare Draft RACR(7 days after Navy comments per SMP)	4 days	Fri 9/27/13	Wed 10/2/13
77	Regulator Review of Draft RACR (30 days per SMP)	21 days	Thu 10/3/13	Thu 10/31/13
78	Develop/Submit Internal Final RACR and RTCs/Participate in Working Meeting w/ Navy/Agencies (33 days per SMP)	24 days	Fri 11/1/13	Thu 12/5/13
79	Navy Review of Internal Final RACR (14 days per SMP)	10 days	Fri 12/6/13	Thu 12/19/13
80	Develop/Submit Final RACR to Agencies (14 days per SMP)	10 days	Fri 12/20/13	Thu 1/2/14
81	Agency Review of Final RACR (14 days per SMP; RACR finalized if no comments received within 14 days)	10 days	Fri 1/3/14	Thu 1/16/14



Project: CTO 0013 Draft NAVSTA TI I
Date: Tue 3/26/13

Task		Rolled Up Task		Inactive Task		Manual Task		Start-only	
Critical Task		Rolled Up Critical Task		Inactive Task		Duration-only		Finish-only	
Milestone		Rolled Up Progress		Inactive Milestone		Manual Summary Rollup		Progress	
Summary		Group By Summary		Inactive Summary		Manual Summary			

Figure 1-4 Project Schedule
NTCRA Work Plan
Naval Station Treasure Island, San Francisco, CA

SAP Worksheet #17 – Sampling Design and Rationale

The following sections provide a rationale for types of sampling that may be performed for this project.

REFERENCE BACKGROUND AREA SAMPLING

A mean background level will be determined by performing measurements at systematic locations within a designated background area. The number of soil samples will be calculated by MARSSIM (DoD et al. 2000) (and concurred with by RASO) to determine the appropriate number of samples. These samples will be collected in the background area at systematic locations as determined by Visual Sampling Plan (VSP) software. Curtis and Tompkins will analyze the samples for Ra-226 (after in-growth) to establish a mean background area level for Ra-226 (based on the 609 keV Bi-214 gamma energy peak).

HOT SPOT SURVEYING AND SAMPLING

Based on previous investigations, radiological hot spots were identified in five areas as follows: one area north of the currently established RCA (Northern Hot Spot) and four areas south of the RCA (Southern Hot Spot). The general approach to removing each hot spot will be to first remove the overlying pavement and place the material on plastic pending radiological scanning activities. For the exposed surfaces and for each subsequent 12-inch lift of soil, a 100 percent gamma scan using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 2-inch by 2-inch sodium iodide (NaI) scintillation detector (or equivalent) will be conducted to identify and mark the location of any discrete near-surface radioluminescent commodities and contaminated soil with measurements above 3 sigma of the mean background area level. Any discrete sources/commodities identified during the scanning activities will be removed and placed into a secure locker for transfer to the DON's LLRW contractor. Soil above 3 sigma of the mean background area level will be segregated and placed into a soil hopper for transfer to the soil screening pad.

One biased sample will be collected at each area exceeding 3 sigma of the background area. Once the scanning activities indicate no elevated readings within each excavated area, or the areas with elevated gamma readings do not have soil samples exceeding the Ra-226 release criterion, a minimum of one soil sample will be collected from each of the sidewalls and one from the bottom of each excavated area based on the highest gamma scan readings of each surface. These soil samples will be analyzed for Ra-226 to confirm the effectiveness of the gamma scans and remedial actions. If the release criterion for Ra-226 is exceeded, the iterative process of remediation followed by collection of a minimum of one postremediation verification sample will continue until the release criterion is achieved.

Once no further contamination is identified in the hot spots excavations, FSS activities will be conducted using MARSSIM guidance. Due to the close proximity and the expectation that together the five individual excavations will be less than 1,000 square meters in size, they will be combined into one MARSSIM Class 1 survey unit. The spatial boundaries for hot spot excavation FSSs will be determined by the area that is excavated during the hot spot removal activities. The boundary area will extend, at a minimum, 2 feet beyond any excavated area. The

SAP Worksheet #17 – Sampling Design and Rationale (Continued)

objective of the FSS will be to demonstrate that residual radioactivity levels within the excavations meet the release criterion for Ra-226. The FSS will comprise the following:

- Eighteen randomly selected sample (systematic) locations will be generated using VSP software with a random start point on a triangular grid (or other number of sample locations and distribution per RASO concurrence due to the small size of the total excavation area).
- Based on review of the last gamma scan performed for each hot spot excavation, the RSO (or designee) will review the data and select a minimum of two additional biased sample locations (or other number of sample locations and distribution per RASO concurrence due to the small size of the total excavation area).
- Gamma direct static measurements will be collected from each discrete systematic and biased soil sample collection location using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 NaI scintillation detector (or equivalent).
- Biased and systematic soil samples will be collected from each of the discrete locations and submitted to Curtis and Tompkins for Ra-226 analysis using the 186.2 keV gamma energy peak directly to determine whether remediation needs to be continued or those samples can be considered FSS samples.
- If radioactive contamination is identified, remediation will be performed and a minimum of one postremediation verification soil sample will be collected and analyzed as described above. This iterative process of remediation followed by postremediation verification samples and systematic and biased sampling will continue until no further contamination is identified, and the samples meet the release criterion for Ra-226.
- Once the samples meet the release criterion for Ra-226, Curtis and Tompkins will reanalyze those samples for Ra-226 but after an in-growth period. This in-growth period is defined as the period after Bi-214 approaches secular equilibrium with Ra-226 (typically 21 calendar days), and thus the Ra-226 result will be reported based on the Bi-214 result, taking into account this time to achieve secular equilibrium. This in-growth data will be considered the FSS sample data used to determine that the excavated areas are ready for backfilling as necessary.

EXCAVATED SOIL SURVEYING AND SAMPLING

Based on professional judgment of the RSO (or designee), excavated soil will be transported to screening pads for subsequent dewatering (if necessary) prior to radiologically scanning, surveying, remediating, and clearing the soil for disposal or direct loaded into containers for disposal as LLRW. To facilitate radiologically clearing of the soil, excavated soil placed on the screening pads will be spread out in lifts not to exceed 6 inches in height (or thicker if approved by RASO) and up to 1,000 square meters in surface area. The radiological surface survey will either be a towed array survey or a walkover survey depending on the amount of soil on the screening pad.

SAP Worksheet #17 – Sampling Design and Rationale (Continued)

The towed array survey will consist of a high-density gamma scan supported by global positioning system equipment. The high-density survey process will result in a 100 percent surface scan survey. Collected scan data will be logged and survey points plotted on survey unit grid maps to document survey results. These data will be used to directly tie the locations of any radiation measurements that are above 3 sigma of the mean background area level to corresponding grid coordinates. If a walkover survey is performed, this will involve a 100 percent gamma scan using a Ludlum Model 2350-1 data logger equipped with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent) to identify and mark the location of any measurements that are above 3 sigma of the mean background area level. Survey data analysis from either type of survey will be performed as the data are received, and questionable areas will be flagged in the field for resurvey or verification.

When a scan survey is complete, sampling will begin for each pad. If the scan survey measurements for the entire pad are less than 3 sigma of the mean background area level, a minimum of two biased samples will be collected (from the locations of the two highest scan readings on the pad). If any scan survey measurement for the pad is greater than 3 sigma of the mean background area level, one biased sample will be collected at that location. The entire pad will also be sampled using the most current version of VSP at 18 systematic sample points (or a lesser number as approved by RASO, based on the small area of soil on the pad, as applicable). All of these samples will be analyzed for Ra-226. If any sample result exceeds the release criterion for Ra-226, characterization samples in the surrounding area will be collected and analyzed in conjunction with existing systematic and/or biased samples to bound the contamination (typically three samples are needed to bound the contamination), and the contaminated soil will be removed from the pad and placed directly into an LLRW container. This process of evaluating results, collecting biased or characterization samples, and removing contaminated material will continue as an iterative process until results indicate the soil left on that pad is below the release criterion for Ra-226 (or RASO concurrence is received).

To characterize the remaining soil on the pads for chemical constituents, one soil sample will be collected per 500 cubic yards of soil on the pads (with a minimum of two samples collected from excavated soil that has a total volume less than 1,000 cubic yards). At a minimum, analysis will include the COPCs for soil at IR Site 12 as follows: PAHs, PCBs, dioxins, and lead. In addition, the statement of work provided by the DON for this project has requested metals (the other 16 metals besides lead that are part of Title 22 metals analysis), total petroleum hydrocarbons (TPH)-extractable (to include diesel and motor oil), and toxicity characteristic leaching procedure (TCLP) lead. All of these analyses will be performed as requested by the DON statement of work for this project except for the TCLP lead, which will be analyzed for only if the total lead results exceed the regulatory criterion that would require a TCLP analysis. Additional analyses may also be performed per disposal facility requirements. In that case, laboratory standard quantitation limits and QC criteria will be used.

Any soil that was excavated with radiation measurements exceeding 3 sigma of the mean background level or sample results exceeding the radiological release criterion for Ra-226 will be segregated and placed in appropriate containers for subsequent transport and disposal under

SAP Worksheet #17 – Sampling Design and Rationale (Continued)

the direction of the DON's LLRW disposal program as directed by the RASO. Any analytical results will accompany the transfer of the LLRW materials.

BUILDING 1121 AND 1323 SURVEYING AND SAMPLING

Buildings 1121 and 1323 are not radiologically contaminated based on past use of the building. However, the interior of the buildings may have been contaminated due to track-in/track-out of soil from the former residents, and windblown radiologically contaminated soil from adjacent excavations may have contaminated the exterior surfaces.

After the remaining floor coverings have been removed to expose the original surfaces, a 100 percent surface scan survey of the first floor and stairwell of each housing unit will be performed using a Ludlum 2360 data logger with 43-37 and 43-68 gas flow proportional detectors. The exterior of the building, to a height of 2 meters, will undergo a 100 percent surface scan using Ludlum 2360 data loggers with 43-37 and 43-68 gas flow proportional detectors. Systematic sampling of the building surfaces will be based on a random start point and sample spacing using the most current version of VSP software with a triangular grid pattern. Twenty systematic samples will be collected per each survey unit (defined as no greater than 100 square meters for Class 1 survey units). At each systematic sample location, a static reading and a swipe sample will be collected. Static readings will be measured in the field using the Ludlum 2360 data loggers, and swipe samples will be analyzed by Curtis and Tompkins for gross alpha/gross beta analysis.

Any areas where the static readings exceed the surface release criteria of 100 dpm/100 cm^2 alpha or 1,000 dpm/100 cm^2 beta for fixed contamination or where the swipe sample results exceed the surface release criteria of 20 dpm/100 cm^2 alpha or 200 dpm/100 cm^2 beta removable contamination will be remediated and disposed of according to the DON's LLRW disposal program as directed by the RASO. After remediation, surveys, including swipe samples for loose contamination, of the remediated areas will be conducted to verify that the contaminated area(s) were successfully remediated.

IMPORT BACKFILL MATERIAL SAMPLING

Imported material to be used as backfill material at NAVSTA TI will be evaluated in accordance with the guidelines established by DTSC in the Information Advisory on Clean Imported Fill Material (DTSC 2001).

Twenty soil samples will be collected from each imported material source prior to use and analyzed initially for Ra-226. If the results are below the release criterion for Ra-226, then Curtis and Tompkins will either analyze those samples again by gamma spectroscopy after an in-growth period and based on the 609 keV Bi-214 gamma energy peak or recalculate the sample results in FSS format by applying an appropriate in-growth correction factor to determine Ra-226 concentration based on the Bi-214 concentration. (An in-growth period is defined as the period after Bi-214 approaches secular equilibrium with Ra-226, which is typically 21 calendar days, and thus the Ra-226 result will be reported based on the Bi-214 result, taking into account

SAP Worksheet #17 – Sampling Design and Rationale (Continued)

this time to achieve secular equilibrium.) While waiting for in-growth results (or after receiving in-growth results below the release criteria), a minimum of four soil samples will be sent to TestAmerica-St. Louis for the following chemical analyses: VOCs, semivolatile organic compounds (SVOCs), pesticides, PCBs, dioxins, metals, and asbestos. Chemical results will be evaluated against criteria listed in SAP Worksheet #15.1.

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 collected and tested for asbestos.

WASTE SAMPLING

Wastes for this project include non-LLRW soil, building debris, and wastewater. Non-LLRW soil will be sampled as discussed in the Excavated Soil Surveying and Sampling section above. Building debris will be characterized based on disposal facility requirements. The number of wastewater samples and analyses will be determined by the wastewater discharge permit for either the NAVSTA TI Publicly Owned Treatment Works or another wastewater discharge avenue on-site.

The wastewater discharge permit requirements for the City and County of San Francisco (Department of Public Works Order No. 158170) include only the analysis of metals, phenols, and cyanide. Those analyses and permit discharge criteria are listed in SAP Worksheet #15.2. In addition to those required analyses, it is assumed that at a minimum radiological analysis, including Ra-226, will be performed (since the wastewater is being generated from radiological contaminated sites). It is also assumed that the COPCs for soil at IR Site 12, which include PAHs, PCBs, dioxins, and lead, will also be required. Therefore, SAP Worksheet #15.2 includes these analyses with the evaluation criteria as to be determined by the Department of Public Works. Furthermore, during the course of this project, additional analyses other than those listed in this SAP may be required prior to discharge or to subsequent disposal. In those cases, laboratory standard quantitation limits and QC criteria will be used.

This page intentionally left blank.

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

Sampling Location / ID Number	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
Reference background area / See SAP Worksheet #27 for Sample ID	Soil	Surface	Ra-226 [a]	The appropriate number of soil samples to be collected will be calculated by MARSSIM (DoD et al. 2000) (and concurred with by RASO).	SAP Worksheet #14
Postexcavation samples from hot spot excavations / See SAP Worksheet #27 for Sample ID	Soil	TBD [b]	Ra-226 [a]	Sample collection will depend on the results of the scan surveys conducted in the excavated hot spot areas. See SAP Worksheet #17 for details on number of samples.	SAP Worksheet #14
Buildings 1121/1323 / See SAP Worksheet #27 for Sample ID	Swipe	Not applicable [c]	Gross Alpha/Gross Beta	TBD [b]	SAP Worksheet #14
Excavated soil on soil screening pads See SAP Worksheet #27 for Sample ID	Soil	Random	Ra-226 [a]	Sample collection will depend on the results of the scan surveys conducted in the soil screening pads. See SAP Worksheet #17 for details on number of samples.	SAP Worksheet #14
Excavated soil chemical samples (not radioactive) / See SAP Worksheet #27 for Sample ID	Soil	Random	Per COPCs for soil at IR Site 12 as follows: PAHs, PCBs, Dioxins, Metals (which include lead), TPH-extractable	One soil sample from each IR site will be collected per 500 cubic yards of soil (with a minimum of two samples collected from any excavated soil unit with a total volume less than 1,000 cubic yards).	SAP Worksheet #14
Import backfill material / See SAP Worksheet #27 for Sample ID	Soil	Random	Ra-226 [a] , VOCs, SVOCs (which include PAHs), Pesticides, PCBs, Dioxins, Metals (which include lead), Asbestos	TBD [d]	SAP Worksheet #14
Wastewater / See SAP Worksheet #27 for Sample ID	Water	Not applicable	Ra-226 [a] , PAHs, PCBs, Dioxins, Metals, Phenols, Cyanide	TBD [e]	SAP Worksheet #14

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table (Continued)

Notes:

[a] Ra-226 will be initially screened by using the 186 keV peak. Some samples may require reanalysis of Ra-226 after an in-growth period as described in SAP Worksheet #17.

[b] The depth cannot be determined until the excavation has been completed.

[c] The number of swipe sample locations cannot be determined until the size and locations of the survey unit and extent of contamination are determined. However, each survey location will be numbered sequentially and with nomenclature that identifies the location of each swipe sample within each survey unit. Swipes samples are not collected at depths but collected on surfaces. Therefore, depth is not applicable.

[d] The number of import backfill samples will be determined in the field based on the number of import material sources sampled. Twenty soil samples will be collected for Ra-226 per source, and a minimum of four samples per source will be collected for chemical analyses.

[e] The number of wastewater samples will be determined in the field based on the discharge permit requirements.

SAP Worksheet #19 – Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference[a]	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Soil	Ra-226 (Curtis and Tompkins)	EPA 901.1 / SOP Section 4.1	Gallon ziplock bag then 250-mL tuna can	~ 1000 g (bag) ~ 300 g (can)	None	Not applicable
Swipe	Gross Alpha/Gross Beta (Curtis and Tompkins)	EPA 9310 / Radiation Chemistry Section 4.2	Envelope with paper swipe	47-mm diameter	None	Not applicable
Soil	VOCs (TestAmerica-St. Louis)	EPA 5035A/8260C / ST-MS-0002	Three 5-g En Core samplers [b]	15 g	4±2°C	48 hours/14 days [d]
Soil	SVOCs (which include PAHs) (TestAmerica-St. Louis)	EPA 3550C/8270D ST-MS-0001	One 8-oz glass jar	8 oz	4±2°C	14 days/40 days [d]
Soil	Pesticides (TestAmerica-St. Louis)	EPA 3550C/8081B / ST-GC-0016	One 8-oz glass jar	8 oz	4±2°C	14 days/40 days [d]
Soil	PCBs (TestAmerica-St. Louis)	EPA 3550C/8082A / ST-GC-0015	One 8-oz glass jar	8 oz	4±2°C	14 days/40 days [d]
Soil	Dioxins (TestAmerica-West Sacramento)	EPA 8290 / WS-ID-0005	One 8-oz glass jar	8 oz	4±2°C	30 days/45 days [d]

SAP Worksheet #19 – Analytical SOP Requirements Table (Continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference[a]	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Soil	TPH-extractable (TestAmerica-St. Louis)	EPA 3550C/8015B / ST-GC-0005	One 8-oz glass jar	8 oz	4±2°C	14 days/40 days [d]
Soil	Metals (which include lead) (TestAmerica-St. Louis)	EPA 3050B/6020A and 7471B (mercury) / ST-MT-0001 / ST-MT-0007	One 8-oz glass jar	8 oz	4±2°C	180 days [c] / 28 days [c] (mercury)
Soil	Asbestos (AmeriSci)	CARB 435 or equivalent / Section III-A	One 8-oz glass jar	8 oz	4±2°C	Not applicable

SAP Worksheet #19 – Analytical SOP Requirements Table (Continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference[a]	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Water	Radium-226 (TestAmerica-St. Louis)	EPA 903.0 / ST-RD-0403	One 1 L, poly/glass	1 L	HNO_3 pH < 2	180 days [c]
Water	PAHs (TestAmerica-St. Louis)	EPA 3510C/8270D ST-MS-0001	Two 1 L, glass	2 L	4±2°C	7 days/40 days
Water	PCBs (TestAmerica-St. Louis)	EPA 3510C/8082A / ST-GC-0015	Two 1 L, glass	2 L	4±2°C	7 days/40 days
Water	Dioxins (TestAmerica-West Sacramento)	EPA 8290 / WS-ID-0005	Two 1 L, glass	2 L	4±2°C	30 days/45 days
Water	Metals (TestAmerica-St. Louis)	EPA 3010A/6020A and 7470A (mercury)/ ST-MT-0001 and ST-MT-0005	One 500-mL poly bottle	500 mL	pH ≤ 2 w/HNO_3	180 days [c]
Water	Phenols (TestAmerica-St. Louis)	EPA 420.4 / ST-WC-0017	Two 1-L amber bottles	2 L	pH ≤ 2 w/sulfuric acid, 4±2°C	28 days [c]
Water	Cyanide (TestAmerica-St. Louis)	EPA 9010C / ST-WC-0002	One 500-mL poly bottle	500 mL	pH ≤ 2 w/sodium hydroxide, 4±2°C	14 days [c]

Notes:
Sample containers such as glass jars and water containers may be combined for analyses as directed by the laboratory.

[a] Analytical SOPs are provided in Appendix C of this SAP.

[b] If En Core samplers cannot be used due to saturated soil, then only the 8-ounce jar will be used, and VOC analysis will be conducted from the jar sample.

[c] The time listed is the maximum holding time for the analysis. Preparation time is included in the analytical method holding time.

[d] The time listed is the maximum holding time for the preparation/analysis.

This page intentionally left blank.

SAP Worksheet #20 – Field Quality Control Sample Summary Table

The following table applies only to chemical analyses for import backfill samples. (Field QC samples are not applicable to radiological, asbestos, or wastewater analyses.) The only field QC samples required are MS/MSDs. (Field duplicate and blanks are not applicable as described in SAP Worksheet #12.)

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Blanks	No. of VOA Trip Blanks	No. of PT Samples	Total No. of Samples to Lab
Soil	VOCs	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	SVOCs (which include PAHs)	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	Pesticides	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	PCBs	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	Dioxins	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]
Soil	Metals (which include lead)	TBD [a]	Not applicable	1 per 20 samples	Not applicable	Not applicable	Not applicable	Not applicable	TBD [a]

Notes:

[a] The number of sample locations (and thus the number of total samples to the laboratory) will be determined in the field based on the number of import backfill sources sampled.

This page intentionally left blank.

SAP Worksheet #21 – Project Sampling SOP References Table

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP 1	Radiation and Contamination Surveys, Revision 0, October 2012	TtEC	See SOP attached in Appendix A	N	None
SOP 6	Sampling Procedures for Radiological Surveys, Revision 0, October 2012	TtEC	See SOP attached in Appendix A	N	None

This page intentionally left blank.

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
Ludlum Mod 3 or 12 Meter w/ 44-9 detector (or equivalent); Ludlum Model 19 (or equivalent); Ludlum 2350-1 w/ 44-10 detector (or equivalent); Ludlum 2360 w/ 43-68 detector (or equivalent); Ludlum 2360 w/ 43-89 detector (or equivalent); Eberline Model RO-20 (or equivalent); GR 135 Exploranium (or equivalent); Ludlum Model 177 w/ HP-210 detector (or equivalent)	1. Calibrate at lab featuring NIST traceable standards 2. Operational checks and verifications	1. Annually 2. Daily	1. Pass/fail 2. +/- 20% of baseline response criteria	1. If recalibration fails, then instrument combo is retained/exchanged by instrument vendor. 2. If checks and verifications fail, then instrument combo is placed OOS/returned to instrument vendor for repair/exchange. Subsequently, data collected with instrument since previous QC check will be reviewed.	Site Instrument Mechanic or Radiological Control Technician under direction of Project Supervisor (with oversight from project/ license RSO)	SOP 2 (as provided in Appendix A in this SAP)	None

SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table (Continued)

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
F&J High/Lo Vol Air Sampler (or equivalent	1. Calibrate at lab featuring manufacturer air flow acceptance standards and equipment 2. Operational checks and verifications	1. Annually 2. Daily	Pass/fail	If checks and verifications fail, then instrument combo is placed OOS/returned to instrument vendor for repair/ exchange.	Site Instrument Mechanic or Radiological Control Technician under direction of Project Supervisor (with oversight from project/ license RSO)	SOP 2 (as provided in Appendix A in this SAP)	None

SAP Worksheet #23 – Analytical SOP References Table

Lab SOP Number [a, b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
SOP Section 4.1	Determination of Gamma-Ray Radioactivity in Soils Using Modified EPA Method 901.1 Revision 2.1, 11/21/11	Screening or Definitive	Soil Ra-226	EG&G Ortec Gamma Spectroscopy System	Curtis and Tompkins	N
Radiation Chemistry Section 4.2	Determination of Gross Alpha and Beta Radioactivity on Smears and Air Sample Filters Using Protean Gas Proportional Counting System WPC 1050 Revision 1.1, 11/18/11	Screening or Definitive	Smear/Swipe Gross Alpha/Gross Beta	Protean WPC 1050 Alpha/Beta Counting System	Curtis and Tompkins	N
ST-RD-0403	Low Background Gas Flow Proportional Counting System Analysis Revision 13, 06/15/12	Definitive	Water Radium-226	Gas Flow Proportional Counter	TestAmerica-St. Louis	N
ST-MS-0002	Determination of Volatile Organics by GC/MS Revision 18, 03/19/12	Definitive	Soil VOCs	GC/MS	TestAmerica-St. Louis	N
ST-MS-0001	GC/MS Semivolatiles Analysis Revision 13, 12/30/11	Definitive	Soil / Water SVOCs / PAHs	GC/MS	TestAmerica-St. Louis	N
ST-GC-0016	Pesticide Gas Chromatographic Analysis Revision 13, 05/31/12	Definitive	Soil Pesticides	GC	TestAmerica-St. Louis	N
ST-GC-0015	PCB GC Analysis Revision 10, 09/30/11	Definitive	Soil / Water PCBs	GC	TestAmerica-St. Louis	N
WS-ID-0005	Analysis of Samples for Polychlorinated Dioxins and Furans by HRGC/HRMS Revision 7.4, 01/14/11	Definitive	Soil / Water Dioxins	GC/HRMS	TestAmerica-West Sacramento	N
ST-GC-0005	Extractable Total Petroleum Hydrocarbons by GC-FID Revision 16, 08/19/11	Definitive	Soil TPH-extractable	GC/FID	TestAmerica-St. Louis	N

SAP Worksheet #23 – Analytical SOP References Table (Continued)

Lab SOP Number [a, b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
ST-MT-0001	Analysis of Metals by Inductively Coupled Plasma/Mass Spectroscopy Revision 20, 01/20/12	Definitive	Soil/Water Metals	ICP-MS	TestAmerica-St. Louis	N
ST-MT-0007 ST-MT-0005	Preparation and Analysis of Mercury in Solid Samples by Cold Vapor Atomic Absorption Spectroscopy Revision 12, 03/20/12 Preparation and Analysis of Mercury in Aqueous Samples by CVAA Revision 12, 03/20/12	Definitive	Soil Mercury Water Mercury	Cold Vapor AA	TestAmerica-St. Louis	N
ST-WC-0017	Phenolics, Total Recoverable Revision 9, 05/11/12	Definitive	Water Phenols	Spectrophotometer	TestAmerica-St. Louis	N
ST-WC-0002	Analysis of Cyanide in Water and Soil Revision 15, 03/20/12	Definitive	Water Cyanide	Traacs	TestAmerica-St. Louis	N
Section III-A	Analysis of Asbestos in Bulk Building Materials by Polarized Light Microscopy Revision 2, 09/20/06	Definitive	Soil Asbestos	Microscopy	AmeriSci	N

Notes:

[a] Analytical SOP revision number and date listed are current as of the date this SAP was published.

[b] Analytical SOPs are provided in Appendix C of this SAP.

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference [a, b]
EG&G Ortec Gamma Spectroscopy System	Ortec Gamma Vision-32 A66-B32 Operations Manual	Annual, after maintenance and at the request of the lab manager	+/- 10% for the radionuclides used for calibration	• Recalibration • Instrument maintenance • Notify lab manager	Curtis and Tompkins Laboratory Supervisor	SOP Section 4.1
Protean WPC 1050 Alpha/Beta Counting System	IPC 9025 Operations Manual, Protean Instrument Manual	Annual, after maintenance and at the request of the lab manager	+/- 10% for the radionuclides used for calibration	• Recalibration • Instrument maintenance • Notify lab manager	Curtis and Tompkins Laboratory Supervisor	Radiation Chemistry Section 4.2
Gas Flow Proportional Counter	• Plateau generation and/or verification • Discriminator setting • Initial long background count • Mass attenuated efficiency calibration • Eight source dual/single calibration curves	Annual	• Plot efficiencies vs. masses • Calculate equation of curve – degree ≤3 • Remove outliers >15% deviation from theoretical values but not more than 20% of total points • Calculate coefficient of determination (R^2). R^2 must be ≥0.9 • Verify calibration with second source standard count – must be within 30 percent of true value and mean across all detectors <10%	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica-St. Louis Group Leader	ST-RD-0403
GC/MS	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	%RSD<20% all compounds, Relative Response Factor meet method criteria	Repeat calibration	TestAmerica-St. Louis Analyst	ST-MS-0002
GC/MS	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ±30% of expected	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-MS-0002

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference [a, b]
GC/MS	Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	+/- 20%D criteria for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if 2nd CV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-MS-0002
GC/MS	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	%RSD<20% all compounds, Relative Response Factor meet method criteria	Repeat calibration	TestAmerica-St. Louis Analyst	ST-MS-0001
GC/MS	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ±30% of expected	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-MS-0001
GC/MS	Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	+/- 20%D criteria for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if second CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-MS-0001
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	RSD for each analyte ≤ 20%	Repeat calibration	TestAmerica-St. Louis Analyst	ST-GC-0016
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-GC-0016
GC	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	Re-inject CCV; if passes rerun previous 10 samples and continue run; if second CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0016

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference [a, b]
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Mean RSD for each PCB ≤ 20%	Recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0015
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 20% of expected value (initial source)	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-GC-0015
GC	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 20% of expected value from the ICAL	Re-inject CCV; if passes rerun previous 10 samples and continue run; if 2nd CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0015
GC/HRMS	Initial Calibration (ICAL) – five-point ICAL	ICAL prior to sample analysis, as needed by the failure of calibration verification, and when a new lot is used as a standard source for calibration verification, internal standard or recovery standard solutions.	%RSD<20% all compounds, Relative Response Factor meet method criteria	Repeat calibration	TestAmerica-West Sacramento Analyst	WS-ID-0005
GC/HRMS	Second Source calibration verification	Immediately following ICAL	Value of second source for all analytes within ±30% of expected	Rerun ICV one time, second failure requires recalibration	TestAmerica-West Sacramento Analyst	WS-ID-0005

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference [a, b]
GC/HRMS	Calibration Verification (CV)	At the beginning of each 12-hour period, and at the end of each analytical sequence.	+/- 20%D criteria for all analytes	Re-inject CV; if passes rerun previous 10 samples and continue run; if second CCV fails, recalibrate	TestAmerica-West Sacramento Analyst	WS-ID-0005
GC/FID	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Linear mean RSD ≤ 20%	Recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0005
GC/FID	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Rerun ICV one time, second failure requires recalibration	TestAmerica-St. Louis Analyst	ST-GC-0005
GC/FID	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: Every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 15% of expected value from the ICAL	Re-inject CCV; if passes rerun previous 10 samples and continue run; if second CCV fails, recalibrate	TestAmerica-St. Louis Analyst	ST-GC-0005
ICP-MS	Initial Calibration (ICAL) – minimum one high standard and a calibration blank	Daily initial calibration prior to sample analysis	Three standards and a blank. Correlation Coefficient of ≥ 0.998	Recalibrate	TestAmerica-St. Louis Analyst	ST-MT-0001
ICP-MS	Second Source Calibration Verification (ICV)	Once after each initial calibration, prior to sample analysis	Value of second source for all analyte(s) within ± 10% of expected	Recalibrate	TestAmerica-St. Louis Analyst	ST-MT-0001
ICP-MS	Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the analysis sequence	All analytes within + 10% of expected value	Recalibrate – rerun 10 samples previous to failed CCV.	TestAmerica-St. Louis Analyst	ST-MT-0001

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference [a, b]
Cold Vapor AA	Initial Calibration (ICAL)	Daily initial calibration prior to sample analysis	Correlation coefficient R>=0.995 for linear regression	Recalibrate	TestAmerica-St. Louis Analyst	ST-MT-0007 ST-MT-0005
Cold Vapor AA	Second Source Calibration Verification (ICV)	Once after each initial calibration, prior to sample analysis	Value of second source for all analyte(s) within ± 10% of expected value (second source)	Recalibrate	TestAmerica-St. Louis Analyst	ST-MT-0007 ST-MT-0005
Cold Vapor AA	Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the analysis sequence	All analytes within + 20% of expected value	Recalibrate – rerun 10 samples previous to failed CCV.	TestAmerica-St. Louis Analyst	ST-MT-0007 ST-MT-0005
Spectrophotometer	Initial Calibration	Daily – minimum of 5 points	Acceptable calibration must have a correlation coefficient ≥ 0.995.	Recalibrate	TestAmerica-St. Louis Analyst	ST-WC-0017
Spectrophotometer	ICV	Immediately after the last calibration standard	Acceptance limit is 85%–115%.	Recalibrate	TestAmerica-St. Louis Analyst	ST-WC-0017
Spectrophotometer	CCV	Every 10 samples during the sequence and after the last analytical sample	The CCV must be within the 15%D criteria.	Recalibrate and reanalyze all analytical samples analyzed since the last compliant CCV	TestAmerica-St. Louis Analyst	ST-WC-0017

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference [a, b]
Traacs	Initial Calibration	Daily – minimum of 5 points	Correlation coefficient of 0.995 or greater	Recalibrate	TestAmerica-St. Louis Analyst	ST-WC-0002
Traacs	ICV	Immediately after the last calibration standard	+/- 15% of true value	Recalibrate	TestAmerica-St. Louis Analyst	ST-WC-0002
Traacs	CCV	Every 10 samples during the sequence and after the last analytical sample	± 10% of true value. The high and low distilled check standard must be ± 10%.	Recalibrate and reanalyze all analytical samples analyzed since the last compliant CCV	TestAmerica-St. Louis Analyst	ST-WC-0002

Notes:

[a] Analytical SOP revision number and date listed are current as of the date this SAP was published.

[b] Analytical SOPs are provided in Appendix C of this SAP.

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference [a, b]
EG&G Ortec Gamma Spectroscopy System	Clean cave; fill LNO_2	Physical check	Physical check	Weekly	Acceptable background	• Recalibrate • Instrument maintenance • Consult lab manager	Curtis and Tompkins Laboratory Supervisor	SOP Section 4.1
	Background check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	• Recalibrate • Instrument maintenance • Consult lab manager	Curtis and Tompkins Laboratory Supervisor	SOP Section 4.1
	Source check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	• Recalibrate • Instrument maintenance • Consult lab manager	Curtis and Tompkins Laboratory Supervisor	SOP Section 4.1
Protean WPC 1050 Alpha/Beta Counting System	Alpha source check/check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	• Recalibrate • Instrument maintenance • Consult lab manager	Curtis and Tompkins Laboratory Supervisor	Radiation Chemistry Section 4.2
	Beta source check/check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	• Recalibrate • Instrument maintenance • Consult lab manager	Curtis and Tompkins Laboratory Supervisor	Radiation Chemistry Section 4.2
	Background blank/check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	• Recalibrate • Instrument maintenance • Consult lab manager	Curtis and Tompkins Laboratory Supervisor	Radiation Chemistry Section 4.2
	P10 gas supply	Physical check	Physical check	Daily	Adequate	Resupply	Curtis and Tompkins Laboratory Supervisor	Radiation Chemistry Section 4.2

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Continued)

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference [a, b]
Gas Flow Proportional Counter	1. Clean instrument 2. Inspect windows 3. QA check	1. Physical check 2. Physical check 3. Background and source count	1. Physical check 2. Physical check 3. Check deviation	1. Daily 2. High counts and/or background 3. Daily	1. None applicable 2. No physical defects 3. Within 3 sigma of 20 day population	• Recalibrate • Instrument maintenance • Consult with Technical Director	TestAmerica-St. Louis Group Leader / Analyst	ST-RD-0403
GC/MS GC GC/HRMS GC/FID ICP-MS Cold Vapor AA	Parameter Setup	Physical check	Physical check	Initially; prior to DCC	Predetermined optimum parameter settings	Reset if incorrect	TestAmerica-St. Louis Analyst	ST-MS-0002, ST-MS-0001, ST-GC-0016, ST-GC-0015, WS-ID-0005, ST-GC-0005, ST-MT-0001, ST-MT-0005, ST-MT-0007, ST-MT-0005
GC/MS GC/HRMS	Tune Check	Instrument Performance	Conformance to instrument tuning	Initially; prior to DCC	Compliance to ion abundance criteria	Repeat tune check to rule out standard degradation or inaccurate injection. If problem persists, perform retune the instrument and repeat tune check.	TestAmerica-St. Louis Analyst TestAmerica-West Sacramento Analyst	ST-MS-0002, ST-MS-0001, WS-ID-0005

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Continued)

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference [a, b]
ICP-MS	ICS	Instrument Performance	Conformance to interference check	Prior to sample analysis	Within + 20% of expected value	Terminate analysis, reanalyze ICS to rule out standard degradation or inaccurate injection. If problem persists, perform instrument maintenance, repeat calibrations and reanalyze all associated samples.	TestAmerica-St. Louis Analyst	ST-MT-0001
ICP-MS	ICB/CCB	Instrument Performance	Instrument contamination check	After every calibration verification	ICB: No analytes detected > RL; CCB: no analyte detected > 3X MDL	Determine possible source of contamination and apply appropriate measure to correct the problem. Reanalyze calibration blank and all associated samples.	TestAmerica-St. Louis Analyst	ST-MT-0001
Cold Vapor AA	ICB/CCB	Instrument Performance	Instrument contamination check	After every calibration verification	No analytes detected > RL	Determine possible source of contamination and apply appropriate measure to correct the problem. Reanalyze calibration blank and all associated samples.	TestAmerica-St. Louis Analyst	ST-MT-0007 ST-MT-0005
Spectrophoto-meter	Change membrane as needed	Performance	QC check	Day of use	Meet method criteria	Contact repair service – reanalyze any affected samples.	TestAmerica-St. Louis Analyst	ST-WC-0017

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Continued)

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference [a, b]
TRAACS	Check air pressure, change tubing as needed, finish run with wash out	Performance	QC check	Day of use	Meet method criteria	Contact repair service – reanalyze any affected samples.	TestAmerica-St. Louis Analyst	ST-WC-0002

Notes:

[a] Analytical SOP revision number and date listed are current as of the date this SAP was published.

[b] Analytical SOPs are provided in Appendix C of this SAP.

SAP Worksheet #26 – Sample Handling System

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Sampler / TtEC
Sample Packaging (Personnel/Organization): Sampler / TtEC
Coordination of Shipment (Personnel/Organization): Sampler / TtEC
Type of Shipment/Carrier: Courier or FedEx®
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian / Curtis and Tompkins or TestAmerica-St. Louis
Sample Custody and Storage (Personnel/Organization): Sample Custodian / Curtis and Tompkins or TestAmerica-St. Louis
Sample Preparation (Personnel/Organization): Sample preparation personnel / Curtis and Tompkins or TestAmerica-St. Louis
Sample Determinative Analysis (Personnel/Organization): Analyst / Curtis and Tompkins or TestAmerica-St. Louis
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): 90 calendar days
Sample Extract/Digestate Storage (No. of days from extraction/digestion): up to 40 calendar days depending on method holding times
Biological Sample Storage (No. of days from sample collection): Not applicable
SAMPLE DISPOSAL/ARCHIVE
Personnel/Organization: Sample Custodian / Curtis and Tompkins or TestAmerica-St. Louis
Number of Days from Analysis: Chemical samples are 90 calendar days. Radiological samples are archived at the project site.

This page intentionally left blank.

SAP Worksheet #27 – Sample Custody Requirements Table

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, so that the sample cannot be reached without breaking the seal

Appendix D presents an example of the COC record. The COC record lists each sample and the individuals performing the sample collection, shipment, and receipt. Appendix D 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. 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 project or company affiliation will accompany each signature. When FedEx is used to ship samples to an off-site laboratory, the waybill number and courier name (i.e., FedEx) will be recorded on the COC. The shipping container will be secured with two custody seals, thereby allowing for custody to be maintained by the shipping personnel until receipt by the laboratory.

Sample custody will be the responsibility of sampling personnel from the time of sample collection until the samples are accepted by the laboratory. Thereafter, the laboratory performing the analysis will maintain custody. The sample custodian will sign the COC, inventory each shipment, and note on the original COC record any discrepancy in the sample custody, temperature of the cooler for chemical samples, or broken sample containers. The Curtis and Tompkins laboratory will note discrepancies and will immediately notify the Laboratory Coordinator. TestAmerica-St. Louis will also note any discrepancies and notify the Project Chemist. The laboratory will have a system for tracking samples consistent with the Quality Systems Manual (QSM) (DoD 2010). The Curtis and Tompkins laboratory will archive the samples collected from NAVSTA TI and maintain their custody. Radiological soil samples submitted to TestAmerica-St. Louis shall be returned to NAVSTA TI for archiving and disposition. Chemical samples submitted to TestAmerica-St. Louis shall be held for up to 90 calendar days after sample collection, at which time the samples will be disposed of by the laboratory.

SAP Worksheet #27 – Sample Custody Requirements Table (Continued)

In addition to providing a custody exchange record for the samples, the COC record serves as a formal request for sample analyses. The COC records will be completed, signed, and distributed as follows:

- A copy provided to the laboratory with the samples
- A copy retained on-site for inclusion in the project files
- A copy e-mailed to the Project Chemist on a daily basis to allow tracking of samples sent to TestAmerica-St. Louis to confirm laboratory receipt of samples

SAMPLE NUMBERING

The sample number will be recorded in the field logbook, on the labels, and on 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. Samples will be uniquely designated using a numbering system that identifies the CTO number, location/type of sample, and a sequential number as follows:

- Reference Area: **WW-IR12-RA-UU**, where:

  WW – CTO number
  IR12 – Abbreviation for IR Site 12
  RA – Identifier to indicate that the sample is "reference area" sample
  UU – Two-character consecutive sample number starting with 01 (number of samples collected from each reference area)

- Survey Pads: **WW-IR12-PQQQ-UU**, where:

  WW – CTO number
  IR12 – Abbreviation for IR Site 12
  P – Identifier to indicate that the sample is a screening "pad" sample
  QQQ – Three-character consecutive pad number starting with 001; continues consecutively throughout the CTO with no repeated numbers
  UU – Two-character consecutive sample number starting with 01 (number of samples collected from each survey pad)

- Excavation Hot Spot Survey Unit: **WW-IR12-E-HSYY-UU**, where:

  WW – CTO number
  IR12 – Abbreviation for IR Site 12
  E – Identifier to indicate that the sample is from an "excavation"
  HS – Identifier to indicate that the sample is from a "hot spot"
  YY – Two-character hot spot location or excavation survey unit number
  UU – Two-character consecutive sample number starting with 01 (number of samples collected from each survey unit)

- Buildings 1121 and 1323 Survey Units: **WW-IR12-BXXXX-Z-SYYY-UU**, where:

  WW – CTO number

SAP Worksheet #27 – Sample Custody Requirements Table (Continued)

IR12 – Abbreviation for IR Site 12
BXXXX – Identifier to indicate "Building 1121" or "Building 1323"
Z – One-character; use E to indicate "exterior" sample and I to indicate "interior" sample
S – Identifier to indicate "survey" unit
YYY – Three-character consecutive survey unit number starting with 001; continues consecutively throughout the CTO with no repeated numbers
UU – Two-character consecutive sample number starting with 01 (number of samples collected from each survey unit)

- Soil samples collected from import backfill material sources: **WW-IR12-IF-XXX-UU**, where:

  WW – CTO number
  IR12 – Abbreviation for IR Site 12
  IF – Identifier to indicate "import fill" samples
  XXX – Three-character designation for import backfill source name
  UU – Two-character consecutive sample number starting with 01 (number of samples collected from each source)

- Wastewater samples: **WW-IR12-WW-UU**, where:

  WW – CTO number
  IR12 – Abbreviation for IR Site 12
  WW – Identifier to indicate "wastewater" sample
  UU – Two-character consecutive sample number starting with 01 (number of samples collected from wastewater)

SAMPLE PACKAGING

Radiological Samples

Sample packaging and shipping will be performed in accordance with SOP 6 (as provided in Appendix A in this SAP), which governs sampling procedures for radiological surveys.

Chemical Samples

Immediately after sample labeling, custody seals will be affixed to each sample container. Each container will be placed in double-resealable plastic bags to protect the samples from moisture. For volatile organic analysis (VOA) vials and En Core samples, the custody seal will be placed on the outside of the first resealable bag; then the containers will be placed in a second resealable bag. This will prevent any contact with the adhesive from the custody seal and the samples. VOA vials will be wrapped with bubble wrap (if transported by a commercial carrier), placed in a resealable bag, and then placed in another resealable bag following application of a custody seal over the first bag.

Samples to be transported to the laboratory will be shipped in coolers. Each cooler will be shipped with a temperature blank. A temperature blank is a container filled with tap water and

SAP Worksheet #27 – Sample Custody Requirements Table (Continued)

stored in the cooler during sample collection and transportation. The sample cooler will be lined with a plastic bag. Double-bagged ice will be added inside the plastic bag 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. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

For air (FedEx) delivery, the COC record will include the air bill number, and the "Received By" box will be labeled with the commercial courier's name. 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 air bill will be placed on the cooler and secured with clear tape. The air bill will be completed for priority overnight delivery and placed in the pouch. If multiple coolers are being shipped, the original air bill will be placed on the cooler with the COC record, and copies of the air bill will be placed on the other coolers. The number of packages should be included on each air bill (1 of 2, 2 of 2). Saturday deliveries, if required, should be coordinated with the laboratory in advance via the Project Chemist, and field sampling personnel or their designee must ensure that Saturday delivery stickers are placed on each cooler by the commercial courier.

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe

Matrix: Soil
Analytical Group: Ra-226
Analytical Method/SOP Reference [a] : EPA 901.1 / SOP Section 4.1 (Curtis and Tompkins)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Background Sample	Daily	Absolute value < MDA	[b]	Curtis and Tompkins or TestAmerica-St. Louis Analyst	Accuracy	Absolute value < MDA
LCS	Weekly Weekly and may be performed 1 per preparatory batch (defined as ≤ 20 samples) for FSS samples	Gamma source check ± 20% of known activity Prepared LCS within 13 ± 6 pCi/g for Ra-226	[c]	Curtis and Tompkins Analyst	Accuracy	Gamma source check ± 20% of known activity Prepared LCS within 13 ± 6 pCi/g for Ra-226
Sample Duplicate	1 per preparatory batch (defined as ≤ 20 samples)	RPD ≤40% or RER ≤1	[d]	Curtis and Tompkins or TestAmerica-St. Louis Analyst	Precision	RPD ≤40% or RER ≤1

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Matrix: Swipe
Analytical Group: Gross Alpha/Gross Beta
Analytical Method/SOP Reference [a] : EPA 9310 / Radiation Chemistry Section 4.2 (Curtis and Tompkins)

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Background Determination	Daily	As specified in laboratory SOPs	As specified in laboratory SOPs	Curtis and Tompkins or TestAmerica-St. Louis Analyst	Accuracy	As specified in laboratory SOPs

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Matrix: Soil
Analytical Group: VOCs
Analytical Method/SOP Reference [a]: EPA 8260C / ST-MS-0002

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[e]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Surrogate	Per sample, blank, LCS, LCSD, MS, MSD	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Matrix: Soil
Analytical Group: SVOCs (which include PAHs)
Analytical Method/SOP Reference [a] : EPA 8270D / ST-MS-0001

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[e]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Surrogate	Per sample, blank, LCS, LCSD, MS, MSD	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Matrix: Soil
Analytical Group: Pesticides
Analytical Method/SOP Reference [a] : EPA 8081B / ST-GC-0016

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[e]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Surrogate	Per sample, blank, LCS, LCSD, MS, MSD	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Matrix: Soil
Analytical Group: PCBs
Analytical Method/SOP Reference [a] : EPA 8082A / ST-GC-0015

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[e]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Surrogate	Per sample, blank, LCS, LCSD, MS, MSD	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Matrix: Soil
Analytical Group: Dioxins
Analytical Method/SOP Reference [a] : EPA 8290 / WS-ID-0005

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL (OCDD is considered a common laboratory contaminant and treated accordingly.)	[b]	TestAmerica-West Sacramento Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-West Sacramento Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[e]	TestAmerica-West Sacramento Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Matrix: Soil
Analytical Group: TPH-extractable
Analytical Method/SOP Reference [a] : EPA 8015B / ST-GC-0005

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[e]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Surrogate	Per sample, blank, LCS, LCSD, MS, MSD	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Matrix: Soil
Analytical Group: Metals (which include lead) / Lead
Analytical Method/SOP Reference [a] : EPA 6020A and 7471B / ST-MT-0001 and ST-MT-0007

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
Calibration Blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > 2 × MDL	[b]	TestAmerica-St. Louis Analyst	Accuracy	No analytes detected > 2 × MDL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS and/or MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[e]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Serial dilution	Each new sample matrix	1:5 dilution must agree within ±10% of original determination	[g]	TestAmerica-St. Louis Analyst	Accuracy	1:5 dilution must agree within ±10% of original determination
Post-digestion spike	When serial dilution or matrix spike fails	75–125%	[h]	TestAmerica-St. Louis Analyst	Accuracy	75–125%

SAP Worksheet #28.1 – Laboratory QC Samples Table – Soil/Swipe (Continued)

Notes:

[a] Analytical SOPs are provided in Appendix C of this SAP.

[b] Any sample associated with a blank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.

[c] Reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.

[d] Reprep and reanalyze the sample and duplicate in the associated preparatory batch for failed analytes if sufficient sample material is available and the sample is homogeneous. If RPD/RER still out of range, report as matrix interference confirmed and write a nonconformance. If reanalysis is in range, re-extract samples in batch.

[e] The data will be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.

[f] Reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.

[g] Perform post-digestion spike addition if serial dilution does not meet criteria.

[h] Reanalyze post-digestion spike.

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water

Matrix: Water
Analytical Group: Radium-226
Analytical Method/SOP Reference [a] : EPA 903.0 / ST-RD-0403

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < MDA	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < MDA
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	70–130% for americium-241, Cs-137, cobalt-60 (and Ra-226 for 903.0) RPD ≤40% and/or RER ≤1	[c]	TestAmerica-St. Louis Analyst	Accuracy	70–130% for americium-241, Cs-137, cobalt-60 (and Ra-226 for 903.0) RPD ≤40% and/or RER ≤1
Sample Duplicate	1 per preparatory batch (defined as ≤ 20 samples)	RPD ≤40% and/or RER ≤1	[d]	TestAmerica-St. Louis Analyst	Accuracy	RPD ≤40% and/or RER ≤1
Tracer	Per sample, blank, LCS, LCSD, sample duplicate	EPA 903.0 only: Barium tracer 40–110%	[e]	TestAmerica-St. Louis Analyst	Accuracy	EPA 903.0 only: Barium tracer 40–110%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: PAHs
Analytical Method/SOP Reference [a] : EPA 8270D / ST-MS-0001

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Surrogate	Per sample, blank, LCS, LCSD, MS, MSD	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[g]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: PCBs
Analytical Method/SOP Reference [a] : EPA 8082A / ST-GC-0015

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Surrogate	Per sample, blank, LCS, LCSD, MS, MSD	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[g]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Dioxins
Analytical Method/SOP Reference [a] : EPA 8290 / WS-ID-0005

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL (OCDD is considered a common laboratory contaminant and treated accordingly.)	[b]	TestAmerica-West Sacramento Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-West Sacramento Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS/MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-West Sacramento Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Metals
Analytical Method/SOP Reference [a] : EPA 6020A and 7470A / ST-MT-0001 and ST-MT-0005

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
Calibration Blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > 2 × MDL	[b]	TestAmerica-St. Louis Analyst	Accuracy	No analytes detected > 2 × MDL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS and/or MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
Serial dilution	Each new sample matrix	1:5 dilution must agree within ±10% of original determination	[g]	TestAmerica-St. Louis Analyst	Accuracy	1:5 dilution must agree within ±10% of original determination
Post-digestion spike	When serial dilution or matrix spike fails	75–125%	[h]	TestAmerica-St. Louis Analyst	Accuracy	75–125%

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Matrix: Water
Analytical Group: Phenols
Analytical Method/SOP Reference [a]: EPA 420.4 / ST-WC-0017

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS and/or MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

Matrix: Water
Analytical Group: Cyanide
Analytical Method/SOP Reference [a]: EPA 9010C / ST-WC-0002

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (defined as ≤ 20 samples)	Analytes < ½ QL	[b]	TestAmerica-St. Louis Analyst	Accuracy	Analytes < ½ QL
LCS and/or LCSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[c]	TestAmerica-St. Louis Analyst	Accuracy	Per DoD QSM/laboratory limits listed in Appendix B in this SAP
MS and/or MSD	1 per preparatory batch (defined as ≤ 20 samples)	Per DoD QSM/laboratory limits listed in Appendix B in this SAP	[f]	TestAmerica-St. Louis Analyst	Accuracy/ Precision	Per DoD QSM/laboratory limits listed in Appendix B in this SAP

SAP Worksheet #28.2 – Laboratory QC Samples Table – Water (Continued)

Notes:

[a] Analytical SOPs are provided in Appendix C of this SAP.

[b] Any sample associated with a blank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.

[c] Reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.

[d] Reprep and reanalyze the sample and duplicate in the associated preparatory batch for failed analytes if sufficient sample material is available and the sample is homogeneous. If RPD/RER still out of range, report as matrix interference confirmed and write a nonconformance. If reanalysis is in range, re-extract samples in batch.

[e] Truncate carriers/tracers above 100% recovery to eliminate low biased results. Reprep and reanalyze sample if carrier is low (indicating high biased results) if there is activity in the sample above the reporting limit. No reanalysis if matrix interference is nonconformance during sample preparation.

[f] The data will be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.

[g] Perform post-digestion spike addition if serial dilution does not meet criteria.

[h] Reanalyze post-digestion spike.

This page intentionally left blank.

SAP Worksheet #29 – Project Documents and Records Table

Document	Where Maintained
Work Plan, which includes attachments such as this SAP	TtEC project file; NAVFAC SW Administrative Record
Field logbook	TtEC project file
Field forms	TtEC project file
COC	Curtis and Tompkins/TestAmerica-St. Louis Laboratories; NAVFAC SW Administrative Record will receive a copy of definitive data COC
Shipping records	TtEC project file
Field surveillance reports	TtEC project file
Field Change Requests	TtEC project file
Curtis and Tompkins laboratory results report	Curtis and Tompkins Laboratory and TtEC project file
Curtis and Tompkins/TestAmerica-St. Louis laboratory data package (EPA Level III- or IV-equivalent)	Curtis and Tompkins/TestAmerica-St. Louis Laboratories and TtEC project file; project file copy will subsequently be sent to NAVFAC SW Administrative Record
Data validation report	Validator and TtEC project file; project file copy will subsequently be sent to NAVFAC SW Administrative Record

Field documentation associated with sampling activities includes field logbooks, sample labels, COCs, sample shipping records, field surveillance reports, and Field Change Request (FCR) forms. In addition, laboratory and data validator documentation will be generated during this project. These types are described in the following sections.

Field Logbook

A permanently bound field logbook with consecutively numbered pages, used for sampling activities only, will be assigned to this project. 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. All entries will be recorded in indelible black or blue ink. At the end of each work day, 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

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- 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
- Descriptions of deviations from this SAP
- 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

Sample Labels

For radiological sample collection, a resealable plastic bag will be used to collect soil/sediment samples. Two sample labels will be computer generated at the time the COC is prepared. One label will be affixed to the resealable plastic bag and the second will be affixed to the prepared tuna can during sample processing. (If not computer generated, labels will then be hand-written using indelible black or blue ink.) An example sample label is provided in Appendix D. The label will contain the following:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock) from the start of sampling
- Sampler's initials
- Sample weight (data completed by laboratory)

If containers are too small to fit the entire above-listed sample information (like for swipe samples), at a minimum the container will be labeled with the sample identification number.

For radiological water samples and chemical samples to be sent to TestAmerica-St. Louis, labels will be hand-written using indelible black or blue ink and affixed to each sample container at the time of sample collection (or labels may be computer generated). Each sample label will be covered with clear tape once placed on the container. The label will contain the following information:

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock) from the start of sampling
- Sampler's initials
- Preservative (if any)

Chain of Custody

COC information is described in SAP Worksheet #27.

Sample Shipping Records

Samples will be dropped off directly at the Curtis and Tompkins laboratory located on-site at Hunters Point Naval Shipyard, and samples will be shipped via FedEx to TestAmerica-St Louis. Curtis and Tompkins will sign the COC and accept the samples. For samples shipped via FedEx, the COC will be packaged within the cooler, and the sender's copy of the air bill will serve as custody documentation and will be maintained on-site in the project file. Sample shipping procedures are detailed in SAP Worksheet #27.

Field Surveillance Reports

Field surveillances will be performed in accordance with the three phases of inspection as required by the QC Program. A Preparatory Inspection will be performed by the PQCM prior to the first sampling activities. This will include a general orientation for health and safety. An Initial Inspection will be conducted at the beginning of field sampling activities for this project. Daily field inspections and subsequent surveillances will be performed at the discretion of the PQCM or the Quality Control Program Manager (QCPM) throughout the duration of the project. The PQCM will use the Initial Inspection Checklist during inspection.

Field Change Request

An FCR will be prepared by the Program Chemist, or a designee, if a change to the SAP occurs during sampling activities. These changes will be minor and not result in a change in scope and/or DQOs for this project. The FCR must be approved prior to field implementation.

Major changes to work scope affecting the original DQOs or meeting criteria described in EWI #2, 3EVR.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs) (NAVFAC SW 2011) will require preparation of a SAP Addendum. The SAP Addendum must be approved by the NAVFAC SW QAO prior to conducting sampling and analysis.

Laboratory Documentation

Initial analytical results that are e-mailed to the project team for review will be submitted by the laboratories as follows:

<u>Curtis and Tompkins results report:</u>

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Sample results
- Laboratory duplicate results

The following documentation is maintained by Curtis and Tompkins and is available for review, as required:

- Copy of COC
- Energy control check standard daily for each detector

<u>TestAmerica-St. Louis results report</u>

- Case narrative
- Laboratory signed review page
- Copy of COC
- Sample receipt and login
- Sample results
- Batch QC results

For samples that represent FSSs or material to be used on-site as backfill are to be validated in accordance with SAP Worksheet #36. For these type of samples, Curtis and Tompkins and TestAmerica-St. Louis will produce a final data package in hardcopy format (that is 3-hole punched) and in PDF format. Both of these formats will be sent to the Project Chemist. Eighty percent of the FSS or backfill samples will be submitted in an EPA Level III-equivalent data package and 20 percent will be submitted in an EPA Level IV-equivalent data package. The EPA Level IV-equivalent samples will be chosen randomly and denoted on the COCs.

Any other data generated by TestAmerica-St. Louis (i.e., wastewater results) will be submitted as EPA Level III-equivalent data package (except for asbestos data, which will be submitted as EPA Level II-equivalent).

For the EPA Level III- or IV-equivalent data packages, samples will be assigned into a sample delivery group (SDG) number for every batch of 20 samples or less based on as received on a daily basis by the laboratory. The EPA Level III- or IV-equivalent data packages will be page numbered and contain the following information:

- Cover page (with laboratory name, address, phone number, contact person, and SDG number, as well as the project name and project number)
- Table of contents
- Case narrative including resolution of all corrective actions and nonconformance
- Sample management records, including a copy of the COC record, shipping documents as applicable, and laboratory sample receipt forms

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Cross-reference table for sample IDs versus laboratory IDs
- Analytical results and quality assurance/QC information by test as follows:
  - Radiological raw data sequence
    a. Sample results forms, including method blanks
    b. Sample raw data (EPA Level IV only)
    c. QC summaries
    d. Initial calibration (ICAL)
    e. Calibration checks, including all related continuing calibration verifications (CCVs)
    f. Instrument run log
    g. Sample preparation log
  - Organic raw data sequence
    a. Sample result forms, including method blanks
    b. Sample raw data after each result form (EPA Level IV only)
    c. Surrogate summaries (surrogate results may appear on the sample result forms)
    d. QC summaries
    e. Tune data (gas chromatograph/mass spectrometer [GC/MS] only)
    f. ICAL
    g. Daily calibration checks, including related CCVs
    h. Resolution check standards (GC/MS and pesticides), if applicable
    i. QC LCS, MS/MSD raw data (EPA Level IV only)
    j. Instrument run log
    k. Sample preparation log
  - Inorganic raw data sequence
    a. Sample results forms, including method blanks
    b. Sample raw data (EPA Level IV only)
    c. QC summaries
    d. ICAL
    e. Daily calibration checks, including all related CCVs
    f. Calibration blanks, including all related continuing calibration blanks
    g. Interference check standards A and B for inductively coupled plasma (ICP)-atomic emission spectrometer (AES) only
    h. QC raw data (EPA Level IV only)
    i. Post-digestion spike results
    j. Analytical spike results
    k. Method of standard additions

SAP Worksheet #29 – Project Documents and Records Table (Continued)

l. ICP-AES serial dilutions
m. Instrument run log
n. Sample preparation log

All relevant laboratory raw data and documentation including, but not limited to, logbook, data sheets, electronic files, and reports, will be maintained by the laboratory for at least 5 years. TtEC must be notified 30 days before disposal of any relevant records.

For EPA Level III- or IV-equivalent data, an EDD will be submitted to the Project Chemist in automated data review format. Both the EDDs and the hardcopy data package will present results to two or three significant figures. For radiological results, at least three significant figures will be used for all results. For organic results, at least two significant figures will be used for all results. For inorganic results, at least two significant figures will be used for results less than 10, and at least three significant figures will be used for results greater than 10. Results for QC analyses (method blanks, MS/MSD, LCS, and duplicates) will be reported up to three significant figures.

When revisions to EPA Level III- or IV-equivalent data packages are required, the revised pages will be stamped with the notation "amended or revised report" and have the same page numbering system as the original pages. If the revisions affect the EDDs, the revised EDD will then be sent along with the revised hardcopy pages to the Project Chemist.

Data Validation Reports

For samples that represent FSSs or material to be used on-site as backfill are to be validated in accordance with SAP Worksheet #36. The validation report will include the data validation findings worksheets. Each laboratory SDG will have its own data validation report. The validation reports will contain the following information:

- Title page that contains 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 that includes the number of samples per matrix, analytical method reference, validation guideline reference, and 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.
- Evaluation of the following parameters:
  - Technical holding times
  - GC/MS instrument performance check (tune) if applicable
  - Calibration
  - Laboratory blanks
  - Accuracy and precision data for internal laboratory QC associated with each SDG

SAP Worksheet #29 – Project Documents and Records Table (Continued)

  - 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 statement of work requirements
- Validation findings worksheets
- Qualifier classification

The data validator will submit a hardcopy validation report (that is three-hole punched), a PDF copy of the report, and a validated EDD to the Project Chemist.

The data validation subcontractor will maintain validation records for at least 5 years. TtEC will be notified 30 days before disposal of any records.

This page intentionally left blank.

SAP Worksheet #30 – Analytical Services Table

Matrix	Analytical Group	Sampling Locations/ ID Number	Analytical Method	Data Package Turnaround Time	Laboratory/ Organization (contact information)	Backup Laboratory/ Organization (contact information)
Soil Swipe	Ra-226 Gross Alpha/Gross Beta	All All	EPA 901.1 EPA 9310	2 business days	Curtis and Tompkins Contact: Mr. Phil Smith 201A & 201B Fisher Avenue San Francisco, CA 94124 (415) 216-2768	TestAmerica-St. Louis Contact: Erika Starman 13715 Rider Trail North Earth City, MO 63045 (314) 298-8566
Soil/Water	All analytical groups as listed in SAP Worksheet #23 as applicable to TestAmerica-St. Louis, TestAmerica-West Sacramento, and AmeriSci	All	All analytical groups as listed in SAP Worksheet #23 as applicable to TestAmerica-St. Louis, TestAmerica-West Sacramento, and AmeriSci	30 business days	TestAmerica-St. Louis Contact: Erika Starman 13715 Rider Trail North Earth City, MO 63045 (314) 298-8566 (Dioxins and asbestos analyses will be subcontracted to TestAmerica-West Sacramento and AmeriSci laboratories via TestAmerica-St. Louis)	GEL Contact: Tasha Horton 040 Savage Road Charleston, SC 29407 (843) 556-8171

Curtis and Tompkins and TestAmerica-St. Louis have been selected to analyze samples for this project. TestAmerica-St. Louis will subcontract dioxin analysis to TestAmerica-West Sacramento and asbestos analysis to AmeriSci. Curtis and Tompkins, TestAmerica-St. Louis, and TestAmerica-West Sacramento laboratories have successfully completed the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) certification for the matrices and methods listed in SAP Worksheet #23 and will maintain current status throughout the duration of this project. Curtis and Tompkins, TestAmerica-St. Louis, and TestAmerica-West Sacramento are also certified by the CDPH under the California National Environmental Laboratory Accreditation Program (NELAP) for the associated analytical methods as listed in SAP Worksheet #23. All three laboratories are capable of providing the project QC and data deliverables required by this SAP and the QSM for Environmental Laboratories (DoD 2010). Asbestos testing is a specialty testing and is not part of DoD ELAP or CDPH NELAP accreditations; however, AmeriSci does have the National Voluntary Laboratory Accreditation Program certification to perform asbestos analysis.

SAP Worksheet #30 – Analytical Services Table (Continued)

Curtis and Tompkins is located at Hunters Point Naval Shipyard and is being used to provide expedient sample analysis turnaround time for Ra-226 and gross alpha/gross beta analyses that will guide site remediation, investigation, and characterization efforts in the field. Expedient analyses, especially for Ra-226, is performed by 1) using the 186.2 keV gamma energy peak directly to determine whether remediation needs to be continued or those samples can be considered FSS samples and 2) preparing the sample on-site into a sealed tuna can geometry, which allows for the in-growth of Ra-226 daughter products to approach secular equilibrium leading to analysis of the 609 keV Bi-214 gamma energy peak after in-growth is complete, typically 21 calendar days.

TestAmerica-St. Louis will be used to perform chemical analyses for this project and as a backup laboratory for Curtis and Tompkins for radiological analyses.

Definition of Detection and Quantitation Limits

Radiological analyses reports data with detections limits different from chemical analyses. The following definitions are included herein to explain those differences:

- **MDA:** For this project, the minimum detectable activity (MDA) pertains only to radiological analyses as is defined as follows in accordance with the Multi-Agency Radiological Laboratory Analytical Protocols: the MDA is calculated as a sample-specific value and typically these values assumed both a Type I (α) and Type II (β) error of 5 percent.

- **DL:** The detection limit (DL) (associated with chemical analyses only) is an estimate of the measured concentration at which there is 99 percent confidence that a given analyte is present in a given sample matrix. The MDL is the concentration at which a decision is made regarding whether an analyte is detected by a given method. The MDL can be calculated from replicate analyses of a matrix containing the analyte. Results reported above the MDL (and below the QL as defined below) are considered "estimated" concentrations and are qualified by the laboratory with a "J" qualifier.

- **LOD:** The limit of detection (LOD) (associated with chemical analyses only) is the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%).

- **LOQ:** The limit of quantitation (LOQ) (associated with chemical analyses only) is the minimum level, concentration, or quantity of a target analyte that can be reported with a specified degree of confidence.

SAP Worksheet #30 – Analytical Services Table (Continued)

- **QL:** Quantitation Limit (QL), associated with chemical analyses only, is defined as the concentration of an analyte in a laboratory sample at which the measurement process gives results within a specified relative standard deviation. Unless otherwise specified in a specific method or SOP, this relative standard deviation is typically 10 percent. In addition, the QL is the lowest value used for the calibration curve for a given method. Results reported above the QLs are considered detected concentrations with no qualifications.

This page intentionally left blank.

SAP Worksheet #31 – Planned Project Assessments Table

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)
Field Sampling Surveillance	At a minimum, once at the beginning, once during, and once toward the end of the project	Internal	TtEC	PQCM, TtEC	Project Manager, TtEC	Project Manager, TtEC	Project Manager and QCPM, TtEC
Management Review	Once during the project duration	Internal	TtEC	QCPM, TtEC	Project Manager, TtEC	Project Manager, TtEC	PQCM, TtEC

This page intentionally left blank.

SAP Worksheet #32 – Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Title and Organizational Affiliation)	Time Frame of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Title and Organizational Affiliation)	Time Frame for Response
Field Sampling Surveillance	Surveillance Report	Project Manager, TtEC	7 days after completion of the inspection	Corrective Action Report	Project Manager and QCPM, TtEC	5 days after notification
Management Review	Surveillance Report	Project Manager, TtEC	7 days after completion of the inspection	Corrective Action Report	Project Manager, TtEC	14 days after notification

This page intentionally left blank.

SAP Worksheet #33 – QA Management Reports Table

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	Once at the beginning, once during, and once towards the end of field sampling activities	Determined during the project	PQCM, TtEC	Project Manager and QCPM, TtEC
Management Review Report	Once after management review is completed	Determined during the project	QCPM, TtEC	Project Manager and Program Manager, TtEC

This page intentionally left blank.

SAP Worksheet #34 – Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Title and Organizational Affiliation)
Field logbook	Field logbooks will be reviewed weekly and verified for information accuracy and completeness. 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	Laboratory Coordinator, TtEC
Sample receipt	For samples shipped via courier or FedEx to TestAmerica-St. Louis, the Project Chemist will verify receipt of samples by the laboratory the day following shipment.	I	Project Chemist, TtEC
Sample logins	Sample login information will be reviewed and verified for accuracy and completeness in accordance with the requirements in this SAP.	E	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
Laboratory analytical results prior to release	Laboratory analytical results will be reviewed to verify that the requirements in this SAP have been met. Prior to release, results will be verified as follows:	E	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
	All analytical results (100 percent) comply with the method- and project-specific requirements and any deviations or failure to meet criteria is documented for the project file.	E	Analyst, Curtis and Tompkins/TestAmerica-St. Louis
	All manual entries (100 percent) are free of transcription errors and manual calculations are accurate; computer calculations are spot-checked to verify program validity; results 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.	E	Peer Analyst, Curtis and Tompkins/TestAmerica-St. Louis
	Analytical results 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.	E	Supervisor, Curtis and Tompkins/TestAmerica-St. Louis

SAP Worksheet #34 – Verification (Step I) Process Table (Continued)

Verification Input	Description	Internal/ External	Responsible for Verification (Title and Organizational Affiliation)
Laboratory analytical results prior to release (Continued)	Analytical results 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 results since reviews are done only on 10 percent of the results.	E	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
Laboratory analytical results due at turnaround time listed on COC	Laboratory analytical results will be verified for having been obtained following the protocols in this SAP and being of sufficient quality to satisfy DQOs.	I I	RSO or designee, TtEC Project Chemist, TtEC
Laboratory data packages	Screening data reports and EPA Level III or IV-equivalent laboratory data packages will be verified by the laboratory performing the work for completeness and technical accuracy prior to submittal in accordance with requirements described in SAP Worksheet #29.	E I I	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis RSO or designee, TtEC Project Chemist, TtEC
Field and electronic data	One hundred percent of manual entries will be reviewed against the hard-copy information and 10 percent of electronic uploads will be checked against the hard copy.	I I	RSO or designee, TtEC Project Chemist, TtEC

SAP Worksheet #35 – Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Title and Organizational Affiliation)
IIa	Sample Collection	Ensure that the sampling procedures described in this SAP were used to collect samples and that any deviations to those procedures were documented in a FCR.	PQCM, TtEC Project Chemist, TtEC
IIa	Sample Handling	Ensure that the procedures described in this SAP for sample handling, packaging, and transport to the laboratory were followed.	PQCM, TtEC Project Chemist, TtEC
IIa	Sample Documentation	Ensure that the COC procedures described in this SAP were followed for sample collection and that logbooks or field forms were completed as required.	PQCM, TtEC Project Chemist, TtEC
IIa	Analytical Procedures	Ensure that the analytical methods and deliverable requirements described in this SAP were followed including holding times, analyte lists, and QC criteria.	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
IIa	Laboratory data reports	Data reports will be validated by the laboratory performing the work for technical accuracy and requirements listed in SAP Worksheet #29 prior to submittal.	Laboratory Supervisor, Curtis and Tompkins and Laboratory Project Manager, TestAmerica-St. Louis
IIb	Sampling Procedures	Review of sampling procedures to appropriately document if any deviations occurred and if corrective action is required.	PQCM, TtEC
IIb	Analytical Procedures	Review of analytical procedures to appropriately document if any deviations occurred and if corrective action is required.	RSO or designee, TtEC Project Chemist, TtEC
IIb	Project Quantitation Limits and Laboratory QC Criteria	Ensure project quantitation limits and laboratory QC criteria were followed and any deviations documented.	RSO or designee, TtEC Project Chemist, TtEC

This page intentionally left blank.

SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (Title and Organizational Affiliation)
IIa	All	All	In accordance with laboratory SOPs listed in SAP Worksheet #23 and DoD QSM	RSO or designee, TtEC Project Chemist, TtEC
IIb	All	All	In accordance with DoD QSM and EPA Level III and IV guidelines (see description below)	Third-party data validator, LDC

Curtis and Tompkins will be producing two type of data reports as described in SAP Worksheet #29:

- A results report (EPA Level II-equivalent) that will not undergo third-party validation but will be reviewed in accordance with Step IIa above by the RSO or designee.
- An EPA Level III or IV-equivalent data package will undergo third-party data validation in accordance with Step IIb above.

TestAmerica-St. Louis will be producing EPA Level III or IV-equivalent data packages for all samples they receive and/or subcontract out to TestAmerica-West Sacramento or AmeriSci. Any samples designated as FSS or material used for backfill will be sent for third-party data validation in accordance with Step IIb above. All other sample results (like swipes or waste) will not require third party data validation.

Third-party data validation will be performed by Laboratory Data Consultants (LDC). For this project, 80 percent of the data will require EPA Level III-equivalent data validation and 20 percent EPA Level IV-equivalent data validation. The 20 percent will be randomly chosen on the COC. EPA Level III-equivalent data validation includes the comparison of QC parameters to the appropriate criteria or limits. (QC parameters include holding times, tune, calibration, blanks, spikes, surrogates, and internal standards, as applicable.) EPA Level IV-equivalent data validation includes not only what is performed in an EPA Level III-equivalent validation but also includes review of raw data and backup documentation (for calibrations, standards, analysis run logs, etc.). This information is used for checking calculations of quantified analytical results during an EPA Level IV-equivalent data validation review.

The following documents will be used as guidance for validating analytical results: 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); EWI #1, 3EN2.1, Chemical Data Validation (SWDIV 2001); Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846, Third Edition and final updates (EPA 1986); QSM (DoD 2010); and the QC criteria specified in this SAP. Currently, there are no standards for data validation of radiological analyses. Therefore, guidance documents on validation of radiological data and modified functional guidelines will be used by the validator.

SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table (Continued)

Analytical results that have been validated 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. Advisory violations are when technical validation criteria have not been met. These qualifications will be noted in the validation reports.

SAP Worksheet #37 – Usability Assessment

After the analytical results have been reviewed, verified, and validated in accordance with SAP Worksheets #34 through 36, a data quality assessment (DQA) report may be prepared to assess data quality and usability. The DQA will include review of the following:

- Sample collection and analytical methods to verify that these were performed as discussed in SAP Worksheets #14 and 17
- Project-specific QLs as listed in SAP Worksheets #15.1 and 15.2 to verify that project-specific remedial goals were met
- DQOs to determine whether they have been achieved by the data collected
- Project-specific data quality indicators for precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters as discussed below

Analytical DQOs as assessed through the PARCC parameters are as follows:

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. As applicable, field duplicate, sample duplicate, MSD, and laboratory control sample duplicate (LCSD) samples will be used to assess field and analytical precision. The precision measurement will be determined using the relative percent difference (RPD) or relative error ratio (RER) between the duplicate sample results as follows:

$$\text{RPD} = 100 \times 2 \times (\text{result - duplicate result})/(\text{result + duplicate result})$$

$$\text{RER} = (\text{result activity} - \text{duplicate activity})/(\text{sample uncertainty + duplicate uncertainty})$$
using 2 sigma propagated uncertainty

As applicable, the RPD or RER limits for laboratory duplicates, MSD, and LCSD are presented in SAP Worksheets #28.1 and 28.2. Associated samples that do not meet the criteria will be evaluated by the validator.

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, LCS, or LCSD analyzed for every batch of up to 20 samples and serve as a measure of analytical accuracy. Surrogate standards, as applicable, are added to all samples, blanks, MS, MSD, LCS, or LCSD and evaluate the method's accuracy and help to determine matrix interferences. %R is calculated as follows:

$$\%R = 100 \times (\text{spiked sample result - unspiked sample result})/\text{amount of spike added}$$

SAP Worksheet #37 – Usability Assessment (Continued)

As applicable, the laboratory will review the spiked sample and surrogate recoveries for each analysis to ensure that the %R lies within the control limits listed in SAP Worksheets #28.1 and 28.2. Associated samples that do not meet the criteria will be evaluated by the validator.

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.

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:

$$\% \text{ completeness} = 100 \times (\text{number of valid analyte results/number of possible results})$$

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 results.

Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units and standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

REFERENCES

AEC (Atomic Energy Commission). 1974. Regulatory Guide 1.86. Termination of Operating Licenses for Nuclear Reactors. June.

CDPH (California Department of Health). 2011. Treasure Island, Site 12 Gamma Survey Report, Survey Dates: April 5–7, 2011. September 23.

DoD (Department of Defense). 2010. Quality Systems Manual for Environmental Laboratories. Version 4.2. October.

DoD, Department of Energy, Nuclear Regulatory Commission, and U.S. Environmental Protection Agency. 2000. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575. August.

DON (Department of the Navy). 2007. Action Memorandum/Interim Remedial Action Plan: Non-Time Critical Removal Action for Solid Waste Disposal Areas, Installation Restoration Site 12, Old Bunker Area, Naval Station Treasure Island, San Francisco, California. February 15.

DTSC (Department of Toxic Substances Control). 2001. Information Advisory on Clean Imported Fill Material.

EPA (U.S. Environmental Protection Agency). 1986. Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846. Third Edition and final updates.

——————. 1999. National Functional Guidelines for Organic Data Review, EPA 540/R-99/008. Contract Laboratory Program. October.

——————. 2000. Radionuclides Notice of Data Availability Technical Support Document. Targeting and Analysis Branch, Standards and Risk Management Division, Office of Groundwater and Drinking Water, EPA. March.

——————. 2002. Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS. December.

——————. 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). March.

——————. 2006a. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, QAMS. May.

——————. 2006b. Guidance on Systematic Planning using the Data Quality Objectives Process, EPA QA/G-4, QAMS. February.

NAVFAC SW (Naval Facilities Engineering Command Southwest). 2011. Environmental Work Instruction (EWI) #2, EV3.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs). January 12.

NFECSW (Naval Facilities Engineering Command Southwest). 2005. Environmental Work Instruction (EWI) EVR.6, Environmental Data Management and Required Electronic Delivery Standards. April 19.

Shaw (Shaw Environmental, Inc.). 2007. Removal Action Work Plan/Remedial Design, Non-Time Critical Removal Action, Installation Restoration Site 12, Three Solid Waste Disposal Areas (SWDAs A&B, 1207/1209, and 1231/1233), Treasure Island, San Francisco, California. February 26.

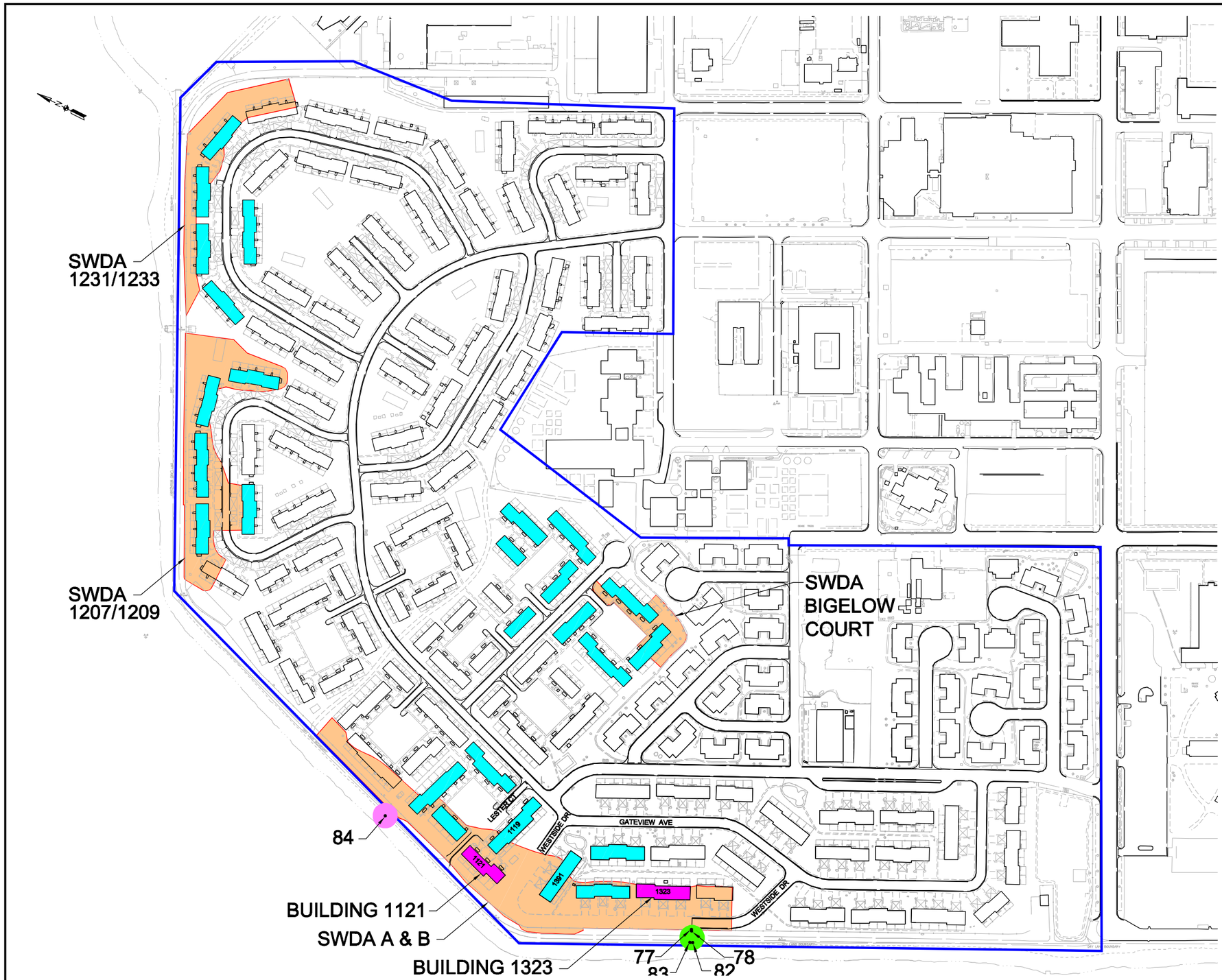
SWDIV (Southwest Division Naval Facilities Engineering Command). 2001. Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation. November 28.

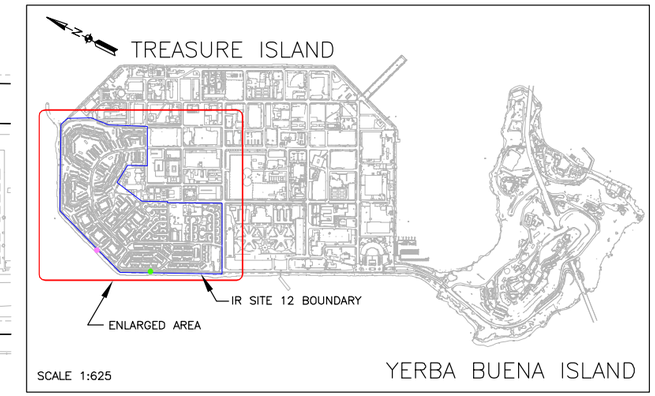
TriEco-Tt (Joint Venture of TriEco LLC and Tetra Tech EM, Inc.). 2012. Final Remedial Investigation Report for Installation Restoration Site 12, Old Bunker Area, Naval Station Treasure Island, San Francisco, California. June.

Weston (Weston Solutions, Inc.) 2006. Treasure Island Naval Station Historical Radiological Assessment, Former Naval Station Treasure Island, San Francisco, California. February.

FIGURES

This page intentionally left blank.





LEGEND:

- IR SITE 12 BOUNDARY
- SOLID WASTE DISPOSAL AREAS (SWDAs)
- • 77 AREAS OF ELEVATED ACTIVITY
- BUILDINGS TO BE DEMOLISHED
- BUILDINGS
- UNOCCUPIED BUILDINGS
- NORTHERN HOT SPOT (INCLUDES SAMPLE ID 84)
- SOUTHERN HOT SPOT (INCLUDES SAMPLE IDS 77, 78, 82, AND 83)

CDPH Elevated Activity Data

Sample ID	Longitude	Latitude	Exposure Rate one meter (µR/hr)	Exposure Rate contact (µR/hr)	Dose Rate one meter (µrem/hr)	Dose Rate contact (µrem/hr)	Gamma Count Rate contact (cpm)
77	-122.3780747	37.82557866	8	800	4	500	349224
78	-122.3780826	37.82557246	8	11	4	13	53735
82	-122.3781783	37.825522	6.5	90	4	80	155981
83	-122.3781904	37.82554082	6	28	5	10	24428
84	-122.378509	37.8281435	12.5	600	5	450	880097

Source: CDPH 2011

NOTE:
AREAS OF ELEVATED ACTIVITY (77, 78, 82, 83, AND 84) BASED ON CALIFORNIA DEPARTMENT OF PUBLIC HEALTH SURVEY PERFORMED IN APRIL 2011 (TREASURE ISLAND, SITE 12 GAMMA SURVEY REPORT, SURVEY DATES: APRIL 5–7, 2011 DATED SEPTEMBER 23, 2011).

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

NTCRA SAMPLING AND ANALYSIS PLAN
INSTALLATION RESTORATION SITE 12

FIGURE 1

SITE LOCATION MAP

NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CA

REVISION:
AUTHOR: A.CRABTREE
PROJECT NO:
FILE: SEE BELOW

TETRA TECH EC, INC.

P:\CAD Project Files\Treasure Island CAD Files\DWG\TI-NTCRA_Figure 1-1.dwg

12/4/12

APPENDIX A

TTEC STANDARD OPERATING PROCEDURES
(on CD only)

This page intentionally left blank.

Standard Operating Procedure

RADIATION AND CONTAMINATION SURVEYS

SOP-001

Revision 0

Approved By:

11/9/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/9/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 General 5
4.1.1 Discussion 5
4.1.2 Planning and Prerequisites 5
4.2 Procedure Process 6
4.2.1 Exposure/Dose Rate Surveys 6
4.2.2 Removable Contamination Surveys 6
4.2.3 Surveys for Fixed Alpha/Beta Contamination 8
4.2.4 Gamma Surveys 9
5.0 RECORDS 10
6.0 REFERENCES 10
7.0 ATTACHMENTS 10

1.0 PURPOSE

The purpose of this procedure is to specify methods and requirements for radiological surveys, and to provide 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.

Exposure/Dose Rate – The amount of radiation (exposure or dose) delivered at a given point per unit time. Typical units for exposure are microroentgen per hour (microR/hr) while typical units for dose are micro Rem per hour (microRem/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.

4.0 PROCEDURE DETAILS

4.1 General

Radiation surveys are performed to identify radiation areas, measure the exposure and or dose 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 survey forms like 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.

Field backgrounds will be checked and MDC calculations verified each work day.

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.
- A routine survey is required to meet TtEC's Nuclear Regulatory Commission Radioactive Materials License or Agreement State Radioactive Materials License.
- 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:

- Checked to make sure battery is charged.
- 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/Dose Rate Surveys

Always survey a sufficient number of locations to determine the average and maximum general area and contact radiation levels.

A Ludlum Model-19, Bicron MicroREM, or equivalent meter, should be used for performing exposure or dose rate surveys for 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/dose 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/dose rate.
- Perform contact exposure/dose rate measurements with the detector within 1 inch of the surface to be surveyed.
- Perform surveys at approximately 1 meter (waist level) from the surface to establish posting requirements for the area.
- Verify the exposure/dose rates of known elevated exposure/dose rate locations.

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.

4.2.2.3 Counting Swipes

A Ludlum Model-2929 scaler with a Model 43-10-1 ZnS(Ag) scintillation probe (or equivalent) or Protean Alpha/Beta Gas Flow Proportional Counter (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 areas, 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 survey requirements.
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 LAW to dry prior to counting.
2. Scan the LAW with an appropriate field instrument (Ludlum Model-2360 meter with a 43-89 probe, or equivalent), in an area with a low background.
3. Hold the detector within a quarter 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.

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 meter with a 43-68 probe, 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 a quarter 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 a quarter 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:

$$A_S = \frac{R_{S+B} - R_B}{\varepsilon_i \varepsilon_s \frac{W_A}{100\ \mathrm{cm}^2}}$$

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 meter with a 44-10 probe, or equivalent, should be used for gamma radiation surveys. For large areas, a RASO-approved vehicle towed array system may be used in accordance with *SOP 013, Vehicle Towed Array*.

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 gamma 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

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 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:						
RSOR:						
Isotopes of Concern:						

Description or drawing:

Routine (Daily / Weekly / Monthly) ☐ Non-routine ☐

All radiation readings in µr/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:	RSOR	Date/Time:

Standard Operating Procedure

PREPARATION OF PORTABLE RADIATION AND CONTAMINATION SURVEY METERS AND INSTRUMENTS FOR FIELD USE

SOP-002

Revision 0

Approved By:

11/9/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/9/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 PROCEDURE DETAILS 5
4.1 CALIBRATION 5
4.2 GENERAL CONSIDERATIONS 5
4.3 DETERMINATION OF INSTRUMENT BACKGROUND 6
4.4 CHI-SQUARE TEST 7
4.5 INSTRUMENT EFFICIENCY FOR PORTABLE INSTRUMENTS 7
4.6 OPERATION CHECK 9
4.7 MAINTENANCE 10
5.0 RECORDS 10
6.0 REFERENCES 10
7.0 ATTACHMENTS 10

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 (i.e., Task-specific Plans (TSPs), work instructions, and other Work Plan 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 $\pm$ 20 percent or $\pm$ 2σ 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, 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 disintegration though are typically recorded as a unitless value.

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 Radiation Safety Officer Representative (RSOR), 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

Upon receipt of survey equipment from an offsite vendor, and prior to shipment to an offsite vendor, the survey equipment shall be surveyed for alpha/beta fixed and loose contamination in accordance with *SOP 003, Release of Materials and Equipment from Radiologically Controlled Areas*. If any contamination limits are exceeded, notify the RSOR immediately.

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.

In the event that any instrument and detector combination fails a chi-square test or daily operation check or has exceeded its annual calibration date without RSO approval, the instrument shall be put in an "out of service" condition by placing an "out of service" tag or equivalent on the instrument and detector combination, and securing in a separate area such that the instrument and detector combination cannot be issued for use. The RTS shall be notified immediately when any survey instrumentation has been placed "out of service".

Any instrument and detector combinations that have not had a daily operation check performed because daily plans do not include their use shall be secured in an area to prevent their use until operation checks have been performed.

Table 4-1 gives suggested geometries to use for the most common instrument types to be used. Alternate geometries can be used provided that they are more appropriate for the intended usage of the instrument.

4.3 Determination of Instrument Background

The determination of an instrument specific background is an optional procedure which may be employed at the discretion of the RSOR. 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.

TABLE 4-1

SUGGESTED GEOMETRIES FOR BACKGROUND MEASUREMENTS AND SOURCE CHECKS

Measurement	Instrument/Detector Combinations	Probe Location
Exposure/Dose Rate	Ludlum Model 19, RO-20, Bicron MicroREM, or equivalent meter with integral tissue equivalent plastic or sodium iodide (NaI) 1”x1” detector	contact[a]
Gamma	Ludlum Model 2221, 2350-1 or 2360 portable survey meter or equivalent with a Ludlum Model 44-10, FIDLER or equivalent detector	4 inches above ground surface/source
Beta/Gamma	Ludlum Model 2360 portable survey meter or equivalent with a Ludlum Model 43-37, 43-68, 43-89 or equivalent detector; Ludlum Model 3 portable survey meter with a Ludlum Model 44-9 G-M probe or equivalent	¼ inch above ground surface/source
Alpha/Beta	Ludlum 2360 portable survey meter or equivalent with a Ludlum 43-37, 43-68, 43-89 or equivalent detector	¼ inch from surface/source

Notes:

[a] Field readings with exposure/dose 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.

When required, background determinations will be documented on Attachment A or equivalent 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, this procedure 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 testing is not required to be performed on exposure rate instruments (e.g., Ludlum Model 19 or RO-20) or personnel contamination "frisking" instrument/detector combinations (e.g., Ludlum Model 3 or 177 with 44-9) unless specified in work-specific documents.

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 in Attachment B or equivalent, 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 for a test using 20 counts. 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 RSOR 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,

E_i = the instrument efficiency (counts per disintegration)
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 equipment manufacturer'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 RSOR)

The resulting efficiency should be reported in units of counts per disintegration.

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)

Instructions for performing operation checks for specific instruments and detectors are included in Attachment C of this procedure. Failure of any of the above checks shall result in the instrument being removed from active service until the condition can be addressed. The RSOR 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. A separate check log shall be maintained for each instrument type. 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.

A sticker annotating that daily operation checks have been completed satisfactorily shall be affixed to each instrument. The sticker shall contain the following information at a minimum:

- Initials of technician

- Date of operational check

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, instrument calibration and check logs. Record forms shall be obtained from the attachments of this procedure or equivalent electronic versions or as specified in work-specific procedures.

6.0 REFERENCES

None.

7.0 ATTACHMENTS

Attachment A, Instrument/Detector Background Form

Attachment B, Chi Square Form

Attachment C, Instrument and Detector Operational Check Procedures

Instrument/Detector Background Form

Instrument Model:					Instrument Serial No.		
Cal due date					Data Type		
Detector Model:					Detector Serial No.:		
Today's Date:					Data Collected by:		

Count Number	Background
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
Total	
Mean Count:	
Standard Deviation:	
Mean + 3 σ Value:	

Comments:

Mean +20%	
Mean -20%	

Calculations Completed by:	Date:
Reviewed by:	Date:

Chi Square Form

Instrument Model:				Instrument Serial No.		
Cal due date				Data Type		C_B
Detector Model:				Detector Serial No.:		
Today's Date:				Data Collected by:		
Source ID:		Activity	dpm			
Radionuclide:		CPM	CPM			
Count Number	Background	(Gross) C_G	(Net) C_I		$(C_I - \bar{c})$	$(C_I - \bar{c})^2$
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
Total				SUM		$\Sigma(C_I - c)^2$
Mean Count: $\bar{c}$						
Chi Squared Value (C^2):			10.11 - 30.14	Standard Deviation:		
+ 2 σ Value:		- 2 σ Value:				
Calculations Completed by:						Date:
Reviewed by:						Date:

+20%
-20%

Performed By *(Print)*: _____

Signature: _____

Daily QC Worksheet
2350-1 Countrate Meters

Date: _____ Time: _____

Instrument Model #	Data #	Instrument Serial #	Probe	Probe Serial #	Calibration Due Date	Battery Check	Calibration Check	Condition	Physical Damage	Background Readings (CPM)	Background QC Limits (CPM)	Instrument Readings (Net CPM)	Source QC Limits (CPM)

Source Information:	Isotope	ID	Half-life	Activity	Creation Day
Source Information:	Isotope	ID	Half-life	Activity	Creation Day

Note_____

Reviewed By: _____ Date: _____

Standard Operating Procedure

SAMPLING PROCEDURES
FOR RADIOLOGICAL SURVEYS

SOP-006

Revision 0

Approved By:

11/9/12

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
11/9/12	0	E. Abkemeier	Original	All

TABLE OF CONTENTS

PAGE

REVISION HISTORY 2
TABLE OF CONTENTS 3
1.0 PURPOSE 4
2.0 SCOPE 4
3.0 DEFINITIONS AND ABBREVIATIONS 4
4.0 SAMPLING PROCEDURE DETAILS 4
4.1 GENERAL PROCEDURES 4
4.2 SAMPLING PROCEDURE PROCESS 5
4.2.1 Swipe Sampling 5
4.2.2 Soil Sampling 5
4.2.3 Sediment Sampling 6
4.2.4 Solid Material Sampling 6
4.2.5 Water Sampling 7
4.3 SAMPLE PACKAGING AND TRANSPORT 7
5.0 RECORDS 7
6.0 REFERENCES 7
7.0 ATTACHMENTS 7

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.

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 from the top 15 centimeters (cm) (6 inches) of the surface, unless otherwise noted in the applicable work-planning document [e.g. a Task-specific Plan (TSP), Work Instruction or Work Plan].

Sediment Samples – Sediment samples are defined as a collection of clay, silt, sand, and/or gravel deposited by water, wind, or glaciers used for analytical purposes.

Solid Material Samples – Solid material samples are defined as pieces of concrete, brick, porcelain, wood, or any other hard material collected for analytical purposes from buildings or surrounding areas. The samples could include accumulations from ventilation systems or drain systems.

Liquid Samples – Liquid samples are defined as liquid collected for analytical purposes from sinks, drain piping, sewer systems, rinsate, groundwater, leachate, liquid investigation-derived waste, and low-point accumulation areas inside of buildings, sumps, and excavation pits.

4.0 SAMPLING PROCEDURE DETAILS

4.1 General Procedures

Field instruments used for measurements required by this procedure shall be function checked daily with NIST traceable standards and verified to have current calibration.

Anytime this procedure is in effect, the Radiation Safety Officer Representative (RSOR) (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 SOP 001, *Radiation and Contamination Surveys*. Swipe samples will be documented in a logbook as applicable. Sample COC records shall be completed in accordance with the applicable SAP.

4.2.2 SOIL SAMPLING

Because standard surface soil contamination criteria for radionuclides are applicable to the average concentration in *the upper 15 cm (6 inches) of soil*, the sampling protocol described here is based on obtaining a sample of this upper 15 cm (6 inches). Special situations, such as sampling at depths greater than 15 cm (6 inches), evaluating trends or airborne deposition, determining near-surface contamination profiles, and measuring non-radiological contaminants, may require special sampling procedures. These special situations will be evaluated and incorporated into TSPs as the need arises.

Samples will be collected with a hand-auger, hollow-stem auger, split-spoon sampler, disposable scoop, or equivalent. The soil removed for sampling must be sufficient to yield a sample of sufficient volume for the sample container being used. Soil samples will be collected and handled as follows:

1. Loosen the soil at the selected sampling location to a depth of approximately 15 cm (6 inches), using a clean trowel or other digging instrument. In rocky terrain, a pick axe or mechanical means such as a Hilti gun may be used to remove soil for sampling. If an excavator is used due to health and safety reasons, extreme care should be used to ensure that the soil collected is from the upper com (6 inches) of the original surface.
2. Remove large rocks, vegetation and foreign objects. In some cases, however, these objects may be the source of the contamination and may be collected as separate samples for characterization.
3. Place as much soil as practical into a 250-milliliter (mL)-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag, or other suitable collection device. Approximately 1000 grams may be necessary for soil with significant moisture. Note that if a “split sample” is necessary for a regulatory agency to perform confirmatory analysis, collection of up to 2000 grams of soil will be necessary. Ensure that the material collected is from the upper 15 cm (6 inches) of soil. Note that this may require digging a hole wider, as opposed to deeper.
4. Tape the cap of the container in place or seal the ziplock plastic bag.
5. Label the sample container in accordance with the applicable SAP.
6. Document all samples collected in the sample logbook as applicable. Sample COC records shall be completed in accordance with the applicable SAP.
7. Transport samples in a project vehicle to the on-site laboratory for analysis as soon as possible after sample collection. Sample packaging and shipment procedures for transporting samples to an off-site laboratory are described in Section 4.3 of this procedure.

8. Clean or decontaminated tools will be used at each sampling location. Sampling tools will be decontaminated as described in the applicable SAP.

4.2.3 SEDIMENT SAMPLING

Several methods are available to collect sediment samples. The tools used will be appropriate to the circumstances and may include use of trowels, augers, or other hand tools. Sediment sampling will be conducted as follows:

1. A hand-auger, trowel or similar device will be used to access each sampling location. The sample collection tool will be selected based on physical limitations accessing the sample location.
2. Place as much material as practical into a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag or other suitable container.
3. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.2.4 SOLID MATERIAL SAMPLING

Several methods are available to collect solid material samples. To collect samples, solid materials may need to be broken into smaller pieces. Solid materials will be collected as follows:

1. Break up the material into small enough pieces to fill a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag or other suitable container. A pick axe or mechanical means such as a Hilti gun may be used to remove solid material for sampling. At no time shall an excavator be used to collect samples.
2. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.2.4.1 Pipe and Drain Line Sampling

Pipe and drain line sampling is conducted to assess residual radioactivity that may be inside of drain lines or materials within sanitary sewer and storm drain systems.

1. Since the type of material found inside drain lines varies, there is no specific method identified to collect these samples. Samples may be collected using a plumber's snake, swabs, scraper, trowel, etc.
2. Place as much material as practical into a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag or other suitable container.
3. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.2.4.2 Ventilation Sampling

Ventilation sampling will be performed to identify if the system is impacted and assess the residual radioactivity that may be present.

1. If visible dust is present inside the ventilation system, use a masslin cloth to accumulate the material into a pile. (If no visible dust is present, collect a swipe sample as discussed in SOP 001, *Radiation and Contamination Surveys*.)

2. Using a flat utensil such as a piece of paper or scraper carefully place as much material as possible into a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container, plastic ziplok bag or other suitable container.
3. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.2.5 WATER SAMPLING

Water samples will be collected as follows:

1. Collect water using any of the following sampling equipment: disposable bailer, pump, coliwassa-type tube sampler, or equivalent. Care will be taken to avoid collection of bottom sediment or vegetation.
2. Fill completely a 250-mL-wide mouth plastic bottle, plastic 500-mL Marinelli container or two liter plastic bottles.
3. Follow steps 4 through 8 of Section 4.2.2 to complete sample collection.

4.3 Sample Packaging and Transport

Samples will be delivered for analysis to the laboratory via a box, cooler, or similar container (ice is not required if only radiological analysis will be performed), along with the COC completed as described in the applicable SAP..

The applicable SAP may require samples to be sent to an off-site laboratory for analysis, (e.g., total strontium, isotopic uranium, isotopic plutonium). 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. Prepared packages will be surveyed prior to shipment using an appropriate exposure rate meter in accordance with SOP 001, Radiation and Contamination Surveys.

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*
SOP 001	Radiation and Contamination Surveys

7.0 ATTACHMENTS

None.

APPENDIX B

DoD QSM TESTAMERICA-ST. LOUIS LIMITS
(on CD only)

This page intentionally left blank.

Matrix	MethodDesc	Analyte	Analytical_Method	LCSLow	LCSUp	MSLow	MSUp	RPD	Surrogate Recovery
Solid	Volatile Organic Compounds (GC/MS)	1,1,1-Trichloroethane	8260C	70	135	70	135	20	
Solid	Volatile Organic Compounds (GC/MS)	1,1,2,2-Tetrachloroethane	8260C	55	130	55	130	20	
Solid	Volatile Organic Compounds (GC/MS)	1,1,2-Trichloroethane	8260C	60	125	60	125	20	
Solid	Volatile Organic Compounds (GC/MS)	1,1-Dichloroethane	8260C	75	125	75	125	20	
Solid	Volatile Organic Compounds (GC/MS)	1,1-Dichloroethene	8260C	65	135	65	135	20	
Solid	Volatile Organic Compounds (GC/MS)	1,2-Dichloroethane	8260C	70	135	70	135	20	
Solid	Volatile Organic Compounds (GC/MS)	1,2-Dichloropropane	8260C	70	120	70	120	20	
Solid	Volatile Organic Compounds (GC/MS)	2-Butanone (MEK)	8260C	30	160	30	160	20	
Solid	Volatile Organic Compounds (GC/MS)	4-Methyl-2-pentanone (MIBK)	8260C	45	145	45	145	20	
Solid	Volatile Organic Compounds (GC/MS)	Acetone	8260C	20	160	20	160	20	
Solid	Volatile Organic Compounds (GC/MS)	Benzene	8260C	75	125	75	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Bromodichloromethane	8260C	70	130	70	130	20	
Solid	Volatile Organic Compounds (GC/MS)	Bromoform	8260C	55	135	55	135	20	
Solid	Volatile Organic Compounds (GC/MS)	Bromomethane	8260C	30	160	30	160	20	
Solid	Volatile Organic Compounds (GC/MS)	Carbon tetrachloride	8260C	65	135	65	135	20	
Solid	Volatile Organic Compounds (GC/MS)	Chlorobenzene	8260C	75	125	75	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Chloroethane	8260C	40	155	40	155	20	
Solid	Volatile Organic Compounds (GC/MS)	Chloroform	8260C	70	125	70	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Chloromethane	8260C	50	130	50	130	20	
Solid	Volatile Organic Compounds (GC/MS)	cis-1,2-Dichloroethene	8260C	65	125	65	125	20	
Solid	Volatile Organic Compounds (GC/MS)	cis-1,3-Dichloropropene	8260C	70	125	70	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Dibromochloromethane	8260C	65	130	65	130	20	
Solid	Volatile Organic Compounds (GC/MS)	Ethylbenzene	8260C	75	125	75	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Methyl tert-butyl ether	8260C	80	120	80	120	20	
Solid	Volatile Organic Compounds (GC/MS)	Methylene Chloride	8260C	55	140	55	140	20	
Solid	Volatile Organic Compounds (GC/MS)	Styrene	8260C	75	125	75	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Tetrachloroethene	8260C	65	140	65	140	20	
Solid	Volatile Organic Compounds (GC/MS)	Toluene	8260C	70	125	70	125	20	
Solid	Volatile Organic Compounds (GC/MS)	trans-1,2-Dichloroethene	8260C	65	135	65	135	20	
Solid	Volatile Organic Compounds (GC/MS)	trans-1,3-Dichloropropene	8260C	65	125	65	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Trichloroethene	8260C	75	125	75	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Vinyl chloride	8260C	60	125	60	125	20	
Solid	Volatile Organic Compounds (GC/MS)	Xylenes, Total	8260C	70	130	70	130	20	
Solid	Volatile Organic Compounds (GC/MS)	4-Bromofluorobenzene (surr)	8260C						85-120

Matrix	MethodDesc	Analyte	Analytical_Method	LCSLow	LCSUp	MSLow	MSUp	RPD	Surrogate Recovery
Solid	Volatile Organic Compounds (GC/MS)	1,2-Dichloroethane-d4 (surr)	8260C						71-128
Solid	Volatile Organic Compounds (GC/MS)	Dibromofluoromethane (surr)	8260C						76-126
Solid	Volatile Organic Compounds (GC/MS)	Toluene-d8 (surr)	8260C						85-115
Solid	Semivolatile Organic Compounds (GC/MS)	1,2,4-Trichlorobenzene	8270D	45	110	45	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	1,2-Dichlorobenzene	8270D	45	95	45	95	30	
Solid	Semivolatile Organic Compounds (GC/MS)	1,4-Dichlorobenzene	8270D	35	105	35	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2,4,5-Trichlorophenol	8270D	50	110	50	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2,4,6-Trichlorophenol	8270D	45	110	45	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2,4-Dichlorophenol	8270D	45	110	45	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2,4-Dimethylphenol	8270D	30	105	30	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2,4-Dinitrophenol	8270D	15	130	15	130	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2,4-Dinitrotoluene	8270D	50	115	50	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2,6-Dinitrotoluene	8270D	50	110	50	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2-Chloronaphthalene	8270D	45	105	45	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2-Chlorophenol	8270D	45	105	45	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2-Methylnaphthalene	8270D	45	105	45	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2-Methylphenol	8270D	40	105	40	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	2-Nitroaniline	8270D	45	120	45	120	30	
Solid	Semivolatile Organic Compounds (GC/MS)	3 & 4 Methylphenol	8270D	40	105	40	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	3,3'-Dichlorobenzidine	8270D	24	101	24	101	30	
Solid	Semivolatile Organic Compounds (GC/MS)	4,6-Dinitro-2-methylphenol	8270D	30	135	30	135	30	
Solid	Semivolatile Organic Compounds (GC/MS)	4-Chloro-3-methylphenol	8270D	45	115	45	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	4-Chloroaniline	8270D	28	80	28	80	30	
Solid	Semivolatile Organic Compounds (GC/MS)	4-Nitroaniline	8270D	35	115	35	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Acenaphthene	8270D	45	110	45	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Anthracene	8270D	55	105	55	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Benzo[a]anthracene	8270D	50	110	50	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Benzo[a]pyrene	8270D	50	110	50	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Benzo[b]fluoranthene	8270D	45	115	45	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Benzo[k]fluoranthene	8270D	45	125	45	125	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Bis(2-chloroethoxy)methane	8270D	45	110	45	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Bis(2-chloroethyl)ether	8270D	40	105	40	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Bis (2-chloroisopropyl) ether	8270D	20	115	20	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Bis(2-ethylhexyl) phthalate	8270D	45	125	45	125	30	

Matrix	MethodDesc	Analyte	Analytical_Method	LCSLow	LCSUp	MSLow	MSUp	RPD	Surrogate Recovery
Solid	Semivolatile Organic Compounds (GC/MS)	Butyl benzyl phthalate	8270D	50	125	50	125	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Chrysene	8270D	55	110	55	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Dibenz(a,h)anthracene	8270D	40	125	40	125	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Dibenzofuran	8270D	50	105	50	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Diethyl phthalate	8270D	50	115	50	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Di-n-butyl phthalate	8270D	55	110	55	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Fluoranthene	8270D	55	115	55	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Fluorene	8270D	50	110	50	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Hexachlorobenzene	8270D	52	107	52	107	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Hexachlorobutadiene	8270D	40	115	40	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Hexachlorocyclopentadiene	8270D	38	107	38	107	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Hexachloroethane	8270D	35	110	35	110	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Indeno[1,2,3-cd]pyrene	8270D	40	120	40	120	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Naphthalene	8270D	40	105	40	105	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Nitrobenzene	8270D	40	115	40	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Nitrosodiphenylamine	8270D	50	115	50	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	N-Nitrosodi-n-propylamine	8270D	40	115	40	115	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Pentachlorophenol	8270D	25	120	25	120	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Phenol	8270D	40	100	40	100	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Pyrene	8270D	45	125	45	125	30	
Solid	Semivolatile Organic Compounds (GC/MS)	Pyridine	8270D						
Solid	Semivolatile Organic Compounds (GC/MS)	Nitrobenzene-d5 (surr)	8270D						35-100
Solid	Semivolatile Organic Compounds (GC/MS)	Phenol-d5 (surr)	8270D						40-100
Solid	Semivolatile Organic Compounds (GC/MS)	Terphenyl-d14 (surr)	8270D						30-125
Solid	Organochlorine Pesticides (GC)	4,4'-DDD	8081B	30	135	30	135	30	
Solid	Organochlorine Pesticides (GC)	4,4'-DDE	8081B	70	125	70	125	30	
Solid	Organochlorine Pesticides (GC)	4,4'-DDT	8081B	45	140	45	140	30	
Solid	Organochlorine Pesticides (GC)	Aldrin	8081B	45	140	45	140	30	
Solid	Organochlorine Pesticides (GC)	alpha-BHC	8081B	60	125	60	125	30	
Solid	Organochlorine Pesticides (GC)	beta-BHC	8081B	60	125	60	125	30	
Solid	Organochlorine Pesticides (GC)	Chlordane, Technical	8081B						
Solid	Organochlorine Pesticides (GC)	Dieldrin	8081B	65	125	65	125	30	
Solid	Organochlorine Pesticides (GC)	Endosulfan I	8081B	15	135	15	135	30	
Solid	Organochlorine Pesticides (GC)	Endosulfan II	8081B	35	140	35	140	30	

Matrix	MethodDesc	Analyte	Analytical_Method	LCSLow	LCSUp	MSLow	MSUp	RPD	Surrogate Recovery
Solid	Organochlorine Pesticides (GC)	Endosulfan sulfate	8081B	60	135	60	135	30	
Solid	Organochlorine Pesticides (GC)	Endrin	8081B	60	135	60	135	30	
Solid	Organochlorine Pesticides (GC)	gamma-BHC (Lindane)	8081B	60	125	60	125	30	
Solid	Organochlorine Pesticides (GC)	Heptachlor	8081B	50	140	50	140	30	
Solid	Organochlorine Pesticides (GC)	Heptachlor epoxide	8081B	65	130	65	130	30	
Solid	Organochlorine Pesticides (GC)	Methoxychlor	8081B	55	145	55	145	30	
Solid	Organochlorine Pesticides (GC)	Toxaphene	8081B						
Solid	Organochlorine Pesticides (GC)	DCB (surr)	8081B						50-130
Solid	Organochlorine Pesticides (GC)	TCMX (surr)	8081B						70-125
Solid	Polychlorinated Biphenyls (PCBs) by GC	PCB-1016	8082A	40	140	40	140	30	
Solid	Polychlorinated Biphenyls (PCBs) by GC	PCB-1221	8082A						
Solid	Polychlorinated Biphenyls (PCBs) by GC	PCB-1232	8082A						
Solid	Polychlorinated Biphenyls (PCBs) by GC	PCB-1242	8082A						
Solid	Polychlorinated Biphenyls (PCBs) by GC	PCB-1248	8082A						
Solid	Polychlorinated Biphenyls (PCBs) by GC	PCB-1254	8082A						
Solid	Polychlorinated Biphenyls (PCBs) by GC	PCB-1260	8082A	60	130	60	130	30	
Solid	Polychlorinated Biphenyls (PCBs) by GC	DCB (surr)	8082A						60-125
Solid	Dioxins	2,3,7,8-TCDD	8290	60	138	60	138	20	
Solid	Dioxins	1,2,3,7,8-PeCDD	8290	70	122	70	122	20	
Solid	Dioxins	1,2,3,4,7,8-HxCDD	8290	60	138	60	138	20	
Solid	Dioxins	1,2,3,6,7,8-HxCDD	8290	68	136	68	136	20	
Solid	Dioxins	1,2,3,7,8,9-HxCDD	8290	68	138	68	138	20	
Solid	Dioxins	1,2,3,4,6,7,8-HpCDD	8290	71	128	71	128	20	
Solid	Dioxins	OCDD	8290	70	128	70	128	20	
Solid	Dioxins	2,3,7,8-TCDF	8290	56	158	56	158	20	
Solid	Dioxins	1,2,3,7,8-PeCDF	8290	69	134	69	134	20	
Solid	Dioxins	2,3,4,7,8-PeCDF	8290	70	131	70	131	20	
Solid	Dioxins	1,2,3,4,7,8-HxCDF	8290	74	128	74	128	20	
Solid	Dioxins	1,2,3,6,7,8-HxCDF	8290	67	140	67	140	20	
Solid	Dioxins	2,3,4,6,7,8-HxCDF	8290	71	137	71	137	20	
Solid	Dioxins	1,2,3,7,8,9-HxCDF	8290	72	134	72	134	20	
Solid	Dioxins	1,2,3,4,6,7,8-HpCDF	8290	71	134	71	134	20	
Solid	Dioxins	1,2,3,4,7,8,9-HpCDF	8290	68	129	68	129	20	
Solid	Dioxins	OCDF	8290	63	141	63	141	20	
Solid	Diesel Range Organics (DRO) (GC)	Diesel Range Organics [C10-C24]	8015B	48	102	48	102	30	
Solid	Diesel Range Organics (DRO) (GC)	Motor Oil Range Organics [C24-C36]	8015B					30	

Matrix	MethodDesc	Analyte	Analytical_Method	LCSLow	LCSUp	MSLow	MSUp	RPD	Surrogate Recovery
Solid	Diesel Range Organics (DRO) (GC)	o-Terphenyl (surr)	8015B						49-133
Solid	Metals (ICP/MS)	Antimony	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Arsenic	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Barium	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Beryllium	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Cadmium	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Chromium	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Cobalt	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Copper	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Lead	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Molybdenum	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Nickel	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Selenium	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Silver	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Thallium	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Vanadium	6020A	80	120	80	120	20	
Solid	Metals (ICP/MS)	Zinc	6020A	80	120	80	120	20	
Solid	Mercury (CVAA)	Mercury	7471B	80	120	80	120	20	
Water	Semivolatile Organic Compounds (GC/MS)	Acenaphthene	8270D	45	110	45	110	30	
Water	Semivolatile Organic Compounds (GC/MS)	Anthracene	8270D	55	110	55	110	30	
Water	Semivolatile Organic Compounds (GC/MS)	Benzo[a]anthracene	8270D	55	110	55	110	30	
Water	Semivolatile Organic Compounds (GC/MS)	Benzo[a]pyrene	8270D	55	110	55	110	30	
Water	Semivolatile Organic Compounds (GC/MS)	Benzo[b]fluoranthene	8270D	45	120	45	120	30	
Water	Semivolatile Organic Compounds (GC/MS)	Benzo[k]fluoranthene	8270D	45	125	45	125	30	
Water	Semivolatile Organic Compounds (GC/MS)	Chrysene	8270D	55	110	55	110	30	
Water	Semivolatile Organic Compounds (GC/MS)	Dibenz(a,h)anthracene	8270D	40	125	40	125	30	
Water	Semivolatile Organic Compounds (GC/MS)	Fluoranthene	8270D	55	115	55	115	30	
Water	Semivolatile Organic Compounds (GC/MS)	Fluorene	8270D	50	110	50	110	30	
Water	Semivolatile Organic Compounds (GC/MS)	Indeno[1,2,3-cd]pyrene	8270D	45	125	45	125	30	
Water	Semivolatile Organic Compounds (GC/MS)	Naphthalene	8270D	40	100	40	100	30	
Water	Semivolatile Organic Compounds (GC/MS)	Pyrene	8270D	50	130	50	130	30	
Water	Semivolatile Organic Compounds (GC/MS S	2-Fluorobiphenyl	8270D						11-115
Water	Semivolatile Organic Compounds (GC/MS S	Nitrobenzene-d5	8270D						10-118
Water	Semivolatile Organic Compounds (GC/MS)	Terphenyl-d14	8270D						15-40

Matrix	MethodDesc	Analyte	Analytical_Method	LCSLow	LCSUp	MSLow	MSUp	RPD	Surrogate Recovery
Water	Polychlorinated Biphenyls (PCBs) by GC	PCB-1016	8082A	25	145	25	145	30	
Water	Polychlorinated Biphenyls (PCBs) by GC	PCB-1221	8082A						
Water	Polychlorinated Biphenyls (PCBs) by GC	PCB-1232	8082A						
Water	Polychlorinated Biphenyls (PCBs) by GC	PCB-1242	8082A						
Water	Polychlorinated Biphenyls (PCBs) by GC	PCB-1248	8082A						
Water	Polychlorinated Biphenyls (PCBs) by GC	PCB-1254	8082A						
Water	Polychlorinated Biphenyls (PCBs) by GC	PCB-1260	8082A	30	145	30	145	30	
Water	Polychlorinated Biphenyls (PCBs) by GC	DCB (surr)	8082A						40-135
Water	Dioxins	2,3,7,8-TCDD	8290	72	144	72	144	20	
Water	Dioxins	1,2,3,7,8-PeCDD	8290	79	125	79	125	20	
Water	Dioxins	1,2,3,4,7,8-HxCDD	8290	65	144	65	144	20	
Water	Dioxins	1,2,3,6,7,8-HxCDD	8290	78	137	78	137	20	
Water	Dioxins	1,2,3,7,8,9-HxCDD	8290	74	142	74	142	20	
Water	Dioxins	1,2,3,4,6,7,8-HpCDD	8290	81	132	81	132	20	
Water	Dioxins	OCDD	8290	80	129	80	129	20	
Water	Dioxins	2,3,7,8-TCDF	8290	73	150	73	150	20	
Water	Dioxins	1,2,3,7,8-PeCDF	8290	79	137	79	137	20	
Water	Dioxins	2,3,4,7,8-PeCDF	8290	76	137	76	137	20	
Water	Dioxins	1,2,3,4,7,8-HxCDF	8290	86	126	86	126	20	
Water	Dioxins	1,2,3,6,7,8-HxCDF	8290	79	137	79	137	20	
Water	Dioxins	2,3,4,6,7,8-HxCDF	8290	80	138	80	138	20	
Water	Dioxins	1,2,3,7,8,9-HxCDF	8290	72	145	72	145	20	
Water	Dioxins	1,2,3,4,6,7,8-HpCDF	8290	81	135	81	135	20	
Water	Dioxins	1,2,3,4,7,8,9-HpCDF	8290	72	140	72	140	20	
Water	Dioxins	OCDF	8290	65	145	65	145	20	
Water	Metals (ICP/MS)	Arsenic	6020A	80	120	80	120	20	
Water	Metals (ICP/MS)	Cadmium	6020A	80	120	80	120	20	
Water	Metals (ICP/MS)	Chromium	6020A	80	120	80	120	20	
Water	Metals (ICP/MS)	Copper	6020A	80	120	80	120	20	
Water	Metals (ICP/MS)	Lead	6020A	80	120	80	120	20	
Water	Metals (ICP/MS)	Nickel	6020A	80	120	80	120	20	
Water	Metals (ICP/MS)	Silver	6020A	80	120	80	120	20	
Water	Metals (ICP/MS)	Zinc	6020A	80	120	80	120	20	
Water	Mercury (CVAA)	Mercury	7470A	80	120	80	120	20	
Water	Cyanide, Total	Cyanide, Total	9010C	85	115	66	120	20	
Water	Phenolics, Total	Phenols, Total	420.4	79	113	54	131	20	

APPENDIX C

ANALYTICAL LABORATORY STANDARD OPERATING PROCEDURES (on CD only)

This page intentionally left blank.

Curtis & Tompkins, Ltd.

DETERMINATION OF GAMMA-RAY RADIOACTIVITY IN SOIL SAMPLES

Modified EPA Method 901.1

Approved:

11/21/11
HPS Laboratory Director/ Date

11/21/11
QA Director/ Date

11/21/11
HPS Laboratory Supervisor/ Date

11/21/11
HPS Laboratory Supervisor/ Date

Read, Understood and Agreed:

11/21/11
Signature / Date

11/21/11
Signature / Date

11-21-11
Signature / Date

Signature / Date

11.21.11
Signature / Date

Signature / Date

11-21-11
Signature / Date

Signature / Date

Re-Approved:

Signature / Date

Signature / Date

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

DETERMINATION OF GAMMA-RAY RADIOACTIVITY IN SOIL SAMPLES

Modified US EPA Method 901.1

Table of Content

SCOPE
- Summary of the Method
- Detection Limits

REFERENCES
SAMPLE STORAGE PRESERVATION & HOLDING TIME
QC REQUIREMENTS
- Prep (Method) Blanks
- Duplicates
- Laboratory Control Samples (LCS)
- Minimum Detectable Activity (MDA)/ Minimum Detectable Concentration (MDC)/Lower Level of Detection (LLD)
- Matrix Spike (MS)
- Initial Calibration QC Specifications
- Continuing Calibration Verification (Performance Checks)
- Background Measurement
- Instrument Contamination Monitoring

SAFETY
INTERFERENCES
EQUIPMENT AND SUPPLIES
PROCEDURE
- Initial Calibration Procedure
- Continuing Calibration Verification & LCS Second Source Calibration Verification
- Efficiency Verification
- Daily Background Check
- 6 month Instrumentation Background Check
- Gamma Counting Procedure
- Duplicate Sample Analysis
- Blank Sample Analysis
- LCS Analysis
- Sample Result Review & Evaluation

DOCUMENTATION
WASTE DISPOSAL
POLLUTION PREVENTION
REVISION HISTORY
APPENDIX_1: CALCULATIONS
APPENDIX_2: CALIBRATION STANDARDS
APPENDIX_3: INSTRUMENT CONDITIONS
APPENDIX_4: INSTRUMENT MAINTENANCE
APPENDIX_5: DEFINITIONS

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

DETERMINATION OF GAMMA-RAY RADIOACTIVITY IN SOIL SAMPLES
Modified US EPA Method 901.1

SCOPE

This document describes procedures and quality control criteria for the determination of gross Gamma radioactivity in soil/solid matrices. It describes the analysis, calculations, documentation, data assessment, quality control and acceptance criteria.

This method was developed and validated at C&T's Hunters Point Shipyard (HPS) laboratory for determining gross Gamma emissions from a wide range of radionuclides; client and/or site specific requirements inform the appropriate radioactive isotopes to be determined. The isotopes analyzed by this method include, but are not limited to; Actinium-228 (228Ac), Americium-241, Bismuth-212 Bismuth-214 Cadmium-l09 (109Cd), Cerium-139 (139Ce), Cesium-137 (I37CS), Cobalt-57 (57Co) Cobalt-60 (60Co), Europium-152 (152Eu) Europium-154 (154Eu), Lead-210 (210Pb), Lead-212 (2I2Pb), Lead-214 (214Pb), Mercury-203 (203Hg), Potassium-40 (40K), Radium-226 (226Ra), Strontium-85 (85Sr), Thallium-208 (208TI), Thorium-232, Thorium-234, Tin-l13 (1I3Sn), Uranium-235 (235U), and Yttirum-88 (88Y).

The Navy, US-EPA and State of California have agreed upon a 226Ra remediation goal of 1.0 pCi/gm above background for all Navy sites in CA. The operational remediation endpoint for 226Ra in the storm and sewer lines at the HPS is 1.485 pCi/gm. The 226Ra MDA for this method is 1.3 pCi/gr.

This procedure measures 226Ra in soil samples by counting the 186 ke V gamma ray emissions from the sample. This approach provides the most direct technique for measuring 226Ra in soil samples. The HPS lab consistently obtains MDA's below the project Remediation Goal of 1.485 pCi/gm, however, the measurement uncertainty can be as high as 100% when the measured results are near or below the detection limit. This procedure can be modified to measure 226Ra by gamma spectrometry by measuring the 226-Ra decay daughter; 214Bi at 609 keV. Since the 609 keV energy signature of 214Bi is more prominent than the 186 keV energy signature of 226Ra, this "in growth" measurement provides slightly greater precision and lower detection limits. The sample must be sealed and stored for 22 days before 214Bi reaches secular equilibrium with 226Ra. A turnaround time of 22 days is acceptable for final measurement verification, but it is not feasible for supporting field decisions.

The effect of counting time on uncertainty was determined at the HPS laboratory by repeated analyses of a single sample that had initial results near the remediation goal ten times and factored an uncertainty based on the nearness of the ten reported uncertainties. While the reported uncertainties were close to 100%, the factored uncertainty was approximately 3%. This demonstrated the reliability of the data produced by the laboratory and satisfied EPA that using the actual counted activities reported by the on-site lab without regard to the reported two sigma value is appropriate.

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

Summary of the Method

Soil samples are dried, ground and sieved to #10 mesh by HPS SOP 3.6 Soil Sample Preparation and 300-400 gram samples are counted in 250 mL sealable metal containers. This "Tuna Can" geometry is maintained consistently for calibration and for Laboratory Control Standards (LCS). Samples and calibrations standards are placed in the gamma-ray spectroscopy systems and counted directly. Alternatively, samples are counted following sufficient daughter ingrowth (9-28 days). Results are reported in activity as pCi (picoCurie) or activity concentration as pCi/g (picoCurie per gram).

Detection Limits

HPS SAP Worksheet 15.1, page 85

Isotope	CAS #	MDA (pCi/gr)
Americium-241	86954-36-1	0.9
Cesium-137	10045-97-3	0.07
Cobalt-60	10198-40-0	0.03
Europium-152	14683-23-9	0.1
Europium-154	15585-10-1	0.2
Radium-226	13982-63-3	1.3
Thorium-232	7440-29-1	0.9
Uranium-235	15117-96-1	0.18

REFERENCES

US-EPA Method 901.1 Gamma Spectroscopy
DoE HASL 300 Sec 4.5.2.3 Ga-01-R Gamma Radioassay 2/97
DoD Quality Systems Manual, Version 4.2, October 2010
HPS Sampling and Analysis Plan (HPS-SAP) Revision 1 July 2011
HPS SOP 3.6 Preparation of Soil Samples for Gamma Spectroscopy
HPS SOP 2.3 Radiological Data Review

December 15, 2009 letter from Michael Montgomery, Assistant Director of Federal Facilities and Site Clean-up Branch, US-EPA Region IX; to Rufus Howell, Deputy Director Center for Environmental Health, CA Department Health Services. re : EPA acceptance of HPS OnSite Laboratory Results for Radiological Analysis

C1402-98 Standard Guide for High-Resolution Gamma-ray Spectrometry
Ortec Solid-State Photon Detector Operator's Manual GEM Series HpGe (High-Purity Germanium) Coaxial Detector System

Ortec GammaVision-32 A66-B32. Global Value Productivity Add-On for GammaVision-32 Software User's Manual, Version 2.2
Gamma Vision-32, "Gamma-Ray Spectrum Analysis and MCA Emulator for Microsoft Windows 98, 2000, NT, and XP." Software User's Manual A66-B32. Version 6.09.

Maestro-32, "MCA Emulator for Microsoft Windows 98 SE, 2000 Pro, and XP Pro." User's Manual A65-B32. Version 6.0.

"Calibration Factors for Ge Detectors Used for Field Spectrometry," Health Physics, Vol. 55, No I (July), 1988
HpGe System for Measurement of Contaminated Soils, PerkinElmer Instruments/ORTEC Oak Ridge TN (Sept), 2000

SAMPLE STORAGE PRESERVATION & HOLDING TIME

All samples are collected by client field technicians and provided with a chain of custody.
No sample preservation is required for gamma-ray spectroscopy.
Appropriate Sample Containers plastic bags, or jars and once prepared, tuna cans
Samples are delivered, shipped and stored at ambient temperature
There is no maximum holding time for preparation or analysis. When determining 226-Radium using progeny ingrowth, a hold time before counting of between 9 and 28 days is required.
All samples in process are stored and secured in the sample storage or sample preparation Conex(s). Following analysis, all samples are secured in archive storage at ambient temperature and held until authorization is received from the client for disposal.

QC REQUIREMENTS

Instrument Calibration procedures, specifications and acceptance criteria with corrective actions are established for this test in the HPS Basewide Sampling and Analysis Plan (SAP). Method performance is monitored through the use of laboratory control standards (LCS), duplicate sample analysis, and participation in a proficiency sample program. Technical requirements and issues related to low level environmental radiochemical testing preclude the use of spikes, and other QC samples outside of duplicates carried through sample preparation procedures.

SAP Worksheet 28.1, Page 175 specifies the following QC samples and frequencies:

a) Prep Blank sample processed daily
b) An LCS counted and evaluated weekly
c) A sample duplicate processed at a frequency of one per 20 samples

<u>Prep (Method) Blanks</u>

The HPS Gamma spectroscopy prep (method) blank consists of a Tuna Can left on the bench in the sample prep Conex during sample preparation, at least once daily, and after samples have been prepared, the open tuna can is sealed empty containing only dust that may have settled into the can during sample prep steps. The can is labeled as a method blank and counted under the same conditions and settings as samples.

The prep blank tuna can is counted daily on sequentially different detectors prior to samples being run. For example, if Monday's prep blank is counted on Detector #1, Tuesday's prep blank is counted on detector #2 and rotated sequentially on a daily basis. Prep Blank results are

evaluated against the weekly background measurement and updated as appropriate. The blank can is assumed to contain 350grams of soil material for calculation purposes.

Method blank analysis criteria are specified in HPS SAP Worksheet 28.1, page 175:
Frequency: Daily
Acceptance Criteria: Absolute value less than analyte RL
Corrective Action: Any sample associated with a blank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.

Field Equipment blanks are treated and analyzed as samples.

Duplicates
HPS SAP Worksheet 20, page 139 specifies 1 Laboratory Duplicate analysis per SDG of import fill soil samples.

Duplicate analysis criteria are specified in HPS SAP Worksheet 28.1, page 175:
Frequency: 1 per prep batch, max 20 samples per batch
Acceptance Criteria: Relative percent difference (RPD) ≤40% or relative error ratio (RER) ≤1
Corrective Action: Re-prepare and reanalyze the sample and duplicate in the associated preparatory batch for failed analytes if sufficient sample material is available and the sample is homogeneous. If RPD/RER still out of range, report as matrix interference confirmed and write a nonconformance. If reanalysis is in range, re-prepare samples in the batch provided sufficient sample exists to do so. Evaluate the data to determine the source of difference and if there is a matrix effect or analytical error.

Laboratory Control Samples (LCS)
The nature of Gamma Spectroscopy at low environmentally significant levels precludes using LCS material that can be or is carried through sample preparation procedures, suitable material is not commercially available nor can it be obtained in suitably homogeneous form from onsite locations. Available LCS is limited to controlling the counting phase of the gamma radiation determination.

LCS Criteria are specified in HPS SAP Worksheet 28.1, page 175
Frequency: Weekly
Acceptance Criteria: Gamma source check +/- 20% of known activity
Corrective Action: If the LCS fails perform troubleshooting and instrument maintenance as needed and reanalyze the LCS and all samples affected by the changes made to the instrument.

Curtis & Tompkins, Ltd.

Minimum Detectable Activity (MDA)/Minimum Detectable Concentration (MDC)/Lower Level of Detection (LLD)

See HPS SAP Worksheet 15.1, page 85 in Detection Limits above

Soil sample weight should be 300g to 400g in the Tuna Can to achieve detection limits within reasonable (45+ minute) counting time. Soil sample counting time is typically 45 Minutes (2700 seconds) to achieve detection limits for all isotopes of concern.

If less than 300g of soil is present in the tuna can, the counting period may change as informed by data quality objectives and approved by the HPS Laboratory Director or Lab supervisor.

The detection limit for remediation is based on a Critical Level Calculation. Ortec GammaVision-32 software, used in this procedure, provides a Critical Level MDA process, sometimes referred to as the Method Detection Limit (MDL). The Critical Level is 2.33 times the square root of the isotope of concern's background level in the spectrum. For purposes of this procedure, the terms MDA and MDL may be utilized interchangeably.

Matrix Spike (MS)
MS/MSD's are not analyzed at the HPS laboratory because no suitable comparable radioactive material is available at a relevant activity level based on the low levels of radiation in typical sample determinations experienced at the HPS Lab.

Initial Calibration QC Specifications
ICAL Criteria are specified in HPS SAP Worksheet 24 Page 151.
Frequency: as needed for detectors being brought back from maintenance or failed CCV's, or once annually per detector.
Acceptance criteria: +/- 10% of the true value of the nuclides used for the calibration.
Corrective actions: 1) Recalibration, 2) Instrument maintenance, 3) Notify Lab Director
All ICAL events must be documented in the instrument maintenance logs

Continuing Calibration Verification (Performance Checks)
CCV checks are performed on each detector daily prior to use using a CCV check source calibration standard
Acceptance criteria: +/- 10% of the true value of the nuclides used for the calibration.
Corrective actions are: 1) Recalibration, 2) Instrument maintenance, 3) Notify Lab Director

Background Measurement
Background Measurement Criteria are specified in HPS SAP Worksheet 28.1, page 175
Frequency: Daily
Acceptance Criteria: Absolute value less than analyte RL

Corrective Action: Any sample associated with a prepblank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.

In addition to the daily background checks, a long background check (14,000sec) is performed at the end of each week for background correction for the following week.

Instrument Contamination Monitoring
Instrument contamination is monitored by background checks see Background Measurement above and Daily Background Check and 6 month Instrumentation Background Check below.

SAFETY

Laboratory safety shall be conducted as required in accordance with the specifications stated in C&T's Health and Safety Manual as well as the Tetra Tech safety manual, "Accident Prevention/Site Safety and Health Plan", Latest Version.

Laboratory safety shall be conducted as required in accordance with the specifications stated in, "Hunter's Point Radiation Protection Plan and Attachments", Latest Version.

All work areas shall be kept as clean as possible at all times and the entire work area shall be cleaned at the conclusion of the last shift of the day.

Promptly clean any spills that occur using the guidance contained in the Health and Safety Manuals and support of the Radiation Safety Officer and Health and Safety Officer if necessary.

INTERFERENCES

Electrical noise is a common interference. Line conditioners are used to minimize electrical surges.

Background interference is also a concern, but addressed by using long counting times.

Precautions

- Keep HpGe (High Purity Germanium) detectors cold. Minimizing the number of times the detectors are allowed to get to room temperature will extend the life of the crystal/detector.
- Ensure the detector cold-finger is submerged in liquid nitrogen at least 8 hours before applying any voltage to the crystal.
- In cases where the detector is removed from the liquid nitrogen source, or when a

detector shutdown signal is triggered due to increasing temperature, the cold finger should be stabilized at room temperature for a minimum of 24 hours prior to re-submerging in liquid nitrogen.

- Never exceed the manufacturer's recommended operating voltage for the detector. Operate detectors using the correct polarity.
- For detectors that do not have the Detector Interface Module (DIM) hardwired to the detector, ensure N-type detectors are connected to a Negative DIM and P-type detectors are connected to a Positive DIM.
- Do not open the detector shielding during counting operations.

Instrument high voltages and gains are established using the procedures described in Ortec Solid-State Photon Detector Operator's Manual GEM Series HpGe (High-Purity Germanium) Coaxial Detector System.

EQUIPMENT AND SUPPLIES

Ortec Gamma Radiation Counting Equipment

EG&G Ortec Beryllium Window HPGe Gamma Spectroscopy System
High Purity Germanium detector with built in preamplifier and lead shield
Dewar flask with fill collar (30 Liter); Linear amplifier; Detector Interface Module (DIM)
Ethernet transceiver with cable or UBS connection
Multi-channel Analyzer with DSP(Digital Signal Processing) system & WinTel Computers
GammaVision for Windows Model A66-B32 Version 6.09; Global Value Version 2.2

Supplies

250ml plastic jar: ESS Part# 0250, SKS Part# 5786
250ml seam sealable metal can: Wells Can Company Part #BP307, Part #BP307EE
Liquid Nitrogen (LIN) Airgas Industrial Grade
Drying Pans & Aluminum foil: Kirland Part#31680
Poly Carbonate/Seam Sealed Metal Can Counting Geometry Soil Sample

Maintenance Activities

HPS SAP Worksheet 25 Page 161 specifies maintenance procedures for Gamma spectroscopy equipment it is in APPENDIX_4: INSTRUMENT MAINTENANCE of this SOP.

PROCEDURE

Note: This procedure is only valid for the tuna can geometry. If a different geometry is used, separate calibrations must be performed using the different detector-source geometries.

Curtis & Tompkins, Ltd.

Initial Calibration Procedure

The calibration procedure is specified in the Ortec Gamma Vision-32 A66-B32 Operations Manual and abstracted below.

The energy calibration data is used to define the energies of the peaks in the spectrum. These adjustments allow the calculated energies to correspond to the correct library entry, to correctly identify the peak and attribute it to the corresponding nuclide.

Calibrating the detector efficiency relates the number of gamma rays emitted from a source to the number of gamma rays collected in the full-energy peak by the detector. Efficiency calibration data includes effects from the detector itself, the detector source geometry, the materials surrounding the detector, and the absorption in the source material or matrix. Incorrect efficiency calibrations will cause the nuclide activity to be incorrectly reported.

Calibration Standards see APPENDIX_2: CALIBRATION STANDARDS

Tuna Can Soil Standard (Density: 1.5 g/cc)

23.5 mm Diameter Multi-energy Button Source. Isotope Eu-152

Energy and Efficiency Calibrations

1. Place the Eu-152 multi-energy button source on top of two stacked empty tuna can geometries.
2. Open GammaVision and Click on ACQUIRE then click on MCB PROPERTIES using the menu bar displayed on GammaVision opening screen.
3. Click on the amplifier tab displayed on the MCB PROPERTIES screen, then click on START AUTO in the OPTIMIZE BLOCK to commence peak optimization.
4. Remove the EU-152 button source and replace with the mixed gamma TUNA CAN standard upon completion of peak optimization. Click on GO displayed in the menu bar of the opening screen of Gamma Vision to initiate a count.
5. Set the cursor at channel 10,660 during the accumulation of counts and adjust the 1332.5 keV Co-60 energy peak to center on the cursor using the ALT+SHIFT+ (+ or -) keys. Once the 1332.5 keV peak is centered at channel 10,660, secure the count by clicking on the STOP button in the menu bar.
6. Acquire a tuna can specific geometry calibration spectrum using the opening screen of Gamma Vision by clicking on ANALYZE then SETTINGS in the menu bar to display the Sample Type Settings screen. Click on PRESETS to view the LIVE TIME block to ensure 10,000 seconds is displayed. Close window and return to opening screen. Click on GO to start the spectrum accumulation. A typical calibration spectrum will contain each peak with at least 10,000 net area counts. Pb-210 at 46.54 keV peak energy is considered the most limiting parameter. Once 10,000 net counts have accumulated in the Pb-210 channel, the count can be stopped.

Curtis & Tompkins, Ltd.

7. Save the calibration spectrum to the path "C\User\Cal\Spetra\DetX\X_GEOMETRY SOURCENUM.spc" where:

   X = Detector Number

   GEOMETRY = Geometry Description

   SOURCENUM = Source number (i.e,

   C\User\Cal\Det1\1_250 ml Bottle U603.clb)

8. Close all Detector Windows returning to Gamma Vision opening window and click on BUFFER in the Detector ID window. Click on FILE then click on RECALL. Scroll thru the "Look in" window to find the USER FOLDER. Click on USER FOLDER to open folder. Click on CAL folder to open the folder, then, click on SPECTRA to locate the saved calibration spectrum. Click on the saved spectrum to load into BUFFER.
9. Click on Analyze then click on Settings then click on Sample Type. Select the Browse button next to "File:" field and open the file "C:\User\SDF\Cal.Sdf". Click the OK button.
10. If a previously applicable Calibration File exists click on Calibrate then select Recall Calibration. Select the calibration file and Click the Open button. Select CALIBRATE, then, CALIBRATION WIZARD from the BUFFER menu bar.

    Select the option CREATE NEW ENERGY and EFFICIENCY CALIBRATIONS. The TCC Calibration option should remain at the current setting. Select the NEXT button.

    In the ENERGY CALIBRATION WIZARD page, select the library file"C\User\Lib\EfficiencyCalibration.Lib" for mixed gamma using the Browse button. Click on the NEXT button.

    In the EFFICIENY CALIBRATION WIZARD page, select the appropriate CERTIFICATE file in the CERTIFICATE file window. If a certificate file for the applicable source does not exist, then create a Certificate file for the source as follows:

    Click on the Certificate File Browse Button and select the file to edit from the directory "C:\User\Efficiency Tables," then click on the open button. (Note: If a file for the applicable source does not exist, then any of the existing file may be copied and renamed as necessary to create a logical name for the source using geometry and source identification.)

    Select the Certificate File Edit button to edit/review the source data.

    Verify or modify the source data as applicable. If any changes are made to any peak data, then select UPGRADE to apply those changes to the data grid before moving to another peak in the grid.

    After all changes are made to the data grid, select the SAVE AS button and save the Efficiency Table/Certificate File to the "C:\User\Efficiency Tables" directory with an

appropriate name including the geometry and source identification.

Select the OK button to close Certificate File Editor.

Energy, FWHM, and Efficiency Calibrations

1. Click on NEXT to perform the Energy, FWHM, and Efficiency Calibrations.
2. Select the EDIT ENERGY button to review the Energy and FWHM Calibrations.
3. Verify that at least the 46.54 keV peak and the 1836.01 peak are present in the table for a mixed gamma source as these points are at the low and high extremes for measurement and verify that at least 3 points exist between those extremes.
4. Verify that all delta values in the table for the energy calibration are within +/- 0.2%.
5. On the ENERY CALIBRATION sidebar window select FWHM option in the FIT section. Verify that all delta values in the table for the FWHM calibration are within +/- 5%. Delete any points that have a delta > +/- 5%.
6. Close the ENERGY CALIBRATION sidebar.
7. Select the EDIT EFFICIENCY button to review the EFFICIENCY calibration fit.
    a. Verify the FIT TYPE (or MODE) is appropriate for the detector type, i.e., P-type detectors or N-type with Aluminium end cap most commonly use POLYNOMIAL BELOW the knee. N-type detectors without an Aluminium end cap most commonly use QUADRADIC ABOVE and BELOW the KNEE fit with the knee set at 150 keV.
    b. Verify that all delta values in the table for the efficiency calibration are within +/- 5% with the following clarifications:
8. Hg-203 may be deleted from the efficiency table if the calibration spectrum was acquired more than a few months after the assay date. This is due to the increased error associated with the decay correction using a nuclide with a relatively short half-life.
9. Some geometries in close proximity to the detector will experience more coincidence summing of the Y-88 and Co-60 peaks. As a result, the 661.66 keV peak and the 898.01 keV peak may have delta values greater than the 5%. For those two peaks, a maximum delta up to 10% is generally accepted. This results in a conservative activity calculation in samples for Cs-137 and a more accurate assessment of other peaks in this energy range.
10. Peaks with nearby interferences that result in a high delta should be removed from the calibration. For example, the 511 keV peak may interfere with the 514 keV peak

Curtis & Tompkins, Ltd.

depending on the count time and geometry resulting in an erroneous efficiency value for the 514 keV peak in the calibration.

11. The Knee value may need to be adjusted to ensure a smooth curve fit at the transition point. For geometries that are very close proximity to the detector (i.e. Filter Paper), the knee value may provide a better curve fit at approximately 160 kev rather than 150 kev. The user may use trial and error to determine the best fit.

12. When using the Quadratic fit the knee may be adjusted to improve the calibration fit if necessary. Verify that the fitted line is smooth in the transition point near the knee.

13. Close the Efficiency Calibration sidebar window.

14. Select the SAVE CALIBRATION button and save the calibration to "C;\User\Cal\X_GEOMETRY.clb." where X is the detector and GEOMETRY is an appropriate geometry name (i.e., 1_250mlBottle.clb). If the Interpolative Fit was used as a result of the selected spectrum source being used for QC, then the calibration file name must be X_QC.clb where X is the detector number.

(Note: Except for the detector number all calibration names must be consistent for the automation routines to properly select the specified files!Refer to the GVSampleDataSC Software Manual for TetraTech for more details of this system for file identification.)

Enter the calibration description in the format "Detector #X GEOMETRY" where X is the detector number and GEOMETRY is appropriate for Tuna Can when prompted.

Select the FINISH button to close calibration wizard.

Print the calibration report from the menu "Calibration\Print Calibration…"

Close the spectrum BUFFER window and save the spectrum when prompted.

Run the efficiency VERIFICATION AUTOMATION routine from the GVQUICKSTART to verify that the calibration is accurate and all related files were updated successfully. (For the QC calibration, an EFFICIENCY VERIFICATION is not necessary. Run the normal QC to verify the calibration accuracy).

Place the Eu-152 multi-energy button source on top of two stacked empty tuna can geometries.

Acquire a QC calibration spectrum using the opening screen of Gamma Vision by clicking on ANALYZE then SETTINGS in the menu bar to display the Sample Type Settings screen. Click on PRESETS to view the LIVE TIME block to ensure 600 seconds is displayed. Close window and return to opening screen. Click on GO to start the spectrum accumulation. Repeat steps 5.1.8 through 5.1.23 to create a QC calibration file.

Curtis & Tompkins, Ltd.

QC Criteria for Gamma Spectroscopy Calibrations

Total Source Activity
Efficiency and Energy calibrations will be performed annually, and/or following maintenance, power supply anomalies such as power surge spectrum shifts, and failure of control chart parameters 2 sigma warning and 3 sigma control provided by Gamma Vision software.

Energy Calibration
A valid NIST traceable source will be used for all energy calibrations. Two sets of parameters will be accumulated: energy verses channel number and peak shape, i.e., FWHM versus energy. The inputs to this function are a spectrum with isolated peaks distributed over the energy range of interest and a library of peak energies. The formula for energy versus channel number is:

$$E = a_1 + a_2C + a_3C^2$$

Where:
E = energy
a_i = coefficients
C = channel number

The formula for FWHM vs. channels is:

$$F = b_1 + b_2C + b_3C^2$$

Where:
F = FWHM
b_i = coefficients
C = channels

The calculation for FWHM in energy:

$$F(e) = F(c)\ (a_2 + 2a_3 + C)$$

Where:
F(e) = FWHM in energy
F(c) = FWHM in channels at channel C
a_2 = energy calibration slope defined by Eq.1
a_3 = energy calibration quadratic coefficient defined in Eq.1
C = channel number

When the FWHM fit is made, the fit is checked for validity. If the FWHM curve is negative at any part of the spectrum or the curve bends over (has a maximum and then goes down), a warning message, “NON-PHYSICAL FWHM FIT” will be displayed. The FWHM curve can be displayed to see why the fit is incorrect or if the delta between data points and FWHM fit is greater than 25%. The curve may be accepted if the warning is due to the fit outside the energy of interest, or some of the data points need to be deleted. The calibration spectrum should have good

resolution peaks with a minimum of 1,000 counts (preferably 10,000 counts), so, counting longer may remedy the poor fit. In the event Pb-210 is utilized for efficiency calibrations, the Pb-210 peak may be less than 1,000 counts and ignored if desired.

Efficiency Calibration

A valid NIST traceable source that contains isolated singlet peaks over the entire energy range of interest is used for efficiency calibrations.

The polynomial efficiency/energy formula is:

$$\epsilon = e^{\{\Sigma a_i E^{2-i}\}}$$

Where:
ϵ = efficiency at energy E
a_i = fitting coefficients
E = energy in Mev

The result of an efficiency calibration calculation is one or two sets of coefficients (one for the fit above the maximum and one for below) and a set of energy-efficiency pairs. The energy-efficiency pairs are used for the interpolative fit.

Continuing Calibration Verification & LCS Second Source Calibration Verification

1. Continuing Calibration Verifications (CCV) using calibration standards and laboratory control standards (LCS) verify the efficiency and energy calibrations established in the ICAL and check the general operating parameters of the system.
2. CCV checks are performed on each detector daily prior to use using a CCV check source calibration standard
3. A Laboratory Control Standard (LCS) is used as a second source to verify the primary calibration standard following initial detector calibration and weekly thereafter during detector operation. The LCS contains isotopes encompassing the full energy range in the gamma-ray spectrum measurement. The acceptance criteria for LCS is +/- 20% of the known value for isotopes in the LCS. The corrective action for a failing LCS requires re-analysis or an explanation in the narrative portion of the data report.

Efficiency Verification

An Efficiency Verification is performed after the initial calibration. The steps for running an Efficiency Verification are as follows:

1) Place the Mixed Gamma Source on the detector
2) In the Global Value window initiate the Efficiency Verification Job
3) Enter the technician's name and password performing the Job
4) Enter the Source Reference Number when prompted
5) Click OK to start the count

Curtis & Tompkins, Ltd.

6) At the end of the count an Excel file is automatically populated with results. Using the Source Certificate of Calibration enter the referenced γps for all the radionuclides.
7) If the percent difference is within 20% for all the nuclides listed then the detector is operating normally.

Daily Background Check

1. Perform a daily background check on each Gamma Detector to monitor detector contamination and power supply anomalies.
2. A daily background report is automatically generated after completing this test.
3. The daily background is not subtracted from the reported sample results, and serves as a quality control check for changes in background for an individual detector.

6 month Instrumentation Background Check

1. Perform a system component background check for each detector and shield every six months, and/or after a new detector is installed and/or returned to service after maintenance. Record these checks in the detector maintenance log.
2. Check pre-determined parameters (background counts, background count rate) and verify results are within acceptable limits. If the result is less than two standard deviations from the mean, no action is necessary.
3. If the result is between two and three standard deviations from the mean, note the result in the instrument maintenance log.
4. If the result is greater than three standard deviations from the mean, notify the lab supervisor or Lab Manager and the detector must be taken out of service until corrective action is completed. Note these activities in the detector maintenance log.

Gamma Counting Procedure

1. The following steps are to be followed after completing the Daily Background Check, Daily Quality Control Check, and Weekly Laboratory Control Standard Check have been performed as required in accordance with procedures above.
2. Enter sample information into Global Values as follows.
3. Start the gamma-ray spectroscopy counting routine by opening "GLOBAL VALUE", then "GLOBAL VALUE QUICK START". Ensure the proper detector is selected for counting. From "GLOBAL VALUE QUICK START" "AUTOMATION GROUPS" screen, open "ANALYZE SAMPLES" file, then from "AUTOMATION JOBS" screen, open "COUNT SAMPLE". Scan the barcode attached to the sample.
4. From the "GV SAMPLE DATA TETRA TECH" automated pop-up screen "SAMPLE DATA" section, verify that the "SAMPLE ID", "CONTRACT", "SAMPLE DATE/TIME", "UNIT NUMBER", are properly populated. Enter sample description into the "SAMPLE DESCRIPTION" field (if necessary). Enter the “INGROWTH SEAL DATE”
5. From the "GV SAMPLE DATA TETRA TECH" automated pop-up screen "ANALYSIS DATA" section, verify the following fields:

a. "ANALYSIS METHOD" is appropriate for the sample.
b. "GEOMETRY" is appropriate for the sample (i.e., Smear 47 mm Disk, Soil 250ml Plastic Bottle, Soil 250ml Tuna Can) to ensure an appropriate efficiency is used.
c. "LIBRARY" is appropriate for the sample (i.e., Efficiency Calibration, Efficiency Verification, Generic Analysis No Decay, Null, or QC). Note that the typical library for analysis is "Generic Analysis No Decay".
d. "ACTIVITY UNITS" is appropriate for the sample (i.e.,pCi, Ci, Bq, or DPM). Note that the activity units are typically "pCi".
e. "COUNT TIME" is appropriate for the sample. Note that the typical count time is 2700 seconds.

6. From the "GV SAMPLE DATA TETRA TECH" automated pop-up screen "ANALYSIS DATA" section, enter the sample quantity in the "SAMPLE QUANTITY" field. Note that for a soil sample this should be in the range of 300 to 400 grams.
7. Place sample to be counted onto high purity Germanium crystal (HpGe).
8. Select "CONTINUE" to start the spectral analysis and collection. Notify the Lab Director for guidance if a FAILURE NOTIFICATION" window appears at any point in the sample analysis set up process.
9. Upon completion of the gamma-ray spectroscopy analysis, click on "SAMPLES" on the "GLOBAL VALUE QUICK START". Enter USERNAME and PASSWORD, and select "OK". Select the spectrum for the sample analyzed from the "SPECTRUM" field drop down menu. Review the completed gamma-ray spectroscopy analytical report to ensure that the following report attributes are satisfactory:
   f. Sample description
   g. Live time equals the selected count time
   h. Efficiency selected is appropriate to the sample
   i. Radionuclide Library selected is appropriate for the sample
   j. Minimum Detectable Activity (MDA) for respective radionuclides meets the criteria listed in the Sampling Analysis Plan

<u>Duplicate Sample Analysis</u>

1. One laboratory duplicate sample will be analyzed once per twenty samples utilized for unrestricted release.
2. Samples are to be run on the same detector, preferably not in consecutive order. In the event that the samples are run consecutively, the sample container will be physically removed from the shielding housing, relocated to the sample storage location, prior to replacing the sample on the detector. This process ensures that the likelihood of a sample returning to the same geometry on the detector face is random, as would normally be during sample analysis.
3. The acceptable criterion for the duplicate pairs stated in the HPS SAP is a relative percent difference (RPD) of <40. Additional requirements may be imposed through other

work documents. The formula for RPD is:

RPD = 100x2(result -duplicate result) / (result + duplicate result)

Blank Sample Analysis

Blanks are performed at the beginning of every workday before a QC sample is run. The steps for running a Blank are as follows:

1) Place an empty sample can on top of the detector
2) In the Global Value window initiate the Background Check Job Enter the technician's name and password performing the Job
3) Click OK to start the count
4) At the end of the count one Word file is automatically populated with results for the condition of the detector.
5) Review the conditions for the Background check.
6) If the Background check passes then the detector is operating normally and the QC check can be initiated. If the Background check does not pass then the Laboratory Manager or designee will be notified.
7) If the cause of the failure is not immediately obvious, the Laboratory Manager or designee will determine if the technician was compliant with these steps and the detector settings are correct as stated in HPO-Tt-030 (reference) of HPS SAP.
8) If no deviation is found then reference 6.3 Troubleshooting in the Ortec Solid-State Photon Detector Operator's Manual for possible causes.
9) When the cause is determined and remedied the QC check shall be performed again and a note will be made in the Global Value QC notebook.
10) If the detector performance cannot be remedied, the Laboratory Manager or designee will contact Ortec for further instruction.

LCS Analysis

LCS are not easily performed given the requirements for radioactive materials for these tests. The steps for running an LCS are the same as a Continuing Calibration/Efficiency Verification except the LCS Job is selected in the Global Value Window.

Sample Result Review & Evaluation

Samples are counted and reviewed by Lab Technicians. A second data review is performed by the laboratory manager or lab Supervisor or his/her designee and "published" within the Global Value Sample Administrator Program. The sample publishing process automatically creates a folder for the sample unit on the Tetra Tech server.

The data review procedure is specified in HPS SOP 2.3 Radiological Data Review.

Once samples are reviewed an email is sent to the TtEC point of contact stating that all samples have been reviewed and published. At that point Tetra Tech's Data Management Group retrieves the data and performs their review. The specifics for sample publishing are spelled out in the Global Value Software User's Manual.

DOCUMENTATION

Maintenance Benchbooks are at each gamma counter workstation and must be used to document calibrations, any maintenance event, changes to the instrumentation, or changes to associated hardware and software.

Gamma spectroscopy data must be reviewed before "publication" by the Lab Supervisor or Lab Manager and, if acceptable, published for use by the client. Publication creates pdf result files that are automatically submitted to the TtEC On-site Laboratory Coordinator who is responsible for ensuring that the laboratory results are transmitted electronically to the appropriate remediation contractor.

WASTE DISPOSAL

Samples that are determined to need secondary analysis are stored until prepared for shipment to another laboratory. Remaining samples are stored in a long-term waste storage warehouse on site. Expired sources are stored in secure containment separate from current used sources.

Materials used for preparation of samples as well as those used for decontamination of prep areas are disposed in properly labeled radioactive waste bags. These bags are collected weekly and transfer to a region in the long-term waste storage warehouse. Waste generated is disposed in appropriate containers as directed by the Waste Management Plan.

All laboratory activities associated with this procedure will be performed in a fashion designed to generate the least amount of waste possible using ALARA (as low as reasonably acceptable) and still achieve the necessary quality of data. All excess materials, extracts, byproducts, and associated waste will be disposed of in appropriate containers and segregated into the appropriate waste streams in accordance with "Hunter's Point Shipyard Waste Management Plan", Latest Version.

POLLUTION PREVENTION

All laboratory activities, associated with this procedure, will be performed in accordance with the base wide "Hunter's Point Shipyard Pollution Prevention Plan.", Latest Version, to ensure a pollution free work site.

REVISION HISTORY

This SOP is Revision 2, a complete rewrite and expansion of HPS SOP HPO-Tt-028 (6/28/11)

Curtis & Tompkins, Ltd.

APPENDIX_1: CALCULATIONS

The ***background determination*** calculates the first pass background on the low-energy side of the peak using a 5-point average of the channel contents for the region from the peak-centroid channel to the channel which is 6 times the library match width (normally 0.5) times the calculated FWHM (from the calibration) below the centroid. The 5-point average data at a given point is the sum of the data from two channels below the point to two channels above the point divided by 5. This is equivalent to smoothing the data with a smoothing width of 5 and coefficients of 0.2 for all points. The background value is the minimum value of the moving 5-point average and the background channel number is the center channel of the 5. If the minimum average value is within one sigma (counting statistics) of the actual channel value at the assigned channel point, this 5-point average is the low energy background value for this peak. If the average value is not within one sigma of the actual data, a 3-point average is used instead of the 5-point average to calculate a new minimum value. This 3-point average minimum value is compared with the actual data at the assigned channel and is accepted if it is within 1 sigma of the actual data. If the 3-point average also fails this test, the data value at the assigned channel is used for the background. The same process is repeated for the high-energy side of the peak to calculate the background value above the peak. The background under the peak is the straight line between these two values. The net peak area and background are calculated from this first pass.

The ***peak area calculation***, to obtain the library peak area for a particular energy, is to fit the spectrum region with a background plus peak shape function. This so-called "directed fit" can be applied to peaks and has the ability to produce negative peak areas. The negative peak area will produce a negative activity and this will be replotted. Negative activities are required by some reporting agencies for statistical purposes. The fit is iterated until the reduced chi square for the fit changes by less than 1% from the previous iteration up to a maximum of 10 iterations. Most cases will converge in 3 to 4 iterations. Since these values are derived from a fitting process, it is difficult to redo the calculations manually.

The ***counting statistical uncertainty*** is the uncertainty in the gross area and the uncertainty in the background added in quadrature. The uncertainty in the gross area is the square root of the area. The uncertainty in the background is not as simple because the background is a calculated number. The background area uncertainty is the uncertainty in the channels used to calculate the end points of the background multiplied by the ratio of the number of channels in the peak to the number of channels used to calculate the background. For wide peaks and low counts per channel, there is high uncertainty in the calculated background.

Curtis & Tompkins, Ltd.

$$bkg\ error = \left(\frac{(background\ area)\,(peakwidth)}{(width\ of\ low\ average + width\ of\ high\ average)}\right)^{1/2}$$

$$gross\ area\ error = \sqrt{gross\ area}$$

$$net\ area\ error = \sqrt{(gross\ area\ error)^2 + (background\ error)^2}$$

The peak width is calculated at the half maximum, tenth maximum, and twenty-fifth maximum for the net peak shape. The peak width points are linearly interpolated between the two channels that bracket the respective height value.

The ***peak centroid channel*** in total summation is the center-of-moment of the peak and is calculated as the weighted channel number of the peak. That is, the peak centroid is the sum of the net channel contents times the channel number divided by the sum of the channel contents. The centroid is calculated as:

Where: *l, h* = the peak low and high channels i= the channel number
Ci = net contents of channel i

For the directed fit method, the centroid can be refined from the fitting process.

Fraction Limit is used to verify the identification of a particular nuclide in a spectrum, the number of located peaks is compared to the number of possible peaks. This value gives more weight to the more intense peaks. It is expressed as follows:

where *BranchingRatio* is the branching ratio for the peak for the given nuclide, *1*is the sum over the located peaks, and *p* is the sum over the possible peaks. This fraction is between 100 for all peaks located and 0 for no peaks located. This value is compared to a limit value to determine whether this nuclide's peaks are present in sufficient measure to say the nuclide is present. The*fraction limit test* is passed if the fraction is above the selected value

The ***uncertainty*** printed on the report can be either counting or total uncertainty. They can be printed at 1,2, or 3 sigma. The counting uncertainty is the uncertainty of the peak area due to statistical uncertainty. For a peak net area, the counting uncertainty can be expressed in percent of the peak area. This same percent is used to express the percent counting uncertainty in the activity values. The total uncertainty estimate (1 sigma) is determined by summing in quadrature

the individual uncertainties from the various analysis components.

$$\sigma_t = \sqrt{\sigma_{count}^2 + \sigma_{nor}^2 + \sigma_{rsum}^2 + \sigma_{abs}^2 + \sigma_{nuc}^2 + \sigma_{eff}^2 + \sigma_{geo}^2 + \frac{\sigma_{uni}^2}{3}}$$

Where:
σ_t =total uncertainty estimate
σ_{count} = counting uncertainty estimate
σ_{nor} = additional normally distributed uncertainty estimate
σ_{rsum} = random summing uncertainty estimate
σ_{abs} = absorption uncertainty estimate
σ_{nuc} = nuclide uncertainty estimate
σ_{eff} = efficiency uncertainty estimate
σ_{geo} = geometry uncertainty estimate
σ_{uni} = uniformly distributed uncertainty estimate

All components of uncertainty estimates except are computed at the I-sigma level.
The uncertainty estimate for a uniformly distributed error is used at the full range. If a collection factor is not used, the uncertainty estimate is zero for that component.

The ***nuclide activity*** is calculated for all peaks in the library whose energy is between the energy limits selected for the analysis (in-range). There are several methods of determining if a nuclide is present or not, and if MDA should be reported. The nuclide is reported as present if one of the following is true:

1. The first in-range peak of the nuclide in the library is present in the spectrum, and the counting uncertainty is below the peak cutoff.
2. All of the peaks marked as key lines are present.
3. The fraction limit test is passed.

The nuclide activity (in becquerels), based on the peak at energy, *E,* is given by:

$$A_{Ei} = \frac{N_{Ei}}{\varepsilon_E * t * \gamma_d}$$

Where: A_{Ei} = the activity of nuclide i based on energy *E*
N_{Ei} = the net peak area for peak at energy *E*
ε_E = the detector efficiency at energy *E*
t = the livetime
Y_d = the gamma-rays/disintegration for energy *E* of this nuclide

Curtis & Tompkins, Ltd.

The gamma-rays/disintegration value is in the library and the efficiency factor is stored in the calibration file.

This "peak activity" is reported in the nuclide peak matrix. If there is more than one peak in the energy analysis range for a nuclide, then an attempt to average the peak activities is made. The result of the average is the average nuclide activity.

APPENDIX_2: CALIBRATION STANDARDS

NIST Traceable Standards: Eckert & Ziegler Part #85624-918 Total Activity 2.0 ąCi in Tuna Can geometry.

Radionuclide	Quantity in Microcuries
Cd-109	0.85
Co-57	0.019
Ce-139	0.029
Hg-203	0.062
Sn-113	0.049
Cs-137	0.024
Y-88	0.082
Co-60	0.038
Am-241	0.061
Sr-85	0.061
Pb-210	0.77

Put the LCS specifications and identity here

Curtis & Tompkins, Ltd.

APPENDIX_3: INSTRUMENT CONDITIONS

Instrument conditions can vary slightly between instruments. All specific instrument conditions are found with each instrument's method file at each instrument's workstation.

APPENDIX_4: INSTRUMENT MAINTENANCE

As defined by HPS SAP Worksheet #25, page 160

Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person
Clean cave; fill LNO2	Physical check	Physical check	Weekly	Acceptable background	-Recalibrate -Instrument maintenance -Consult lab manager	HPS Laboratory Manager
Background check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	-Recalibrate -Instrument maintenance -Consult lab manager	-Recalibrate -Instrument maintenance -Consult lab manager
Source check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	-Recalibrate -Instrument maintenance -Consult lab manager	-Recalibrate -Instrument maintenance -Consult lab manager

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

APPENDIX_5: DEFINITIONS

Calibration Check - is a standard in the mid range of the energy range that is used to verify the calibration on a daily basis. This is equivalent to continuing calibration verification (CCV) per NELAC.

Laboratory Control Sample (LCS) is a NIST traceable standard from a different lot or if available different vendor than the primary calibration standard. The LCS must include the high, middle and low energy ranges of the isotopes being measured. It serves as an independent check of the calibration. It is run when a new curve is generated.

Prep Blank/Method Background Sample -is an empty tuna can allowed to sit open in the sample prep Conex 250ml jar counted for the same time as a sample and used to assess background contamination.

Efficiency -the percent of decay events from a certified standard radioactive source, in a specific reproducible geometry that are seen and measured by a detector.

Traceable Calibration Standard -A certified calibrated radioactive source prepared as or from a standard reference material traceable to the National Institute of Standards & Technology (NIST), Eckert & Ziegler Isotope Products and others.

ADC -analog to digital converter.

Full Width Maximum (FWHM) -the full width of a gamma-ray peak distribution measured at half the maximum peak height measured above the continuum (background).

Dead Time -the time while the pre amplifier is collecting an electrical pulse generated by photon/detector interaction and is unable to collect another pulse.

Geometry -a standard sample or source counting configuration (i.e. 250 ml polypropylene jar) and its relationship to the detector.

In growth-the expected amount of a decay product that will exist at a later time because of ingrowth from a specified ancestor.

Curtis & Tompkins, Ltd.

SOIL SAMPLE PREPARATION for GAMMA SPECTROSCOPY

Approved:

7/31/12
Lab Director/ Date

7/31/12
QA Director / Date

7/31/12
HPS Lab Supervisor/ Date

7/31/12
HPS Lab Supervisor/ Date

Read, Understood and Agreed:

07.31.12
Signature / Date

7/31/12
Signature / Date

Signature / Date

07.31.12
Signature / Date

07-31-12
Signature / Date

Signature / Date

Signature / Date

Signature / Date

Signature / Date

Re-Approved:

Signature / Date

Signature / Date

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

SOIL SAMPLE PREPARATION for
GAMMA SPECTROSCOPY

Table of Content

SCOPE
REFERENCES
SAMPLE PRESERVATION & HOLDING TIME
QC REQUIREMENTS
- Batch Sizes
- QC Sample Definition

SAFETY
INTERFERENCES
EQUIPMENT
PROCEDURE
- Drying Wet Soil Samples
- Operating the VWR Oven
- Operating the Despatch Oven
- Cooling Samples after Oven Drying
- Crushing and Sieving Soils-Mortar and Pestle Procedure
- Milling Dried Soil Samples in the Ball Mill
- Sub Sampling and Weighing
- Decontamination/Cleaning Support Equipment

DOCUMENTATION
WASTE DISPOSAL
POLLUTION PREVENTION
REVISION HISTORY
APPENDIX_1: CALCULATIONS

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

SOIL SAMPLE PREPARATION for GAMMA SPECTROSCOPY

SCOPE

This document presents the preparation of soil samples submitted for gamma spectroscopy analysis at both HPS and Berkeley Labs. Dry soils and solids of uniform consistency allow improved counting efficiencies and provide greater reproducibility of test results when compared to analysis of soil as received. Herein are specified procedures and equipment employed for drying, reducing particle size and homogenizing soil, sediment and similar samples for Gamma spectroscopy analysis. This procedure is not applicable for rocky and oily samples, filters, and biota and construction debris. Samples prepared in this manner can be analyzed for Gamma Ray Radioactivity by the GS186 and Ra226 21 day ingrowth methods.

REFERENCES

C&T Wet Chem SOP 1.3 Moisture Determination
C&T Rad Chem SOP 3.1 All American Can Sealer Machine
C&T Rad Chem SOP 3.2 Manual Can Sealer Operation
C&T Rad Chem SOP 4.1 Determination of Gamma Ray Activity in Soil Samples
C&T Rad Chem SOP 4.2 Determination of Ra226 by Gamma Ray Spectroscopy
C&T QA SOP 1.4 Balance & Weight Set Calibration Procedures
Basewide SAP Hunters Point Naval Shipyard , Rev1 July 2011 DCN: RMAC-0809-0004-0003.R1

Volume 1, TNI Standard, EL-V1-2009, September 2009
DoD Quality Systems Manual, Rev 4.2 October 2010
Moisture Determination US-EPA CLP Inorganics SOW ILM05.3, Exhibit D, Section 1.6

Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples, EPA/600/R-03/027, November 2003

ASTM. 2003. Standard Guide for Laboratory Subsampling of Media Related to Waste Management Activities. West Conshohocken, PA. D6323-98.

VWR Constant Temperature Oven Installation and Operational Manual. Aug. 2008.
Despatch LBB-12 Oven operators manual: On LIMS in Radiation SOP

SAMPLE PRESERVATION & HOLDING TIME

There is no hold time or preservation required for radiochemical analysis
Soil samples may be collected in either plastic or glass containers.

QC REQUIREMENTS

Daily Balance Calibration must be performed and documented in the benchbook provided. Clean and inspect the balance, verify the balance's ongoing calibration using a 100gr and 500gr

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

class S calibration weights. Handle these weights with the cotton glove provided in the weight box below the balance. Acceptance criteria for calibration is +/- 2%.

100 gr weight must return a weight value between 98-102gr
500gr weight must return a weight value between 490-510gr

If the balance returns a value outside of this range it must be taken out of service, repaired and returned to service when it is fixed. The repair event must be recorded in the balance log.

Clean and inspect the oven, verify the temperature display using the digital thermometer with thermocouple buried in sand. Acceptance criteria are +/- 5% of set temperature. For 200C oven the temperature display should read between +/- 10C of the calibrated thermometer inside the oven, 190-210C.

If the oven fails acceptance criteria, notify the supervisors that corrective action is required.

Batch Sizes

The HPS SAP allows for one batch to be defined as the number of samples that can be processed in a two shift day (40-125 samples). Each batch includes a prep blank, and an LCS

When meeting requirements of DoD QSM and/or processing samples for gamma ray emissions from other sites without specific SAP requirements, a batch is defined as 20 samples prepared with a prep blank, and an LCS.

QC Sample Definition

Prep Blank is a conforming blank soil sample prepared first among all others and allowed to sit open on the bench to collect any airborne dust or particulate that can settle into the open can. It is sealed last and counted with the other samples in the batch.

Laboratory Control Sample (LCS) This is a laboratory prepared reference soil sample containing approximately 10 pCi/gr Ra 226 and processed repeatedly through the procedure presented herein. The LCS was prepared from a Ra226 deck button found at the HPS and blank soil fill material.

SAFETY

There is a real risk from burns due to skin contact with hot surfaces from materials moving out of and into the ovens, use leather or other gloves provided for handling hot sample pans and baking sheets in and around the oven.

Do not place explosive, combustible or flammable material into the oven.

Some soil samples from HPS and other sites contain volatile and semivolatile organic

compounds that may represent unknown inhalation hazards when drying in the oven. Ensure the oven vent to the outside is functional and there is sufficient ventilation in the lab to ensure safe breathing air.

Do not place sealed or filled containers in the oven chamber. They could burst, or worse, explode.

INTERFERENCES

Avoid cross contamination between samples by minimizing soil and dust on the apparatus used to prepare samples. Clean all equipment, pans, balance, baking sheets, mortar, pestle etc..by brushing or wiping between samples using the decontamination procedures specified below..

The level of residual radiation on surfaces can be measured by the Ludlum 44-1 meter with appropriate NaI or other probe. If there is any concern for cross contamination of a sample by a pan or other equipment contact, take a smear sample and count it in the Protean gas proportional counter.

EQUIPMENT

Drying pans: Fat Daddio's Anodized Aluminum Bread Pan, 7.75 Inch x 3.75 Inch x 2.75 (Amazon.com)
Aluminum Baking Sheet 18” x 13” 18 Gauge half Size Aluminum Bun PanSheet Pan (407BUNHALF-EA)
Win-Holt EC 1840-C Enclosed Bun Pan Rack – WEBstaurantstore.com (also for pans)
Glass stirring rods and Stainless Steel spoons
Electronic Top Loading Balance: GF 1200 Top Loader (Users Manual on LIMS)
Oven – VWR Constant Temperature, Model: 1380FM
Despatch Model LBB2-12-1 Forced Air drying oven (Users Manual in LIMS)
4’ Fume Hood
Mortar and Pestle
Glen Mills Inc. 4’ Ball Mill (glenmills.com)
Chrome Steel Grinding Balls: Glen Mills 7400-015875-1 - 5/8" 52100
1 Liter Polyethylene Screw Cap Jar
Standard Soil Scoop
Stainless Steel or Copper Soil Sieve Set: Top Pan & Screen: 10 mesh (2mm) and larger
Thermal Protective (oven) Gloves
40 gr Silica Gel Desiccant Dry Pack fit Pelican Case http://www.amazon.com/shops/SilicaGelProducts
Aluminum Foil (Standard Kitchen grade)
Masslinn, Mohawk Industrial & Nuclear Supply, Inc. Part # 79101

Curtis & Tompkins, Ltd.

PROCEDURE

Note: Oven drying times were validated on standard soil containing 25% moisture (wet mud). Samples containing visible/separable water and soil may contain more than 25% moisture and may have to be dried for longer than 4 hours in the oven.

Drying Wet Soil Samples

1. Preheat the oven to 200^0 C for an hour.
2. Remove approximately 400-500 grams of material from each bulk sample zip-lock bag and place into pre labeled drying pans lined with Aluminum foil.
3. Aggregate pans on baking sheets (Half sheets are easier to handle) to facilitate loading and unloading the oven.
4. During the drying process, check samples visually and periodically break up the soil lumps with a stirring rod or sampling spoon. Minimize X-contamination by wiping the stirring tool with Masslinn or a disposable lab wipe tissue between samples.
5. Allow samples to heat soak in the oven for at least 4 hours.
6. Remove the sample pans on sheets from the oven place and place in bun rack with desiccant packs. See Cooling procedure below.

Operating the VWR Oven

1. Push the POWER switch to the ON position. The digital temperature display will indicate a temperature value. Ensure it shows 200C, check against calibrated electronic thermometer mounted on prep lab wall.
2. Turn the OVERTEMPERATURE SAFETY THERMOSTAT to the maximum position, clockwise e, by using a flat head screwdriver.
3. Enter desired set point. To enter set point mode on the controller, press either the UP or DOWN arrow pad one time. The digital display will start to blink, going from bright to dim. While blinking, the digital display is showing the set point. To change the set point, use the UP and DOWN arrow pads. Wait 5.0 seconds and the display will stop blinking reading the temperature of the oven. Allow the oven to stabilize for at least 24 hours.
4. Turn the SAFETY THERMOSTAT counter clockwise with a flat head screwdriver until the OTP light turns ON.
5. Turn the SAFETY THERMOSTAT clockwise just until the OTP light turns OFF.
6. Turn the thermostat two of the smallest divisions on its scale past the point where the light went out. This sets the SAFETY THERMOSTAT at a temperature approximately 10^0 C above the MAIN TEMPERATURE set point.
7. Set the TIMER DISPLAY by turning the TIMER SWITCH to the ON position. The SET/TIMER display digits will light with no lighted decimals showing. Note: If during any of the following steps, several seconds elapse with no arrow pad or RESET pad activity, the timer will default to the preset displayed setting and it will be necessary to restart all functions over again. The values must be programmed in a consecutive manner with no delays between settings or the default will occur.
8. HOUR FUNCTION: Press and hold the RESET pad until the digits start blinking and a

Curtis & Tompkins, Ltd.

blinking decimal point is between digits 2 and 3. In this mode, pressing the UP and DOWN arrow pads increases or decreases the whole hour value from 0 to 99 (digits 1 and 2).

9. TEN MINUTE FUNCTION: Push the RESET pad again once the correct value for hours is set. The blinking decimal will now move one digit to the right between digits 3 an 4. Pushing the UP or DOWN arrow pads will increase or decrease the ten minute function allowing values between 0 to 5 to be set (digit 3).
10. ONE MINUTE FUNCTI0N: Push the RESET pad again once the correct ten minute value is set. The blinking decimal point will now move one digit to the right beyond digit 4 and be located at the extreme bottom right of the display. With the display in this mode, pushing the UP or DOWN arrow pad will increase the one minute function allowing the value of digit 4 to be adjusted between 0 and 9.
11. ACTIVATION: Pause until timer stops blinking. After all settings are made, push the START/STOP button. The timer activated light will come on and after a brief pause, the preset oven temperature settings will be valid and heating will begin. The oven will now heat up, control at the set point and stop after the timed period on the SET/TIMER display has elapsed.

    Note: When the system is in the timer mode, the heating circuit is de-energized until the START/STOP button is pushed or the TIMER switch is turned OFF. If a change or correction is necessary and the timer has already been activated, push the START/STOP button to “STOP” the timer, then repeat steps>>>>>>>>>>>>>>>>

12. Pre-heat the oven in the normal mode until the desired temperature has stabilized to set the timer so that timed operation will not start until the oven is stable at set point.
13. Turn on the TIMER switch. Push and hold the RESET button until the timer display blinks, this is to be sure that the pre-set timed value is correct. Press the START/STOP button to activate the timer.

Operating the Despatch Oven

1. The Despatch LBB-12 oven has been set for an operating temperature of 200C, and other parameters have been preset including exhaust air rate, upper and lower control limits etc..For a review of oven operations see the users manual in the LIMS Web SOP files under Rad Chem.
2. The Despatch Oven has a calibrated second external thermometer with thermocouple probe mounted at the right side of the oven. The Thermocouple probe can be inserted through a hole in the wall of the right side of the oven and this device can be employed as a second source to verify oven air temperature, alternatively the thermocouple probe can be inserted into a sample to determine when the samples and oven air have reached the same temperature.
3. Turn on the power and heater switches and allow the oven to warm up for approximately an hour before using it to dry samples.

Curtis & Tompkins, Ltd.

Cooling Samples after Oven Drying

1. After samples have completed their hot soak drying, transfer sample pans on sheets to the cooling rack.
2. Allow 4”-6” space (4-6 pan slots) between the sheets in the bun rack to provide sufficient air circulation to allow samples to cool.
3. If possible allow half sheets to be staggered vertically from front to back to allow more space for samples to cool efficiently.
4. Keep a recently dried desiccator cartridge on each sheet to absorb any moisture released by samples and condensing on the bun rack, sheets or pans.
5. Allow Samples to cool for an hour with the rack doors closed and protected from any fugitive dust in the lab.

Crushing and Sieving Soils-Mortar and Pestle Procedure

1. Transfer soil sample to clean mortar and pestle, see decontamination procedure below.
2. Homogenize the dried and cooled soil sample using a mortar and pestle until it is well mixed with uniformly consistent particle size.
3. You may use the pestle to crush samples in the pan, or crush the sample through a larger mesh screen such as an ASTM #2 or # 4 nested above a pan or the #10 sieve.
4. Pass or force the homogenized sample through a clean ASTM No.10 mesh screen. Collect the sample into a clean copper or stainless steel sieve base pan.

Milling Dried Soil Samples in the Ball Mill

1. Transfer the oven dried sample to a labeled 1 liter poly screw cap jar. The sample should fill no more than approximately 50% of the volume in the jar. Discard or save the remaining sample as dictated by any subsequent testing requirements.
2. Add approximately 12 5/8” steel balls, ensure that approximately 25% of the volume of the screw cap jar with sample and balls is air.
3. Put the jar with balls and sample on the ball mill and turn on the rollers, allow the sample to be milled for approximately 4 hours to ensure it will pass a 10 sieve when done milling.
4. Pass or force the milled and homogenized sample through a clean ASTM No.10 mesh screen. Collect the sample into a clean copper or steel sieve base pan. Clean the sieve and pan and other support equipment that comes in contact with the samples as described in the decontamination procedure below
5. Separate the steel balls and clean them as described in the steel ball cleaning procedure below. Use the labeled 1 liter poly jar to store the excess sample.

Sub Sampling and Weighing

1. Dip into the center of the sieved sample with a standard soil scoop, fill it heaping full without pushing against the side of the aluminum pan.
2. Tap the handle of the scoop three times with a spatula, two or three inches from the sample.
3. Hold the spatula perpendicular to the top of the scoop and strike off the excess soil
4. Empty the scoop contents into a tarred tuna can (counting vessel), weigh and record the

weight in the Gamma Spec Sample Preparation Benchbook.

5. If the soil is to be used for additional analyses, i.e. strontium 90, alpha spectroscopy etc., store the remaining soil in an appropriately labeled sample container and submit to the Berkeley lab or other department for additional analyses as and if needed.

Decontamination/Cleaning Support Equipment

1. Use Masslinn to wipe the mortar and pestle and used sample screen(s) between samples to minimize or eliminate cross contamination. Clean mortar, pestle, collecting pans and screen surfaces until Masslinn sheets show no visible dust when swiped across surfaces.
2. As needed, clean sample drying pans, oven and cooling racks and bun rack sheets with Masslinn. Survey this equipment to ensure it is free of detectable radiation.
3. Survey the sample processing equipment (mortar, pestle, all sieves used, etc..) with the Ludlum 44-1 survey meter with 1" x 1" NaI crystal or other suitable probe to verify all equipment that comes in contact with the sample material is clean and free of detectable radiation before reusing it and at the end of the shift.
4. Continue cleaning all equipment that shows any detectable radiation (mortar, pestle, screens etc…) until it shows no detectable radiation.
5. At the end of the shift, clean all bench surfaces in the lab, sweep and or vacuum floor with prep lab dedicated vacuum cleaner, damp mop the floor as necessary to ensure it is clean and free of dust that could potentially cross contaminate samples or increase background radiation. Survey the surfaces with the Lundlum Meter with NaI or other appropriate detector to ensure there is no residual contamination in the laboratory.
6. Clean the chrome steel milling ball media by placing balls in a 1 liter poly jar containing Alconox or equivalent decon detergent, leave 25% void space and rotate the jar on the ball mill for an hour. Collect balls, dry them on Masslinn sheet, survey for detectable radiation and store for reuse. Repeat the process cleaning process until they pass acceptance criteria of no detectable radiation. Evaporate the remaining water in a dish in the oven survey the remaining solids if no detectable radiation clean dish in sink. If radiation is detected transfer solids to solid rad waste container and dispose of as appropriate for this waste stream.

DOCUMENTATION

Document the daily balance calibration check in the balance calibration benchbook

Document the oven temperature calibration verification in the oven benchbook. Check display temp against calibrated second thermometer and record the difference.

Document sample preparation in the sample prep benchbook by recording the sample ID#, Time in and out of the oven, and sample weight in the tuna can.

A copy of the benchbook page documenting when and how the samples were prepared may accompany the samples.

The completed benchbook pages documenting sample preparation must be scanned into the LIMS using the workflow menu lab sample numbers and batch numbers may need to be entered into the scanner.

Each benchbook page should include the following information:

- C&T sample ID's
- Sample weights
- Time in and out of oven
- Date & Time & Lab Tech documenting the work
- Any unusual observations about the sample,

WASTE DISPOSAL

The location and times for storage of retain samples differ at the HPS and Berkeley labs and may differ between projects/sites. Determine how long and where to retain excess sample or tuna cans prior to disposal along with identification of the appropriate laboratory waste stream. Collect waste in appropriately labeled satellite (lab) containers (or bags) and transfer aggregated waste to the waste facility at Berkeley or Building 258 and/or other locations at HPS as advised by the facility RSO or ARSO.

POLLUTION PREVENTION

There are no PP procedures available for this revision.

REVISION HISTORY

This is rev 2. The following changes were mandated by CA ELAP assessors:

- Procedures related to the use of the bun rack, bake sheets, and desiccant
- A description for the use of larger sieves than 10 mesh
- The use of Masslinn sheets for cleaning the mortar and pestle and other equipment
- Procedures to clean lab after shift is over

The following procedures were added to use this procedure at Berkeley

- The use of the Despatch oven
- Use of Ball Mill to supplement mortar & pestle procedures
- Expanded Equipment Section

Curtis & Tompkins, Ltd.

APPENDIX_1:CALCULATIONS

LIMS calculates the %solids and %moisture, using the following equations:

$$\%Solids = \frac{\text{Dry weight of sample}}{\text{Wet weight of sample}} \times 100 = \frac{B - D}{A - D} \times 100$$

$$\%Moisture = \frac{\text{Wet weight of sample - Dry Weight of Sample}}{\textbf{Wet weight of sample}} \times 100 = \frac{A - B}{\textbf{C}} \times 100$$

A = initial (wet) weight of pan plus sample
B = final (dry) weight of pan plus sample
C = initial (wet) weight of sample = (A-D)
D = tare weight of pan

Curtis & Tompkins, Ltd.

DETERMINATION OF GROSS ALPHA AND BETA RADIOACTIVITY ON SMEARS AND AIR SAMPLE FILTERS USING PROTEAN GAS PROPORTIONAL COUNTING SYSTEM WPC 1050

Approved:

11/21/11
HPS Lab Director/ Date

11/21/11
QA Director / Date

11/21/11
HPS Lab Supervisor/ Date

11/21/11
HPS Lab Supervisor/ Date

Read, Understood and Agreed:

11/21/11
Signature / Date

11/21/11
Signature / Date

11-21-11
Signature / Date

Signature / Date

11.21.11
Signature / Date

Signature / Date

11-21-11
Signature / Date

Signature / Date

Re-Approved:

Signature / Date

Signature / Date

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

DETERMINATION OF GROSS ALPHA AND BETA RADIOACTIVITY ON SMEARS AND AIR SAMPLE FILTERS USING PROTEAN GAS PROPORTIONAL COUNTING SYSTEM WPC 1050

Table of Content

SCOPE
REFERENCES
SAMPLE COLLECTION, RECEIPT, PRESERVATION & HOLDING TIME
QC REQUIREMENTS
- Blanks
- Duplicates
- Detection Limits
- Laboratory Control Samples (LCS)
- Instrument Calibration
- Performance Checks (CCV)
- Background Measurement / Instrument Contamination Monitoring
- Corrective Action

SAFETY
INTERFERENCES
EQUIPMENT & SUPPLIES SPECIFICATION
PROCEDURE
- Precautions and Limitations
- Instrument Calibration Procedure
  - Detector Voltage Determination
  - Crosstalk Determination
  - Efficiency Check
  - Efficiency Verification
  - Daily Checks
  - Background Check
- Smear Sample Analysis
- Air Sample Analysis

DOCUMENTATION
WASTE DISPOSAL
POLLUTION PREVENTION
REVISION HISTORY

APPENDIX_1: CALCULATIONS
APPENDIX_2: REAGENTS & STANDARDS
APPENDIX_3: INSTRUMENT CONDITIONS
APPENDIX_4: INSTRUMENT MAINTENANCE

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

DETERMINATION OF GROSS ALPHA AND BETA RADIOACTIVITY ON SMEARS AND AIR SAMPLE FILTERS USING PROTEAN GAS PROPORTIONAL COUNTING SYSTEM WPC 1050

SCOPE

This document contains procedures for the determination of gross beta and alpha radioactivity on smears and air sample filter media. The operation of the Protean WPC 1050 Alpha/Beta Counting System for routine sample analysis is described herein, including access to the computer operating system, calibration, performance checks, starting of data collection, and the printing of data plots and reports.

This is a screening measurement to indicate whether radioactive contamination is present and results indicate the performance of additional specific analyses. Generally, specific analyses are required when gross alpha particle activity exceeds 5 pCi, and gross beta particle emissions exceed 15 pCi. If gross beta activity exceeds 50 pCi, the identity of the major radioactive constituents should be evaluated.

This procedure is not specific to any referenced method. For method scope, applicability or detection limit refer to the method specific SOP.

REFERENCES

HPS Sampling and Analysis Plan (HPS-SAP), Rev 1 July 2011
Volume 1 TNI Standard, EL-V1-2009, September 2009
DoD Quality Systems Manual, Version 4.2, October 2010

EPA Method 9310, Gross Alpha and Gross Beta, Rev 0, September 1986
WPC 1050 Operations Manual, Protean Instrument Corporation, Rev 1, (on LIMS)
Vista-FC Manual for Automatic Counting Systems

ANSI N42.25-1997 Calibration and Usage of Alpha/Beta Proportional Counters.

ASTM D7282-6 (11/2010) Standard Practice for Setup and QC for Instruments used for Radioactive Measurements

SAMPLE COLLECTION, RECEIPT, PRESERVATION & HOLDING TIME

Samples are smear samples and air filters collected by field technicians and provided to the laboratory. No preservation and no holding times are required. Appropriate containers are paper envelopes containing the 47 mm paper filter or swipe samples. Samples are either hand delivered or shipped and stored in the laboratory holding area before analysis. Samples are stored at ambient temperature and held onsite until authorization is received from the client for disposal.

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Curtis & Tompkins, Ltd.

QC REQUIREMENTS

Blanks

Background checks are performed daily as described below in Daily Background Determination

Duplicates

HPS SAP Worksheet 20, page 139 specifies no duplicate analysis for this procedure.

Detection Limits

Per HPS SAP Worksheet 15.1, page 86 No MDA/MDC/LLD is specified

Laboratory Control Samples (LCS)

HPS SAP Worksheet 20, page 139 specifies no LCS analysis for this procedure

Instrument Calibration

ICAL shall be performed prior to initial use, when the instrument is placed back in service after maintenance and/or when the instrument's response exceeds acceptance criteria for instrument QC. Calibration shall be performed with NIST traceable reference standards with the same general characteristics (i.e., filter and swipes) as the associated samples. C&T's calibration standard for the Protean are prepared by E&Z on air sample filters used at the site.

HPS SAP Worksheet 24 Page 150 specifies all Protean calibrations including daily CCV checks are +/- 10% of the true value for the nuclides used for the calibration.

Calibration Procedure	Acceptance Criteria	Corrective action
Plateau generation and/or verification	**Plot efficiencies vs masses**	Recalibrate
Discriminator setting	Calculate equation of curve – degree ≤3	Recalibrate
Initial long background count	Remove outliers >15% deviation from theoretical values but not more than 20% of total points	Instrument Maintenance
Mass attenuated efficiency calibration	Calculate coefficient of determination (R^2). R^2 must be ≥0.9	Consult with Technical Director
Eight source dual/single calibration curves	Verify calibration with second source standard count – must be within 30 percent of true value and mean across all detectors <10%	Recalibrate

Performance Checks (CCV)

The performance check for counting efficiency shall be performed on a day of use basis. For batches of samples that uninterruptedly count for more than a day, a performance check can be performed at the beginning and end of the batch as long as this time interval is no greater than one week. Verification of instrument calibration does not directly verify secondary calibrations, e.g., the mass efficiency curve.

Curtis & Tompkins, Ltd.

Background Measurement/Instrument Contamination Monitoring
Background measurements shall be made on a daily basis and monitored using control charts or tolerance charts. Background values may be subtracted from the total measured activity in the determination of the sample activity.

Corrective Action
Corrective action for out-of-control data might require instrument maintenance, reanalysis, or a more complex set of actions. When troubleshooting measures fail to bring an analytical process or data into control, a Corrective Action Report (CAR) should be initiated in accordance with C&T QA SOP 4.2 Corrective Action procedure

Troubleshooting the instrument is a function of analyst experience. If vendor assistance is needed, contact the Protean Instrument Corporation http://www.proteaninstrument.com/. Maintenance logbooks are kept for the Protean WPC 1050 that contains entries for both routine and non-routine maintenance procedures.

Definitions
Background Sample -is a new unused smear paper or air sample filter placed in an empty planchet counted for the same time as a sample and used to assess background contamination.

Efficiency -the percent of decay events from a certified standard radioactive source, in a specific reproducible geometry that are seen and measured by a detector.

Traceable Calibration Standard -A certified calibrated radioactive source prepared as or from a standard reference material traceable to the National Institute of Standards & Technology (NIST), Eckert & Ziegler Isotope Products.

Check Source: A radioactive source, not necessarily calibrated, that is used to confirm the satisfactory operation of the instrument.

Calibration Check -is a standard that is used to verify the calibration on a daily basis. This is equivalent to continuing calibration verification per NELAC.

Dead Time -the time while the pre amplifier is collecting an electrical pulse generated by particle/detector interaction and is unable to collect another pulse.

Geometry -a standard sample or source counting configuration (i.e. 2 inch planchette) and its relationship to the detector.

Crosstalk: The detection of alpha events in the beta channel or the detection of beta events in the alpha channel during simultaneous counting.

Proportional counter: A gas filled radiation counter tube operated in the range of high voltage in which the total charge collected for each ionizing event is proportional to the number of ion pairs formed in the tube by the initial event.

Self Absorption: Absorption of radioactive emissions by the solids contained on the counting planchet, thereby preventing the emission from reaching the detector.

Simultaneous Counting: The measurement of both gross alpha and gross beta activity at the same time.

SAFETY

All laboratory safety and radiological safety procedures must be adhered to in accordance with Health and Safety Chemical Hygiene Plan and Laboratory Safety Manual.

Laboratory safety shall be conducted as required in accordance with the specifications stated in the Tetra Tech safety manual, “Accident Prevention/Site Safety and Health Plan”, Latest Version. Laboratory safety shall be conducted as required in accordance with the specifications stated in, “Hunter’s Point Radiation Protection Plan and Attachments”, Latest Version.

All work areas shall be kept as clean as possible at all times and the entire work area shall be cleaned at the conclusion of the last shift of the day.

Promptly clean any spills that occur using the guidance contained in the Health and Safety Manuals and support of the Radiation Safety Officer and Health and Safety Officer if necessary.

Dispose of any waste generated in appropriate containers as directed by the Waste Management Plan.

Always wear disposable latex or nitrile gloves when handling sources and samples for Protean.

INTERFERENCES

Temperature inversion decreases the dispersion of Radon 222 through the atmosphere which can cause increased background due to Radon 222 alpha decay.

In this determination the radioactivity of the sample is not separated from the solids of the sample, thus the solids concentration is very much a limiting factor in the sensitivity of the method for any sample.

The largest sample aliquot that should be counted for gross alpha activity has a solids density thickness of 5 mg/cm2 in the counting planchet. For a 2-in. diameter counting planchet (20 cm2),

an aliquot containing 100 mg of solids would be the maximum aliquot size for that sample which should be counted for gross alpha activity.

For analyses requiring isotope specific analyses (i.e. Cl-36, Sr-90), chemical separations are required during sample preparation to remove unwanted counting interferences.

EQUIPMENT & SUPPLIES SPECIFICATION

Equipment

Alpha/Beta low background gas proportional counter, Protean WPC 1050 (same analysis system as model WPC 9550)
Laser printer
Computer and Vista FC software to provide an interface for control of alpha/ beta counting system
Counting gas – P-10 (90% argon, 10% methane) Airgas High Purity 99.9%
Gas flow meter
Compressed gas regulator

Supplies

Aluminum or stainless steel 2 inch counting planchets with raised sides
Tweezers
Fume Hood
Latex or Nitrile disposable gloves

Instrument Maintenance Procedures & Frequency

HPS SAP Worksheet 25 Page 160 can be found in APPENDIX_4: INSTRUMENT MAINTENANCE this table specifies maintenance procedures and frequency for the Protean WPC 1050 system.

PROCEDURE

Precautions and Limitations

Planchets and their contents should never be allowed to protrude above the top surface of the sample holder.

P-10 gas contaminants increase as the gas is depleted from the cylinder. It is good practice to replace a cylinder before tank pressure decreases to 200 psi.

P-10 flow requirements are 60 cc/min window detector and 150 cc/min windowless detectors.

Aluminum sample holders can elevate the beta background, usually contributing

approximately 0.2 cpm.

Instrument Calibration Procedure

The Protean WPC 1050 shall be calibrated at initial installation, every 12 months, after changing a detector, following system maintenance that may affect the electronics, and/or when a problem is suspected. The instrument window settings should not be changed after the initial set up. If the window settings are altered, all calibrations for the instrument must be renewed

Detector Voltage Determination

Select from the Main Screen the Plateau button. The plateau screen is called from the Plateau menu. It is accessible without a password. It shows the plateau name (usually alpha or beta), date the plateau was run, count time for each voltage step, plateau start button, and a plot of count rate versus detector voltage.

Run a plateau by placing the plateau source on the sample slide, and pressing "START PLATEAU". The instrument will step the high voltage from 630 volts to 1770 volt~ in 30-volt increments. At each step it counts for the time shown in the "Preset Time" window. As each set of data is collected it is plotted on the graph. When the plateau run is complete, a visual determination of the set points for the alpha and beta plateau is made, and the values entered through the password protected setup menu.

Once the plateau has been completed, the data may be printed and graphed. The optimum operation voltage for beta counting is approximately 30-150 volts above the knee of the curve. The knee is determined by drawing straight lines along the 1ising slope and the plateau portions of the curve; the knee is the point where these two lines intersect. The operating voltage is typically the first point on the plateau (flat portion of the curve.) The plateau length should be at least 200 volts. The percent slope per 100 volts should be 10% for distributed sources. This will yield good efficiency with the lowest background.

NOTE: Changing the operating voltage will invalidate all calibrations operating at the previous voltage. Contact the HPS Lab Director or Supervisor before changing the operating voltage.

Crosstalk Determination

Crosstalk determination is the measurement of alpha events in the beta channel or beta events in the alpha channel. Crosstalk is determined annually, typically coinciding with the initial calibration (alpha/beta). These crosstalk values are used in all calibrations for the instrument.

Most first pass screening applications require gross counting of samples for both alpha and beta activity. When screening for beta emitters in the presence of a high activity alpha emitter, an artificially high beta activity can be reported unless the appropriate correction factor is pre-

determined and applied. This correction factor is referred to as alpha-beta-crosstalk.

The most predominant source is the alpha decay scheme itself. Alpha emitting isotopes such as Am-241 and Th-230 (two widely used alpha calibration sources) have a variety of decay schemes or branches. Some alpha decay branches are accompanied by conversion electrons, X-ray and/or gamma radiation. This secondary radiation can be detected as beta energy radiation and exaggerate the beta counts intended to identify only beta emitting isotopes.
A secondary source for alpha to beta crosstalk is the resolution of the counting instrument. It is the percentage of false beta counts reported in the presence of a pure alpha emitter. Polonium 210 (Po-210) is a pure alpha emitter used as a test source for cross-talk and alpha efficiency.

Crosstalk values are determined by counting alpha standards and calculating the ratio of the reported beta counts to the reported alpha counts.

1. Determining Alpha Crosstalk
   Alpha crosstalk is the measurement of alpha events in the beta channel. The value is determined by counting a set of pure alpha emitting sources (Po-210), which should increase in mass long enough to achieve 10,000 total alpha counts each. The alpha crosstalk value is calculated by dividing the number of resulting beta counts by the number of resulting alpha counts. Source mass by % crosstalk should be plotted, and the coefficients of the curve should be used in calculating alpha crosstalk for all samples

2. Determining Beta Crosstalk
   Beta crosstalk is the measurement of beta events in the alpha channel. A set of Sr-90 sources should be counted in each detector, long enough to achieve 10,000 total beta counts. Beta crosstalk should be calculated for each source by dividing total alpha counts by total beta counts. An average of all of the sources crosstalk values should be calculated for each detector and this average value will represent that detector's beta crosstalk.

Efficiency Check

1. Daily, and prior to counting samples, an efficiency check and check verification is required.

2. Always wear disposable latex or nitrile gloves when handling sources and samples for Protean.

3. The QC2 carrier is always reserved for the designated alpha (Th-230) source. The QC3 carrier is always reserved for the designated beta (Sr-90) source. The values that are determined are compared to the current alpha and beta control charts.

4. Without handling the surface area of the source, place the Th-230 source into a planchet and into QC2 carrier. Place QC2 carrier into the left magazine of the Protean.

5. Place the Sr-90 source into a planchet and into QC3 carrier. Place QC3 carrier on top of the QC2 carrier in the left magazine of the Protean. Place white end plate on top of QC3 carrier.

6. At the Vista FC program main screen, select *Auto Cycle Setup* option.

7. Deselect the *Enable auto start timer* and *Enable repeat cycles* options. Select *Save* and return to main Vista FC screen.

8. Select *Auto-Start Sample* to begin QC count.

9. Once QC cycles have completed, select *QC Checks* from the Vista FC screen.

10. Select *Chart Type – Alpha Source*. Deselect *Beta CPM* and scroll to today's date to determine if the result is *ok* and is within acceptable range. If the alpha source does not achieve an *ok* result, contact Lab Supervisor.

11. Repeat steps 6-10 above for beta (Sr-90) source.

<u>Efficiency Verification</u>
The detector efficiency must be verified with a second NIST traceable source prior to using the newly established efficiencies. The result of each verification source when calculated with the new efficiency must be± 25% of the known value.

1. Select from the Main Screen CALIBRATE FUNCTION. Select the EFFICIENCY/CROSSTALK option.

2. Select the desired routine (Gross Alpha Beta) by highlighting its name with the arrow keys and then pressing ENTER.

3. A screen will appear which allows various operations to be performed on the calibration data.

4. Toggle the TABLE field to the desired type of calibration [ALPHA and BETA EFFICIENCY]. Select the [Acquire] button.

5. Select the PRESET TIME field on the screen and specify the length of time the standards are to be counted to allow 10,000 counts to accumulate.

6. Enter in the NUMBER OF STANDARDS field the number of data points to be collected. The maximum value is twenty.

7. Load the alpha and beta standards onto the sample changer. The [ADVANCE] and [REVERSE] should be used to position the first standard on the slide. The remaining standard should be to the left of the first one.

8. Select the [START] button from the screen to begin the analysis. As the analysis begins, a screen will appear that will query the operator for information about each standard, i.e., DPM, Half Life, Calibration Date etc.

9. Enter the data for the standard loaded onto the specified carrier. Use the [NEXT] and [PREV] buttons from the screen to enter data for the remaining standards. When data from all standards is entered, the [DONE] button should be selected in order to proceed.

10. Select the [CHART] button when the acquisition time is completed to view the calibration data.

Daily Checks
Ensure the daily QC and Background checks are completed during the first shift of the workday and entered into the control chart program. The results of this daily check are maintained on the LIMS. The control charts provide a means to evaluate detector performance, conformance, and trends.

Background Check
A daily background check is performed to monitor instrument contamination and power supply anomalies. After completing data acquisition, a daily background report is automatically generated.

Verify the pre-determined parameters background counts and background count rate:
Acceptance Criteria are +/- 2 Standard Deviations from the mean.
Narrate Background results above +/- 2SD and below +/-3SD in LIMS.
Complete a CAR for all background results above +/- 3SD and take the instrument out of service and perform necessary maintenance until the instrument can be returned to service.
The daily background is subtracted from sample results reported.

Smear Sample Analysis

1. Upon receiving a set of smears, check all sample identification numbers against chain of custody (COC) forms before preparing the sample for analyses.

2. Always wear disposable latex or nitrile gloves when handling sources and samples for Protean.
3. Determine which Routine carrier is required for smears being counted. Ordinarily, Routine 1 Gross Alpha/Beta carrier is used to count each smear for three minutes. Routine 5 carrier is used to count each smear for 10 minutes. Count smears for time determined by project MDA requirements.
4. Using tweezers, load smears onto planchets and carriers with applicable routine carrier for smears being counted. Load carriers into left Protean magazine with routine carrier on bottom of magazine. Place white end plate on top of last carrier.
5. At the Vista FC program main screen, select *Routine Inputs* routine number and type in sample identification. Select *Auto Cycle Start* to begin sample analysis. Samples will stack in the right magazine while being analyzed. Once analysis is complete, samples will restack to left magazine. Samples can then be removed in the same order they were loaded.
6. Open *Smear Sample* Access database. Select *Add New Smear Survey Reports.* Using smear survey package information, enter Survey Number, Survey Date/Time, Number of Smears, Technician, Count Technician, RWP number, Location, Description, Reason, Inst Probe ID.
7. Select *Create Report*. Review information for errors. Once determined all information is correct, print report. Two copies will print. One copy will be stamped COPY and placed in smear survey notebook. The other copy will be stamped ORIGINAL and given to Lab Supervisor for approval.

Air Sample Analysis

1. Always wear disposable latex or nitrile gloves when handling sources and samples for Protean.
2. Routine 2 carrier is ordinarily used to count air samples.
3. Using tweezers, load air samples onto planchets and carriers with applicable routine carrier. Load carriers into left Protean magazine with routine carrier on bottom of magazine. Place white end plate on top of last carrier.
4. At the Vista FC program main screen, select *Routine Inputs* routine number and type in sample identification. Select *Auto Cycle Start* to begin sample analysis. Samples will stack in the right magazine while being analyzed. Once analysis is complete, samples will restack to left magazine. Samples can then be removed in the same order they were loaded.
5. Open Air Sample Access Database. Select *Add New Air Sample Report*. Using air sample envelope information, enter Sample ID, Start Date/Time, Stop Date/Time, Flow On, Flow Off, Sample ID, Reason, RWP Number, Area, Instrument ID.
6. Select *Create Report*. Review information for errors. Once determined all information is correct, print report. Stamp this report ORIGINAL, sign and submit to Lab Supervisor.

Curtis & Tompkins, Ltd.

DOCUMENTATION
Protean data will be reviewed and, if acceptable, a pdf file will be created and submitted to the On-site Laboratory Coordinator who is responsible for ensuring that the laboratory results are submitted electronically in a timely manner to the appropriate remediation contractor.

Each sample analysis performed is documented in the instrument run log.

All raw data printouts, calculation spreadsheets and batch checklists are filed with sample data for archival in accordance C&T HPS SOP 2.3 Radiologic Data Review

Sample Prep Benchbooks are used to document each sample preparation, if any.
Instrument maintenance is recorded in the Protean Maintenance Log in accordance with C&T QA SOP 5.4 Lab Benchbooks

WASTE DISPOSAL
Samples are stored in a long-term waste storage warehouse on site. Expired sources are stored in secure containment separate from current used sources.

Materials used for preparation of samples such as gloves are disposed in properly labeled radioactive waste bags. These bags are collected weekly and transferred to a region in the long-term waste storage warehouse. Waste generated is disposed in appropriate containers as directed by the Waste Management Plan.

All laboratory activities associated with this procedure will be performed in a fashion designed to generate the least amount of waste possible using ALARA (as low as reasonably acceptable) and still achieve the necessary quality of data. All excess materials, extracts, byproducts, and associated waste will be disposed of in appropriate containers and segregated into the appropriate waste streams in accordance with "Hunter's Point Shipyard Waste Management Plan", Latest Version.

POLLUTION PREVENTION

All laboratory activities, associated with this procedure, will be performed in accordance with the base wide “Hunter’s Point Shipyard Pollution Prevention Plan.”, Latest Version, to ensure a pollution free work site.

REVISION HISTORY
This SOP was originally HPS Laboratory HPO-Tt-029 Revision 0, adopted 1/4/2011. This is Revision 1 reformatted and expanded by C&T.

Curtis & Tompkins, Ltd.

APPENDIX_1: CALCULATIONS

Swipe Sample Equations

$$R_n = R_g - R_b = \frac{N_g}{T_g} - \frac{N_b}{T_b}$$

R_n = net count rate
N_b = number of background counts observed
N_g = number of gross counts observed
R_b = Background count rate
R_g = Gross count rate
T_b = Background count time in minutes
T_g = Sample count time in minutes

$$C = \frac{R_n}{K0.25}$$

C = concentration of radioactive material in dpm/100cm^2
R_n = net count rate in cpm
0.25 = Adjustment factor
K = counting efficiency

$$MDA = \frac{3 + 3.29\sqrt{R_b T_g \left(1 + \frac{T_g}{T_b}\right)}}{KT_g 0.25}$$

R_b = Background count rate
T_b = Background count time in minutes
T_g = Sample count time in minutes
0.25 = Adjustment factor
K = Instrument efficiency

Curtis & Tompkins, Ltd.

Air Sample Equations

$$R_n = R_g - R_b = \frac{N_g}{T_g} - \frac{N_b}{T_b}$$

R_n = net count rate
N_b = number of background counts observed
N_g = number of gross counts observed
R_b = Background count rate
R_g = Gross count rate
T_b = Background count time in minutes
T_g = Sample count time in minutes

$$C = \frac{R_n}{EFKT_s 2.22E6}$$

C = concentration of radioactive material in the air in µCi/ml
R_n = net count rate in cpm
E = fractional filter efficiency
F = airflow rate through the sampler in ml/min
K = counting efficiency
T_s = duration of sample collection in min

<u>Gross Alpha/Beta Measurement Uncertainty</u>
C&T uses a simple method for estimating systemic and random uncertainties expressed as a percent error and propagated using the square root of the sum of the squares (RSS). By placing the various errors in the same units (e.g., percent error) it is possible to determine the overall uncertainty for a specific air sample. See C&T QA SOP 3.5 Measurement Uncertainty

$$MU = SQRT(SD_P^2 + \text{Component Uncertainty}^2 + \ldots)$$

The uncertainty components from counting statistics, instrument efficiency determination, daily source check, and air sampling flow rate determinations can/should be combined with the relative SD of the population of NIST Traceable LCS data available (SD_P).
20 or more individual LCS data points can/should be used to estimate SD_P. Counting measurement uncertainty (MU) can be estimated using the formula:

MU = *k* x SD_P,
where *k* (the coverage factor) equals 2 (for 95% confidence)

If fewer than 20 LCS results are available, the coverage factor should be the appropriate t statistic for 95% confidence for the associated number of degrees of freedom (7=2.365, 8= 2.306, 9=2.262 10=2.228, 20=2.086, 30=2.042, 40=2.021, 60=2.000, 120=1.980

Curtis & Tompkins, Ltd.

Protean Measurement Uncertainty – Calculation of Counting Error (net counts per minute)

Sample counting data events are characterized as being small in relation to the possible events that can occur during the counting time. As a result of this observation, the population of any sample counting data is best described by the Poisson distribution. The standard deviation of any particular sample count rate can be determined by,

$$\sigma = \left[\frac{\sqrt{n}}{t}\right] = \left[\sqrt{\left(\frac{n}{t}\right)\left(\frac{1}{t}\right)}\right] = \left[\sqrt{(r)\left(\frac{1}{t}\right)}\right] = \left[\sqrt{\frac{r}{t}}\right]$$

Where

n = total counts (c)
t = count time (min)
r = count rate (cpm)

Since the background of the counter is important, an additional step is required to determine the standard deviation of the net count rate. The result is also reported at the 95% confidence level.

$$\sigma_n = 1.96\sqrt{\frac{r_g}{t_g} + \frac{r_b}{t_b}}$$

Where

r_g = gross counting rate
t_g = gross count time
r_b = background count rate
r_t = background count time

Example

$$\sigma_n = 1.96\sqrt{\frac{3.7}{10} + \frac{0.79}{100}} = 0.8\ cpm$$

The percent error is then calculated by dividing the standard deviation of the net count rate by the net count rate.

$$\%error = [(0.8/2.91)100\%]$$
$$= 41.4\%$$

Curtis & Tompkins, Ltd.

APPENDIX_2: REAGENTS & STANDARDS

NIST Traceable Standard Alpha/Beta Source Standards:

Radionuclide	Catalog #	Activity(nCi)
Sr-90	Eckert & Ziegler #EAB-090-50LB	10.32
Th-230	Eckert & Ziegler #EAB-230-50LB	10.61

Analyte	CAS Number	Project Action Limit (pCi/g)	Project MDA (pCi/g)
Gross Alpha	12587-46-1	Not applicable	TBD
Gross Beta	12587-47-2	Not applicable	TBD

APPENDIX_3: INSTRUMENT CONDITIONS

All specific instrument conditions are found within the instrument's method file at the instrument's workstation.

APPENDIX_4: INSTRUMENT MAINTENANCE

As defined by HPS SAP Worksheet #25, page 160

Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person
Alpha source check/check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	-Recalibrate -Instrument maintenance -Consult lab manager	HPS Laboratory Manager
Beta source check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	-Recalibrate -Instrument maintenance -Consult lab manager	HPS Laboratory Manager
Background Source check/Check deviation	Physical check	Physical check	Prior to use and at minimum daily	Within 3 sigma of measured population	-Recalibrate -Instrument maintenance -Consult lab manager	HPS Laboratory Manager
P10 Gas Mixture Supply	Physical check	Physical check	Daily	Adequate	Resupply	HPS Laboratory Manager

This SOP contains information that may only be disseminated to C&T staff, clients, and regulators

Title: LOW BACKGROUND GAS FLOW PROPORTIONAL COUNTING (GFPC) SYSTEM ANALYSIS

Approvals (Signature/Date):

Chris Hough 6/14/12	Michael Ridenhower 6/14/12
Chris Hough — Date	Michael Ridenhower — Date
Radiochemistry Department Manager	Health & Safety Manager / Coordinator
Mark Ward 6·14·12	for Elaine Wild 6/15/12
Marti Ward — Date	Elaine Wild — Date
Quality Assurance Manager	Laboratory Director

This SOP was previously identified as SOP No. ST-RD-0403 Rev. 12

Copyright Information:
This documentation has been prepared by TestAmerica Laboratories, Inc. and its affiliates ("TestAmerica"), solely for their own use and the use of their customers in evaluating their qualifications and capabilities in connection with a particular project. The user of this document agrees by its acceptance to return it to TestAmerica upon request and not to reproduce, copy, lend, or otherwise disclose its contents, directly or indirectly, and not to use if for any other purpose other than that for which it was specifically provided. The user also agrees that where consultants or other outside parties are involved in the evaluation process, access to these documents shall not be given to said parties unless those parties also specifically agree to these conditions.

THIS DOCUMENT CONTAINS VALUABLE CONFIDENTIAL AND PROPRIETARY INFORMATION. DISCLOSURE, USE OR REPRODUCTION OF THESE MATERIALS WITHOUT THE WRITTEN AUTHORIZATION OF TESTAMERICA IS STRICTLY PROHIBITED. THIS UNPUBLISHED WORK BY TESTAMERICA IS PROTECTED BY STATE AND FEDERAL LAW OF THE UNITED STATES. IF PUBLICATION OF THIS WORK SHOULD OCCUR THE FOLLOWING NOTICE SHALL APPLY:

©COPYRIGHT 2012 TESTAMERICA LABORATORIES, INC

Facility Distribution No.: 0 **Distributed To:** See Electronic Distribution Sheet

1.0 SCOPE AND APPLICATION

1.1 This SOP is applicable to all Low Background Proportional Counting instruments. TestAmerica St. Louis performs Radium 226, 228, Strontium 89, 90, gross alpha/beta, Neptunium and Chlorine 36.

1.2 This SOP is based on SW846 method 9310, 9315 and 9320; EPA methods 900.0, 903.0, 904.0, 905.0; and DOE EML HASL 300 method, Ba-01-R, Sr-02 and Sr-03-RC.

1.3 The SOP applies to GFPC analysis of liquid and solid matrices.

1.4 The laboratory target analytes supported by this method, the reporting limits, method detection limits and QC limits are maintained in the Information Management System (QuantIMS). A copy of the Structure and Analysis Code (SAC), which lists this information, is included in the appendix of this SOP.

2.0 SUMMARY OF METHOD

2.1 This procedure provides instructions for the daily calibration and maintenance of the Low Background Proportional Counting instrumentation.

3.0 DEFINITIONS

3.1 See the TestAmerica St. Louis Quality Assurance Manual (QAM) for a glossary of common terms and data qualifiers.

3.2 IQC - a computerized Quality Control Program where the counting results of Daily Radioactive check sources and Daily Background checks are entered and compared to statistical average data. A measurement within ± 3 standard deviations indicates the detector is operating within acceptable parameters.

3.3 αLL - discriminator setting indicating the alpha lower voltage limit.

3.4 Alpha Voltage Only - detector voltage capable of collecting ions created by alpha radiation only. Ion pairs created by beta radiation are not collected.

3.5 αUL - discriminator setting indicating the instruments alpha upper voltage limit.

3.6 βLL - discriminator setting indicating the beta lower voltage limit.

3.7 βUL - discriminator setting indicating the beta upper voltage limit.

3.8 Crosstalk - a measure of the amount of beta radiation that is collected in the alpha radiation channel; it is also a measure of alpha radiation collected in the beta channel.

3.9 Plateau - a point on a graph of count rate vs. detector bias voltage where further increases in bias will not result in an increase in measured counting rate.

3.10 LB4100 – LBPC (Low background Gas Flow Proportional Counting instrument).

4.0 INTERFERENCES

4.1 A detector contaminated with radioactive material will result in a high background and interfere with the correct measurement of a sample.

4.1.1 If a sample “times out” reaching 10000 counts before the allotted time, and the sample count rate is 60 cpm or greater, then another daily background check is performed on that detector. If the detector background check is unacceptable, the detector is taken Out Of Service until action is taken to bring the background check within acceptable limits. If the chamber requires action to remove contamination and a new background check is acceptable, then a 30 minute empty chamber count should be performed to determine if a new long background needs to be performed on that detector.

4.2 The actual counting efficiency for alpha radiation decreases greatly with a density > 6.0 mg/cm2. Therefore, the maximum acceptable mass density is typically 5 mg/cm 2 or less that 100 mg for a 2" planchet.

4.3 For beta radiation, reliable data may be obtained counting samples with a density as high as 10 mg/cm 2 or greater.

4.4 Sample thickness as well as moisture content may impact the alpha and/or beta results.

5.0 SAFETY

5.1 Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001), Radiation Safety Manual and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum

5.2 SPECIFIC SAFETY CONCERNS OR REQUIREMENTS

5.2.1.1 None.

5.3 PRIMARY MATERIALS USED

5.3.1 The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

6.0 EQUIPMENT AND SUPPLIES

6.1 Low Background Proportional Counter, equivalent to the Canberra/Oxford/Tennelec LB4100, or Protean MPC9604.

6.2 Gas mixture, 90% argon, 10% Methane

6.3 Blank planchets

6.4 PC based data acquisition system, OSUM software, IQC software

7.0 STANDARDS AND REAGENTS

7.1 All standards and reagent preparation, documentation and labeling must follow the requirements of SOP ST-QA-0002, current revision

7.2 Radioactive sources to measure beta radiation,: Sr-90 and Ra-228 sources.

7.3 Radioactive sources to measure alpha radiation: Am-241, Th-230 and Ra-226

8.0 SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1 TestAmerica St. Louis supplies sample containers and chemical preservatives in accordance with the method. TestAmerica St. Louis does not perform sample collection. Samplers should reference the methods referenced and other applicable sample collection documents for detailed collection procedures. Sample volumes and preservative information is given in ST-PM-0002.

8.2 See associated sample preparation SOPs ST-RC-0020, ST-RC -0021, ST-RC -0036, ST-RC -0040, ST-RC -0041and ST-RC -0050, for more detailed information.

9.0 QUALITY CONTROL

9.1 **Batch**

9.1.1 A sample batch is a maximum of 20 environmental samples, which are prepared together using the same process and same lot(s) of reagents.

9.1.2 Instrument conditions must be the same for all standards, samples and QC samples.

9.1.3 For this analysis, batch QC consists of a method blank, a Laboratory Control Sample (LCS), and Matrix Spike (MS)/ Sample Duplicate (Dup). In the event that there is insufficient sample to analyze a sample duplicate, an LCS Duplicate (LCSD) is prepared and analyzed.

9.1.3.1 Matrix Spike (MS) and Matrix Spike Duplicate (MSD) may be performed upon client request, and are noted in the Client Requirement Sheets and Log-in.

9.2 **Method Blank (MB)**

9.2.1 A method blank is a blank matrix processed simultaneously with, and under the same conditions as, samples through all steps of the procedure.

9.2.2 A method blank must be prepared with every sample batch.

9.3 **Laboratory Control Sample (LCS)**

9.3.1 An LCS is a blank matrix spiked with a known amount of analyte(s), processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.3.2 An LCS must be prepared with every sample batch.

9.4 **Matrix Spike**

9.4.1 A Matrix Spike is an aliquot of a field sample to which a known amount of target analyte(s) is added, and is processed simultaneously with, and under the same conditions as, samples through all steps of the analytical procedure.

9.5 **Sample Duplicate**

9.5.1 A Sample Duplicate is an additional aliquot of a field sample taken through the entire analytical process to demonstrate precision.

9.6 **Procedural Variations/ Nonconformance and Corrective Action**

9.6.1 Any variation shall be completely documented using a Nonconformance Memo and approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

9.6.2 Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the Supervisor and QA Manager. See SOP ST-QA-0036 for details regarding the NCM process.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Voltage Plateau Determination

10.1.1 **Frequency**:

10.1.1.1 Performed as a part of the Intial Calibration.

10.1.2 **Voltage Plateau Determination on LB4110 Red**

10.1.2.1 Place the Am-241 sources in Drawers A and B.

10.1.2.2 Select the auto-sequence file “Plateau”

10.1.2.3 Highlight the detectors in Drawers A and B
10.1.2.4 Click on 'Run"
10.1.2.5 Type 'Alpha' for the sample ID for the detectors with the alpha source
10.1.2.6 Click 'Done'. The voltage plateau will begin automatically.
10.1.2.7 When the alpha counts are complete, the highlighted detectors will flash. Click 'Unit status' and highlight the voltage plateau file name. Click on 'Re-load'. Enter 'Beta" as the sample ID.
10.1.2.8 Place the Sr^{90} beta source on the detector.
10.1.2.9 Click 'Done'. The voltage plateau will complete automatically.
10.1.2.10 When the plateau is complete click on 'Data Output'. Select the plateau file. Print the graphs and data for calibration packages. Archive the data file.
10.1.2.11 Repeat the steps above for drawers C and D.

10.1.3 **Criteria for Plateaus for LB4110 Red**
10.1.3.1 Voltage range used to determine the plateau is 300-1500V
10.1.3.2 Voltage increase per step is <50V per step

10.1.4 **Voltage Plateau Determination on Protean MPC 9604**
10.1.4.1 The manufacturer has counted plateaus and permanently set the discriminator voltages. The manufacturer does not recommend recounting plateaus. The detectors are manufactured to have a high dead time. However, a cross talk test may be performed using different nuclide sources to indicate acceptable discriminator settings. This procedure is outlined in the discriminator setting section of this SOP.

10.1.5 **Criteria for Plateaus for Protean MPC 9604**
10.1.5.1 Plateaus are permanently set for this instrument from the manufactuer.

10.2 **Discriminator Settings**

10.2.1 **Frequency:**
10.2.1.1 Performed as a part of the Intial Calibration.

10.2.2 **Discrimator Settings on LB4110 Red**
10.2.2.1 From the unit menu, select 'Change ROI'
10.2.2.2 Place a beta source in each detector
10.2.2.3 Highligh a detector with a beta source
10.2.2.4 The alpha upper limit should be set at 100% and the beta lower limit should be set a 0%. The alpha lower limit and the beta upperlimit should both be set at 50%.
10.2.2.5 Select 'Count'. Accumulate at least 100,000 beta counts
10.2.2.6 Reduce the beta upper limit/alpha lower limit until there is 3.5% beta into alpha crosstalk.
10.2.2.7 Raise the alpha lower limit until there is 0.10% beta into alpha crosstalk.
10.2.2.8 Raise the beta upper limit until it is 5% less than the alpha lower limit.
10.2.2.9 Select 'Halt'.
10.2.2.10 Repeat steps above until all detectors have been set.
10.2.2.11 Select 'Close'. Discriminator settings are updated automatically.

10.2.3 **Discrimator Settings on Protean MPC 9604**
10.2.3.1 Collect a minimum of 10,000 counts for each of Am-241, Th-230 and Po-210 sources
10.2.3.2 Calculate the percentage of crosstalk and compare the results to historical and expected values. Consult the Technical director if the values fall out of range.

10.3 **Initial Calibration**:

10.3.1 **Frequency**:

10.3.1.1 The Gas Flow Proportional Counter (GFPC) is calibrated initially and each year thereafter. Recalibration may be required if indicated during the operation of the instrument.

10.3.2 The specific calibration source preparations can be found in the file containing the previous calibration.

10.3.3 All nuclide sources shall be NIST traceable.

10.3.4 The efficiency calibration shall consist of at least seven single or dual sets of mass attenuated calibration standards, unless a single point source efficiency is to be determined.

10.3.5 The standards shall have enough activity to generate at least 10000 counts in 90 minutes of count time for the most highly attenuated source. The count rate shall not exceed 5000 counts per second.

10.3.5.1 For alpha and beta analysis, separate sets of calibration sources shall be prepared.

10.3.6 The mass attenuation is accomplished by utilization of a salt solution with comparable make up to the majority of samples seen in the laboratory.

10.3.6.1 Alternatively, the mass attenuation may be accomplished by using the same carrier solution used in a specific analysis.

10.3.7 Each standard shall be counted in every detector to be calibrated.

10.3.8 **Criteria for a Single or Dual Set Calibration**

10.3.8.1 The efficiency of the detector (the dependent variable) shall be plotted on a single graph against the masses (the independent variable) for all data points.

10.3.8.2 The equation of the calibration curve shall be determined using polynomial functions and be included on the plot of the curve. The curve shall be continuous and smooth.

10.3.8.3 The degree of the polynomial shall not exceed three. The number of discreet source pairs shall be two more than the degree of the polynomial.

10.3.8.4 The percent difference of the measured efficiency and theoretical efficiency shall be calculated for all data points.

10.3.8.5 Points that are visual outliers or demonstrate less than 15 percent difference between the measured efficiency and theoretical efficiency may be removed at the analyst's discretion. Low residual mass sources and samples are difficult to plate with acceptable duplicate precision. Therefore, high outliers may not necessarily be removed from the calibration if they mimic live sample masses. In any case outliers above 15 percent shall be removed from the calibration curve. No more than 20 percent of the data points may be removed. Reasons for removal or inclusion of outliers shall be documented in the calibration narrative. Once outliers are removed, the percent difference between the measured efficiency and theoretical efficiency must be recalculated using the new polynomial coefficients generated from removal of data points. If outliers over 15 percent difference remain between the measured efficiency and theoretical efficiency the Radiochemistry Manager/QA must be consulted before calibration may continue.

10.3.8.6 The coefficient of determination (r^2) shall be calculated and displayed on the plot with the equation of the trend line. An r^2 greater than or equal to 0.9 is required to proceed to counting of verification sources.

10.3.8.7 If the coefficient of determination (r^2) is not greater than or equal to 0.9 on the plot of all data points (with or without outliers removed), the data may be plotted using the mean of the paired values for both the efficiencies and the masses. This action is acceptable to reduce the variability caused when plating low mass sources. Calculate the percent difference of each datum value from the mean of the paired points. If the percent difference for any datum value is

greater than 10 percent for alpha or 7.5 percent for beta delete the data pair and perform another statistical fit to the data. More than 20 percent of all data points may not be removed from the curve. The coefficient of determination (r^2) shall be calculated and displayed on the plot with the equation of the trend line. An r^2 greater than or equal to 0.9 is required to proceed to counting of verification sources.

10.4 **Independent Calibration Verification (ICV)**

10.4.1 **Frequency**:

10.4.1.1 Performed with every intial calibration

10.4.2 GFPC initial calibrations must be verified by a second source standard.

10.4.3 The ICV standard is NIST traceable.

10.4.4 The ICV is counted to accumulate at least 5,000 counts.

10.4.5 **ICV for Dual Set Calibrations**:

10.4.5.1 Prepare at least one set of calibration verification sources consisting of a low, medium and high residual mass within the calibration range of the curve.

10.4.5.2 Prepare a blank at the same time.

10.4.5.3 The sources shall contain radionuclide from a second source. Second sources may include a second dilution from the same primary source used for the calibration curve.

10.4.5.3.1 Alternatively, verification source nuclides may consist of different nuclides than the calibration curve if it is customary to do so.

10.4.5.4 Count each secondary source and the blank in all detectors that were calibrated.

10.4.5.5 Calculate the results in terms of percentage recovery.

10.4.5.6 Calculate the mean results of all masses across each detector.

10.4.5.7 Criteria:

10.4.5.7.1 Individual points are within 30 percent of the true value

10.4.5.7.2 The mean result of all masses across all detectors is less than 10 percent.

10.4.5.7.3 If any detector fails the validation tests the Technical Director must be consulted to provide corrective action.

10.4.6 **ICV for Single Set Calibrations**:

10.4.6.1 Prepare at least one set of verification sources varying in expected mass within the calibration range of the curve.

10.4.6.2 Prepare a blank at the same time.

10.4.6.3 The sources shall contain radionuclide from a second source. Second sources may include a second dilution from the same primary source used for the calibration curve.

10.4.6.3.1 Alternatively, verification source nuclides may consist of different nuclides than the calibration curve if it is customary to do so.

10.4.6.4 Count the secondary source and the blank in all detectors that were calibrated.

10.4.6.5 Calculate the results in terms of percentage recovery.

10.4.6.6 Calculate the mean results of all masses across each detector.

10.4.6.7 Criteria:

10.4.6.7.1 Individual points are within 30 percent of the true value

10.4.6.7.2 The mean result of all masses across all detectors is less than 10 percent.

10.4.6.7.3 If any detector fails the validation tests the Technical Director must be consulted to provide corrective action.

10.5 **Setting Performance Check Criteria After Calibration**

10.5.1 Twenty background check samples are counted and used to establish quality control limits for the daily background checks.

10.5.2 Twenty alpha/beta check sources are counted after calibration and used to establish quality control limits for the daily source checks.

10.5.3 The limits will be a running average of the four months post calibration.

10.5.3.1 The limits are to be documented.

10.5.3.2 The limits will be re-established monthly at the following frequency

10.5.3.2.1 1st month – take first five data points from the new month and fifteen data points from the initial calibration.

10.5.3.2.2 2nd month – take first five points from new month, five from prior month and ten from initial calibration.

10.5.3.2.3 3rd month – take first five points from new month, five points each from the previous two months and five from the initial calibration.

10.5.3.2.4 4th month – take first five data points from new month and five points each from the previous three months.

10.5.3.3 Limits are set.

10.6 **Alpha to Beta Crosstalk Determination**

10.6.1 The mean mass is determined for each data point used to calculate the mass attenuation curve.

10.6.1.1 These curves are calculated and plotted and the percent of alpha into beta crosstalk is determined. This is done by dividing the beta counts per minute as observed in the beta channel from the alpha calibration source counts by the sum of the alpha and beta counts per minute.

10.6.1.2 The mean percent of alpha into beta is determined for each mass point by using the count data accumulated for two sets of alpha sources.

10.6.1.3 The crosstalk curve is plotted as mean crosstalk values relative to the mean mass for the two sets of data.

10.6.1.3.1 In this manner the crosstalk factor can be determined for any given mass.

10.6.1.4 The equation of the curve shall be determined using polynomial functions.

10.6.1.5 The coefficient of determination (R^2) shall be calculated and displayed on the plot as well as the equation for the trendline.

10.7 **Beta to Alpha Crosstalk Determination**

10.7.1 Since beta to alpha crosstalk does not vary across mass, a mean beta to alpha crosstalk correction factor is calculated.

10.7.2 The percent of beta into alpha is determined by dividing the alpha counts per minute as observed in the alpha channel from the beta calibration source counts by the sum of the alpha and beta counts per minute.

10.7.3 The mean percent of beta into alpha is determined for all mass points. The mean percent is insignificant in calculating results, therefore is not applied to the result calculation.

10.8 **Long Background**

10.8.1 **Frequency**:

10.8.1.1 Monthly or whenever instrument conditions have significantly changed since the previous background was performed (e.g. detector replaced, etc.)

10.8.1.2 Minimum count time: 1000 minutes.

10.8.2 Wash the planchet holder and clean the drawers with a 20% radiac wash or ethyl alcohol.

10.8.2.1 Do not spray cleaner directly onto the drawers. Spray cleaner on a Kimwipe, a cotton ball, or paper towel and wipe out the drawers.

10.8.3 Check that instrument settings are as specified in 11.1.

10.8.4 **Red Long Background Count Set Up**

10.8.4.1 Place the cursor on the red box in the upper left hand corner of the screen and right click on the mouse.

10.8.4.2 Select 'edit parameters'. Verify the count time on the screen is set to 1000 minutes and the iterations is set to 1. If they are different than 1000 min and 1iteration, change them to 1000 min and 1 iteration. Then select 'close' to exit this window.

10.8.4.3 Place clean empty planchets in instruments.

10.8.4.4 Place the cursor on the red box in the upper left hand corner of the screen and right click on the mouse.

10.8.4.5 Select 'create batch' from the instrument menu.

10.8.4.6 Select 'background'

10.8.4.7 Select the detectors that are to be counted by double clicking the mouse on the drawer desired which selects all detectors in that drawer or on each individual detector in the display.

10.8.4.8 Select 'run'

10.8.4.9 Select 'done'

10.8.4.10 When backgrounds are complete, review the printouts for acceptance.

10.8.5 **Protean Long Background Count Set Up**

10.8.5.1 Create Manual batch in RadCapture

10.8.5.2 Export Manual batch from RadCapture

10.8.5.3 At Protean instrument:

10.8.5.4 Select 'Detector'

10.8.5.5 Select 'Sample Log'

10.8.5.6 Select appropriate Long Background (ex: Sept_Lng_Bkg_00) you want to start under sample ID

10.8.5.7 Change count time to 1000min

10.8.5.8 Select 'Start'

10.8.5.9 Continue these steps with detectors 1-23.

10.8.5.10 Review the data for acceptance when the backgrounds are complete.

10.8.6 **Printing Protean Long Backgrounds**

10.8.6.1 Select 'Print Protean data icon' on the desk top

10.8.6.2 Select OK

10.8.6.3 Enter Batch #

10.8.6.4 Print

10.8.7 **Protean Long Background Entry into Protean**

10.8.7.1 Select Input data

10.8.7.2 Select Definitions

10.8.7.3 Select Calibrations

10.8.7.4 Select Properties

10.8.7.5 Select References 0-7 for Detectors 0 thru 7 and 8-15 for Detectors 8 thru 15

10.8.7.6 Enter Background CPM's for Alpha and Beta from printed data sheet

10.8.8 **Orange and Purple Long Background Count Set-Up**

10.8.8.1 Select detector 0

10.8.8.2 Select 'source log'

10.8.8.3 Select 'monthly long background' by clicking on the file list arrow.

10.8.8.4 Ensure count time is set to 1000 minutes.

10.8.8.5 Select 'start'

10.8.8.6 Continue these steps with detectors 1-23.

10.8.8.7 Review the data for acceptance when the backgrounds are complete.

10.8.9 **Printing Orange and Purple Long Backgrounds**

10.8.9.1 Select 'Data
10.8.9.2 Select 'Source Count Data'
10.8.9.3 Select 'Source Name' Monthly Long BKG
10.8.9.4 Select 'This Range' enter your date range that Long Backgrounds were performed.
10.8.9.5 Select 'Refresh'
10.8.9.6 Select 'Source Count Summary' under Reports
10.8.9.7 Select 'Print'
10.8.9.8 Select 'Landscape' under Orientation
10.8.9.9 Select 'OK'

10.8.10 **Long Background Criteria:**

10.8.10.1 The CPM for the alpha are <0.2 and the beta < 2.0, the detector may be used.

10.8.10.1.1 The data printout must include initials and date to indicate that has been reviewed.
10.8.10.1.2 If a detector is above this limit, discard planchet.
10.8.10.1.3 Clean the planchet holder with radiac wash, ethyl alcohol or a detergent spray cleaner and dry thoroughly.
10.8.10.1.4 Place a clean planchet in the holder and repeat steps for that detector (s) only.
10.8.10.1.5 Perform a new background.

10.8.10.1.5.1 Note: the detector is tagged out of service until a successful background has been achieved.

11.0 PROCEDURES

11.1 Initial Setup

11.1.1 Check the normal instrument settings for all controls as described below:

11.1.1.1 Tank Flow 8 psi
11.1.1.2 Flow Cells >/= 0.3 SCFH, the flow will vary, the target range is 0.15 to 0.20 SCFH.

11.1.2 The High Voltage is set as indicated in the Manuals for the LB4000/LB4100 located in the count room file cabinet. The Protean remains as set by the manufacturer and does not require adjustment.

11.1.3 If counting gas has just been changed or turned on, allow a minimum purge time of 30 minutes prior to operation. Record gas tank changes on document on separate sheet.

11.2 Record date of Daily Background and Check Source Data in runlog logbook.

11.3 Maintenance

11.3.1 Change out the counting gas when the gauge reads under 500 psi. This usually occurs every 1 to 2 weeks. Record in the instrument maintanence logbook.

11.3.2 Allow gas to purge a minimum of 30 minutes prior to operation.

11.4 Data Acquisition: Daily Background Check and Source Check

11.4.1 **Daily Background Check**:

11.4.1.1 **Red Instrument**:

11.4.1.2 Open the drawer by rotating the knob at the front of the drawer to the 'DOWN' position and pull the sample drawer out slowly. Place clean empty planchets in the sample holders.

11.4.1.3 **Before inserting the drawer, confirm that none of the planchets extend above the sample holder. Failure to observe this note can result in damage to the detector.**

11.4.1.4 Slowly insert sample drawer into the instrument and slowly rotate the positioning knob into the 'UP' position.

11.4.1.5 Place the cursor on the red box in the upper left hand corner of the screen and right click on the mouse.

11.4.1.6 Select 'create batch'

11.4.1.7 Select 'daily background check'

11.4.1.8 Select the detectors that are to be loaded by double clicking the mouse on the drawer desired or on each individual detector in the display.

11.4.1.9 Select 'run'

11.4.1.10 Select 'done'

11.4.1.11 Measure the detector background for 200 minutes. The count time is predetermined by the protocol selected. i.e. 'daily background check'.

11.4.1.12 The detector display will be yellow when the detector is counting. The detector display will turn green when the count is complete.

11.4.1.13 When counting is complete, place the cursor on the red box in the upper left hand corner of the screen and right click on the mouse. Select 'data output' and select the data file generated by your background counts for that instrument, "DAY- ###". Select 'ok' to print data.

11.4.1.14 On any work station, i.e. "PC computer in the count room", double click on the IQC icon.

11.4.1.15 Select 'import data'

11.4.1.16 Select 'Red'. Enter the current date. Click on the file list arrow.

11.4.1.17 From the file list select each file generated above individually, and then select import data. i.e. import each "Day" or "DQC" file for that instrument individually.

11.4.1.18 Select 'close'

11.4.1.19 Select 'reporting'. Verfiy the current date in both the 'start' and 'end' date fields. Select 'print' to generate the report.

11.4.2 **Protean Instrument**:

11.4.2.1 Open each detector drawer. Place clean empty planchets into each sample holder and slowly insert each sample drawer into the instrument.

11.4.2.2 Double click detector 0 on the Protean computer screen.

11.4.2.3 Select 'source log'

11.4.2.4 Set the time for 200 minutes.

11.4.2.5 Type 'DB0' in the sample id box. (D for daily. B for background. 0 for detector.)

11.4.2.6 Select 'start'

11.4.2.7 Double click detector 1 on the computer screen. Repeat steps 11.4.2.3 through 11.4.2.5 for each detector, making sure to change the number to coincide with the detector the background is counting for.

11.4.2.8 Remove planchets from detector drawers when counting is complete.

11.4.2.9 On any work station, i.e. "PC computer in the count room", double click on the IQC icon.

11.4.2.10 Select 'import data'

11.4.2.11 Select 'Protean'. Enter the current date. Click on the file list arrow.

11.4.2.12 Select 'close'

11.4.2.13 Select 'reporting'. Verfiy the current date in both the 'start' and 'end' date fields. Select 'print' to generate the report.

11.4.3 **Orange and Purple Instrument**:

11.4.3.1 Open each detector drawer. Place clean empty planchets into each sample holder and slowly insert each sample drawer into the instrument.

11.4.3.2 Select detector 0.

11.4.3.3 Select 'source log'.

11.4.3.4 Select 'DB' by clicking on the file list arrows for orange.

11.4.3.5 Select 'Daily BKG' by clicking on the file list arrows for purple.

11.4.3.6 Select 'start'

11.4.3.7 Repeat these steps with detectors 1-23.

11.4.4 **Daily Background Criteria:**

11.4.4.1 Review the IQC printouts for each detector.

11.4.4.1.1 If a detector fails background criteria (3 sigma), clean the detector with radiac wash or ethyl alcohol and re-run.

11.4.4.1.2 If the detector fails a second time, but the CPM for the alpha are <0.2 and the beta < 2.0, the detector may be used. The data printout must include initials and date to indicate that it was checked.

11.4.4.1.3 Circle any failed detector on the printout.

11.4.4.1.4 Place a planchet upside down in the planchet holder to indicate that the detector is out of service for that day.

11.5 **Daily Source Check**

11.5.1 **Red Instrument**:

11.5.1.1 Open the drawer by rotating the knob at the front of the drawer to the 'DOWN' position and pull the sample drawer out slowly.

11.5.1.2 Place alpha sources in the sample holders of the A and B drawer. Place beta sources in the sample holders of the C and D drawer.

11.5.1.3 Place the cursor on the red box in the upper left hand corner of the screen and <u>right click</u> on the mouse.

11.5.1.4 Select 'create batch'

11.5.1.5 Select 'daily source check'

11.5.1.6 Select the detectors that are loaded by double clicking the mouse on the desired drawer or on each individual detector in the display.

11.5.1.7 Select 'run'

11.5.1.8 Select 'done'

11.5.1.9 Measure the detector source for 2 min. The count time is predetermined by the protocol selected. i.e. 'daily source check'

11.5.1.10 The detector display will be yellow when the detector is counting. The detector display will turn green when the count is complete.

11.5.1.11 When counting is complete, place the cursor on the red box in the upper left hand corner of the screen and <u>right click</u> on the mouse. Select 'data output' and select the data file generated by your background counts for that instrument, "DQC- ###". Select 'ok' to print data.

11.5.1.12 Open the drawer by rotating the knob at the front of the drawer to the 'DOWN' position and pull the sample drawer out slowly. Place beta sources in the sample holders of the A and B drawer. Place alpha sources in the sample holders of the C and D drawer.

11.5.1.13 Repeat steps 11.5.1.3 to 11.5.1.11.

11.5.1.14 On any work station, i.e. "PC computer in the count room", double click on the IQC icon.

11.5.1.15 Select 'import data'

11.5.1.16 Select 'Red'. Enter the current date. Click on the file list arrow.

11.5.1.17 From the file list select each file generated above individually, and then select import data. i.e. import each "Day" or "DQC" file for that instrument individually.

11.5.1.18 Select 'close'

11.5.1.19 Select 'reporting button'. Verify the current date in both the 'start' and 'end' date fields. Select 'print'to generate the report

11.5.2 **Protean Instrument:**

11.5.2.1 Slowly open each detector drawer. Place alpha sources in sample holders of detectors 0-7. Place beta sources in sample holders of detectors 8-15 and slowly insert each drawer into the instrument.

11.5.2.2 Double click detector 0 on the Protean computer screen.

11.5.2.3 Select 'source log'.

11.5.2.4 Set the time for 2 minutes.

11.5.2.5 Type "SA0" in the sample id box. (S for source. A for alpha. 0 for detector.)

11.5.2.6 Select 'start'

11.5.2.7 Double click detector 1 on the computer screen. Repeat steps 11.5.2.3 to 11.5.2.6 for each detector, making sure to change A to B when starting the beta sources on detectors 8-15 and changing the number to coincide with the detector the source is on.

11.5.2.8 When the counting is complete, slowly open each detector drawer. Place beta sources in detectors 1-7. Place alpha sources in detectors 8-15.

11.5.2.9 Double click detector 0 on the Protean computer screen.

11.5.2.10 Type "SB0" in the sample id box. (S for source. B for beta. 0 for the detector.)

11.5.2.11 Double click detector 1 on the computer screen. Repeat steps 11.5.2.10 for each detector, making sure B to A when starting the alpha sources on detectors 8-15.

11.5.3 Remove sources from detector drawers when counting is complete.

11.5.4 **Orange and Purple Instrument**:

11.5.4.1 Slowly open each detector drawer. Place alpha sources in sample holders of detectors 0-7. Place beta sources in sample holders of detectors 8-15. Slowly insert each drawer into the instrument.

11.5.4.2 Select detector 0.

11.5.4.3 Select 'source log'.

11.5.4.4 Select 'SA0'.

11.5.4.5 Select 'start'

11.5.4.6 Repeat these steps for detectors 1-7 using the correlating detector number. For detectors 8-15 select 'SB8', 'SB9', and so on for each correlating detector number.

11.5.4.7 Slowly open each detector drawer when counting is complete. Place beta sources in detectors 1-7 and place alpha sources in detectors 8-15.

11.5.4.8 Select detector 0.

11.5.4.9 Select 'SB0'.

11.5.4.10 Select 'start'.

11.5.4.11 Repeat these steps for detectors 1-7 using the correlating detector number. For detectors 8-15, select 'SB8', 'SB9' and so on for each correlating detector number.

11.5.4.12 Repeat steps 11.5.4.1 to 11.5.4.11 for detectors 16-23.

11.5.4.13 Remove sources from detector drawers when counting is complete.

12.0 DATA ANALYSIS AND CALCULATIONS

12.1 Commonly used calculations (e.g. % recovery and RPD) and standard instrument software calculations are given in the TestAmerica St. Louis QAM.

12.2 Result calculations are performed by TestAmerica St. Louis' Rad Capture software program. These calculations are found in the TestAmerica St. Louis QAM.

13.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA; CORRECTIVE ACTIONS FOR OUT OF CONTROL DATA

13.1 The data assessment and corrective action process is detailed through the Clouseau Nonconformance Memorandum (NCM) process. The NCM process is described in SOP: ST-QA-0036. Below is a subset of the data assessment and QC excursion types within Clouseau; the text in underline is the exact "type" line in Clouseau. For a complete and current listing, please access the software program.

13.2 Method Blank
- 13.2.1 Acceptance Criteria:
  - 13.2.1.1 No target analytes may be present in the method blank above the reporting limit.
  - 13.2.1.2 Project specific requirements if more stringent than our routine procedure (e.g. no target anlaytes present above ½ RL), will be noted on the client requirements sheet.
- 13.2.2 Corrective Action for Method Blanks not meeting acceptance criteria:
  - 13.2.2.1 <u>Method Blank Contamination</u> – See Clouseau NCM for corrective action (e.g. reprep/reanalysis, narration). Note certain analytes are common laboratory contaminants which require special narrative comment. These compounds are so designated in Clouseau.

13.3 Laboratory Control Sample (LCS)
- 13.3.1 Acceptance Criteria:
  - 13.3.1.1 All control analytes must be within the specified control limits for accuracy (%Recovery) and precision (RPD).
- 13.3.2 Corrective Action for LCS not meeting acceptance criteria:
  - 13.3.2.1 <u>LCS Spike Recovery excursion (high)</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).
  - 13.3.2.2 <u>LCS Spike Recovery excursion (low)</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).
- 13.3.2.3 <u>RPD/RER Duplicate excursion</u> – See Clouseau NCM for corrective action (e.g. , reanalysis, narration).

13.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)
- 13.4.1 Analytes should be within control limits for accuracy (%Recovery) and precision (RPD).
- 13.4.2 Corrective Action for MS/MSD not meeting acceptance criteria:
  - 13.4.2.1 <u>MS/MSD Spike Rec. excursion</u> may not necessarily warrant corrective action other than narration. See Clouseau NCM to determine if re-preparation re-analysis is required.

13.5 Sample result evaluation
- 13.5.1 Tracer/Carrier recovery must be within specified limits.
- 13.5.2 <u>Tracer/Carrier recovery low</u>– See Clouseau NCM for corrective action.
- 13.5.3 <u>Tracer/Carrier recovery high</u>– See Clouseau NCM for corrective action.

13.5.3.1 A sample tracer recovery outside QC limits may be accepted if the sample results are determined valid:
13.5.3.2 minimum number of tracer counts
13.5.3.3 level of uncertainty
13.5.3.4 client project requirements/approval

13.5.4 These expections will be documented using the NCM process. The NCM will narrate the conditions upon which the sample results were accepted with tracer recovery excursions.

13.6 Insufficient Sample

13.6.1 For any prescribed re-preparation corrective action, if there is insufficient sample to repeat the analysis and narrative comment stating such is included in the report narrative. The insufficient sample description is included in the the Clouseau NCM within the type defining the excursion.

14.0 METHOD PERFORMANCE AND DEMONSTRATION OF CAPABILITY

14.1 Method performance data, Reporting Limits, and QC acceptance limits, are given in the appendix of this SOP.

14.2 Demonstration of Capability

14.2.1 Initial and continuing demonstrations of capability requirements are established in the QAM.

14.3 Training Qualification

14.3.1 The manager/supervisor has the responsibility to ensure that this procedure is performed by an analyst who has been properly trained in its use and has the required experience.

14.3.2 The analyst must have successfully completed the initial demonstration capability requirements prior to working independently. See requirements in the QAM.

14.4 Annually, the analyst must successfully demonstrate proficiency to continue to perform this analysis. See requirements in the QAM.

15.0 VALIDATION

15.1 Laboratory SOPs are based on standard reference EPA and DOE methods that have been validated by the EPA and the lab is not required to perform validation for these methods. The requirements for lab demonstration of capability are included in LQM. Lab validation data would be appropriate for performance based measurement systems or non-standard methods. TestAmerica ST Louis will include this information in the SOP when accreditation is sought for a performance based measurement system or non-standard method.

16.0 WASTE MANAGEMENT AND POLLUTION CONTROL

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for “Waste Management and Pollution Prevention.”

16.2 Waste Streams Produced by the Method

16.2.1 The following waste streams are produced when this method is carried out.

16.2.1.1 Contaminated disposable glass or plastic materials utilized in the analysis are disposed of in the sanitary trash. If the lab ware was used for the analysis of

radioactive samples and contains radioactivity at a level of 100 cpm over background as determined by a GM meter, the lab ware will be collected in waste barrels designated for solid rad waste for disposal by the EH&S Coordinator.

17.0 REFERENCES

17.1 Department of Energy (DOE) Environmental Monitoring Laboratory (EML) HASL-300 Procedures Manual, method Ba-01-R, Beta Radioassay, Sr-02 Strontium 90, Sr-03-RC Strontium 90 in Environmental Samples.

17.2 Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Section 1, Method 900.0 Gross Alpha and Gross Beta Radiochemistry

17.3 Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Section 6, Method 903.0 Alpha-Emitting Radium Isotopes

17.4 Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Section 8, Method 904.0 Radium 228

17.5 Prescribed Procedures for Measurement of Radioactivity in Drinking Water, Section 9, Method 905 Radioactive Strontium in Drinking Water

17.6 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 9310, Gross Alpha and Gross Beta

17.7 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 9315, Alpha-Emitting Radium Isotopes

17.8 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Method 9320, Radium 228

17.9 TestAmerica St. Louis Quality Assurance Manual, current revision

17.10 Corporate Environmental Health and Safety Manual (CW-E-M-001) and St. Louis Facility Addendum (SOP ST-HS-0002), current revisions

17.11 Associated SOPs:

- 17.11.1 ST-PM-0002 “Sample Receipt and Chain of Custody”
- 17.11.2 ST-QA-0002, “Standards and Reagent Preparation.”
- 17.11.3 ST-QA-0036, “Non-Conformance Memorandum (NCM) Process”
- 17.11.4 ST-RC-0004, “Preparation of Soil, Sludge, Filter, Biota and Oil/Grease Samples for Radiochemical Analysis”.
- 17.11.5 ST-RC-0020, “Determination of Gross Alpha/Beta Activity”
- 17.11.6 ST-RC-0021, “Gross Alpha Radition in Water using Copreciptation”
- 17.11.7 ST-RC-0036, “Determination of Chlorine-36 in Various Matrices by GFPC”
- 17.11.8 ST-RC-0040, ‘Total Alpha Emitting Isotopes of Radium”
- 17.11.9 ST-RC-0041, “Radium 228 in Water”
- 17.11.10 ST-RC-0050, “Preparation of Strontium 89 and 90”
- 17.11.11 ST-RC-0300, “New Jersey 48-hour Gross Alpha Testing for Private Well Testing ACT (PWTA)

18.0 MODIFICATIONS TO THE REFERENCE METHOD

18.1 TestAmerica St. Louis uses Thorium-230 to calibrate the GFPC system for Ra-226. Th-230 has similar alpha energies and a sufficiently long half life to eliminate the need for purification. The laboratory has historically performed well on PE programs for Ra-226, demonstrating the laboratory’s ability to accurately calibrate for this isotope. Calibrating with a Ra-226 source presents a severe bias in the quantitated result. Ra-226 can be purified and separated from all other alpha emitting isotopes, but the moment after separation, alpha emitting daughters begin to grow (i.e. Radon-222, Polonium-28 and Polonium-214). As the daughter’s in-growth alpha activity changes and due to the higher alpha energies of these daughters, the measured efficiency of the GFPC changes as well. After three weeks the alpha activity from purified Ra-226 increases

by a factor of four. Due to their short half lives, these daughters can not be isolated long enough to mathematically correct for the bias brought on by them. Calibrating the GFPC with Ra-226 is actually calibrating with a mix of the four isotopes and not a legitimate calibration under the cited regulation.

18.2 Strontium 89's short half life makes it impractical to use as a calibration standard for both Radium 228 analysis, as stated in EPA method 904 and SW method 9310, and Strontium 89 analysis, as stated in EPA method 905. TestAmerica St. Louis uses a mixed Strontium 90/Yittrium 90 standard for its' GFPC beta calibration used in Gross Beta, Strontium 90, Strontium 89, and Radium 228 analyses. TestAmerica St. Louis has selected the Strontium 90/Yittrium 90 standard because it produces a stable beta emission which can be reliably used for initial and continuing calibration. By using this standard mix, we have beta emissions at the lower and upper energetic spectrum whose average is in the middle of the beta range.

18.3 For Radium 228 analysis, TestAmerica St. Louis uses chemical separation techniques to eliminate other potential beta emitters.

18.4 TestAmerica St. Louis does not perform a direct Strontium 89 analysis. TestAmerica St. Louis provides calculated results based on the difference between Total Strontium and Strontium 90.

19.0 CHANGES FROM PREVIOUS REVISION

19.1 Updated Section 10 to address voltage increase per step, plateau slope and QC check count requirements (5000 counts)

19.2 Rev. 11;
- 19.2.1 Added instument Purple throughout section 10 and 11.
- 19.2.2 Adjusted procedure steps throughout section 11.

19.3 Rev. 12,
- 19.3.1 Added Sr-02-RC and Sr-03-RC to sections 1.0 and 17.0.

19.4 Rev. 13:
- 19.4.1 Added Neptunium to scope in section 1.0.
- 19.4.2 Updated the Quality Control Program for counting daily rad checks and daily background checks in section 3.0.
- 19.4.3 Updated background count set-up, printing and entering protean data in section 10.8.

TAL Reference Data Summary

Structured Analysis Code: **I-FR-ZA-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Total
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	4	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-HZ-ZA-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Dissolved
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6498							Spike List 6533						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5630	Gross Alpha, Dissolved	3	pCi/L			0	C	Y			80	140	40	C	Y			33	150	40
5632	Gross Beta, Dissolved	4	pCi/L			0	C	Y			77	123	40	C	Y			71	146	40

TAL Reference Data Summary

Structured Analysis Code: **I-H6-ZA-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Suspended
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6499							Spike List 6534						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5629	Gross Alpha, Suspended	3	pCi/L			0	C	Y			73	136	40	C	Y			44	150	40
5631	Gross Beta, Suspended	4	pCi/L			0	C	Y			73	122	40	C	Y			66	147	40

TAL Reference Data Summary

Structured Analysis Code: **A-FS-ZA-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Thin Layer on Planchet
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			38	138	40	C	Y			43	123	40
4171	Gross Beta	10	pCi/g			0	C	Y			44	124	40	C	Y			55	125	40

TAL Reference Data Summary

Structured Analysis Code: **A-HI-ZA-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Total Dissolution
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6527							Spike List 6528						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
4171	Gross Beta	10	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-K2-ZA-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Thin Layer on Planchet
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			38	138	40	C	Y			43	123	40
4171	Gross Beta	10	pCi/g			0	C	Y			44	124	40	C	Y			55	125	40

TAL Reference Data Summary

Structured Analysis Code: **I-FR-Y9-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Total
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	4	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-HZ-Y9-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Dissolved
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6584							Spike List 6585						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5630	Gross Alpha, Dissolved	3	pCi/L			0	C	Y			63	130	40	C	Y			63	130	40
5632	Gross Beta, Dissolved	4	pCi/L			0	C	Y			80	120	40	C	Y			80	120	40

TAL Reference Data Summary

Structured Analysis Code: **I-H6-Y9-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Suspended
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6582							Spike List 6583						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5629	Gross Alpha, Suspended	3	pCi/L			0	C	Y			63	130	40	C	Y			63	130	40
5631	Gross Beta, Suspended	4	pCi/L			0	C	Y			80	120	40	C	Y			80	120	40

TAL Reference Data Summary

Structured Analysis Code: **I-J6-Y9-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: 48 HOUR - EVAPORATIVE PREPARATION
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	4	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-MH-Y9-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: 48 hour- Evaporative Prep Suspended
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	2	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	2	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-MI-Y9-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: 48 hour- Evaporative Prep Dissolved
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	2	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	2	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-FS-Y9-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Thin Layer on Planchet
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			38	138	40	C	Y			43	123	40
4171	Gross Beta	10	pCi/g			0	C	Y			44	124	40	C	Y			55	125	40

TAL Reference Data Summary

Structured Analysis Code: **A-HI-Y9-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Total Dissolution
Method: Gross Alpha/Beta EPA 900
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6527							Spike List 6528						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40
4171	Gross Beta	10	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-J6-3Z-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: 48 HOUR - EVAPORATIVE PREPARATION
Method: Gross A/B by NJ EPA 900 PWTA
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6501							Spike List 6548						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	2	pCi/L			0	C	Y			62	134	40	C	Y			35	150	40
4171	Gross Beta	2	pCi/L			0	C	Y			58	133	40	C	Y			54	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-FR-ZA-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Total
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6880							Spike List 6881						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4171	Gross Beta	4	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FS-ZA-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Thin Layer on Planchet
Method: GROSS A/B BY GFPC SW846 9310 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6880							Spike List 6881						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4171	Gross Beta	10	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FR-Y9-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Evaporative Preparation, Total
Method: Gross Alpha/Beta EPA 900
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6880							Spike List 6881						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4171	Gross Beta	4	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FS-Y9-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Thin Layer on Planchet
Method: Gross Alpha/Beta EPA 900
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6880							Spike List 6881						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4170	Gross Alpha	10	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25
4171	Gross Beta	10	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-G2-ZW-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-G3-ZW-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-NR-ZW-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth, Dissolved
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5656	Radium (226), Dissolved	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-G1-ZW-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **A-G5-ZW-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **A-RC-ZW-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Ra-226, ASTM 3987-85/ SW846 9315
Method: Radium 226 by SW846 9315 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z3-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-G3-Z3-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-G1-Z3-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z3-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **A-K4-Z3-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation - 14 Day Ingro
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-ZY-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-G3-ZY-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			68	136	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-P3-ZY-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth, Dissolved
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6321							Spike List 6322						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5656	Radium (226), Dissolved	1	pCi/L			0	C	Y			45	150	40	C	Y			50	130	40

TAL Reference Data Summary

Structured Analysis Code: A-G1-ZY-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **A-G5-ZY-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **A-S7-ZY-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As received, Digest, Precipitate, Separation 21 day ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6504							Spike List 6550						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			64	138	40	C	Y			72	140	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-ZY-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-G5-ZY-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by EPA 903.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z3-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z3-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by DOE RA-06-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-G2-ZW-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-G5-ZW-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 226 by SW846 9315 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6882							Spike List 6883						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2257	Radium (226)	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z5-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G3-Z5-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-NR-Z5-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth, Dissolved
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5657	Radium 228, Dissolved	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-G1-Z5-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z5-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-RD-Z5-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Ra-228, ASTM 3987-85/ SW846 9320
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z6-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G3-Z6-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-G1-Z6-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z6-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-K4-Z6-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation - 14 Day Ingro
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z4-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G3-Z4-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-P3-Z4-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 14 day Ingrowth, Dissolved
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6323							Spike List 6324						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5657	Radium 228, Dissolved	1	pCi/L			0	C	Y			60	149	40	C	Y			62	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-G1-Z4-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 14day ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z4-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-S7-Z4-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As received, Digest, Precipitate, Separation 21 day ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z4-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6884							Spike List 6885						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z4-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC EPA 904 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6884							Spike List 6885						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z6-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z6-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC DOE RA-06-RC Mod
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **I-G2-Z5-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation - 21 day Ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/L			0	C	Y			60	142	40	C	Y			64	150	40
4152	Ra-228	1	pCi/L			0														

TAL Reference Data Summary

Structured Analysis Code: **A-G5-Z5-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation - 21day ingrowth
Method: Radium 228 by GFPC SW846 9320 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6505							Spike List 6551						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2259	Radium 228	1	pCi/g			0	C	Y			62	132	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-LP-2Z-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total Alpha Radium EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6503							Spike List 6596						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/L			0	C	Y			70	125	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-LQ-2Z-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Precipitate, Separation
Method: Total Alpha Radium EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6503							Spike List 6596						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/g			0	C	Y			52	114	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-L1-2Z-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Precipitate, Separation
Method: Total Alpha Radium EPA 903.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6503							Spike List 6596						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/g			0	C	Y			52	114	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-LP-20-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total Radium by DOE RA-06-RC
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6890							Spike List 6891						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-LQ-20-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Precipitate, Separation
Method: Total Radium by DOE RA-06-RC
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6890							Spike List 6891						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2261	Radium (total)	1	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-0K-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-89 BY GFPC EPA 905.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-FW-0K-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-89 BY GFPC EPA 905.0 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-FX-0J-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-FW-0J-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-K3-0J-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6524							Spike List 6516						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-FX-0J-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6886							Spike List 6887						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-0J-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-89 BY GFPC DOE SR-01-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6886							Spike List 6887						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-0K-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-89 BY GFPC EPA 905.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6886							Spike List 6887						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-0K-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-89 BY GFPC EPA 905.0 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6886							Spike List 6887						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4109	Strontium 89	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZO-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: SR-90 BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/L			0	C	Y			80	130	40	C	Y			19	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZO-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: SR-90 BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-HL-ZO-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PREP RC-0003 , RC-0004 , SEP RC-0050 , CT SL-13021
Method: SR-90 BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZK-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/L			0	C	Y			80	130	40	C	Y			19	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-HL-ZK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PREP RC-0003 , RC-0004 , SEP RC-0050 , CT SL-13021
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-K3-ZK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6502							Spike List 6549						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			86	127	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZK-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6888							Spike List 6889						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZK-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6888							Spike List 6889						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZK-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6888							Spike List 6889						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZK-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Strontium-90 by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6888							Spike List 6889						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4111	Strontium 90	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZM-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total SR BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZM-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Total SR BY GFPC EPA-905 MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/g			0	C	Y			72	110	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZM-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total SR BY GFPC EPA-905 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6892							Spike List 6893						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZM-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Total SR BY GFPC EPA-905 MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6892							Spike List 6893						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZJ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/g			0	C	Y			72	110	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-K3-ZJ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: As Received, Digest, Precipitate, Seperation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits					Check List 6525							Spike List 6593						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	10	pCi/sampl			0	C	Y			72	110	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **I-FX-ZJ-DO-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Precipitate, Separation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6892							Spike List 6893						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/L			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **A-FW-ZJ-DO-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Digest, Precipitate, Separation
Method: Total Strontium by GFPC DOE SR-03-RC MOD
QC Program: DOE QSAS
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6892							Spike List 6893						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4154	Strontium Total	3	pCi/g			0	C	Y			75	125	25	C	Y			60	140	25

TAL Reference Data Summary

Structured Analysis Code: **I-JE-3S-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Dry, Grind, Leach/Digestion, phos ppt. -> amm. ppt.
Method: Phosphorus-32/33 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6544							Spike List 6568						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5481	Phosphorus-32/33	5	pCi/L			0	C	Y			70	130	5	C	Y			50	150	5

TAL Reference Data Summary

Structured Analysis Code: **A-JE-3S-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Leach/Digestion, phos ppt. -> amm. ppt.
Method: Phosphorus-32/33 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6544							Spike List 6568						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5481	Phosphorus-32/33	5	pCi/g			0	C	Y			70	130	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-JG-3U-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Dry, Grind, Leach/digestion,separation -> BaSO4 ppt.
Method: Sulfur-32/35 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6546							Spike List 6570						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5485	Sulfur-32/35	5	pCi/L			0	C	Y			70	130	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **A-JG-3U-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Leach/digestion,separation -> BaSO4 ppt.
Method: Sulfur-32/35 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6546							Spike List 6570						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5485	Sulfur-32/35	5	pCi/g			0	C	Y			70	130	40	C	Y			50	150	40

TAL Reference Data Summary

Structured Analysis Code: **I-JF-3T-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Dry, Grind, Leach/digestion,separation -> AgCl ppt.
Method: Chlorine-36 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6545							Spike List 6569						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5483	Chlorine-36	5	pCi/L			0	C	Y			70	130	40	C	Y			70	130	40

TAL Reference Data Summary

Structured Analysis Code: **A-JF-3T-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Dry, Grind, Leach/digestion,separation -> AgCl ppt.
Method: Chlorine-36 by GFPC
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6545							Spike List 6569						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5483	Chlorine-36	5	pCi/g			0	C	Y			68	120	40	C	Y			70	130	40

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 763 to 799

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

TAL Reference Data Summary

Structured Analysis Code: **I-25-VU-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (524.2)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6087							Spike List 6088						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	2	ug/L	0.344	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	10	150	20
20	Acetonitrile	10	ug/L	2.039	ug/L	20100106														
39	Acrolein	10	ug/L	2.75	ug/L	20100108														
46	Acrylonitrile	10	ug/L	0.583	ug/L	20100104														
196	Benzene	1	ug/L	0.064	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	71	115	20
318	Bromobenzene	1	ug/L	0.076	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	69	115	20
321	Bromochloromethane	1	ug/L	0.133	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
325	Dichlorobromomethane	1	ug/L	0.088	ug/L	20100427														
323	Bromodichloromethane	1	ug/L	0.088	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	71	115	20
340	Bromoform	1	ug/L	0.166	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	116	20
344	Methyl bromide	2	ug/L	0.126	ug/L	20100427														
343	Bromomethane	2	ug/L	0.126	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	47	145	20
363	1-Butanol	40	ug/L	12.3	ug/L	20100106														
2729	n-Butanol	40	ug/L	12.3	ug/L	20100106														
3271	2-Butanone (MEK)	5	ug/L	0.518	ug/L	20100106														
372	2-Butanone	5	ug/L	0.518	ug/L	20100106	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	47	119	20
373	Methyl ethyl ketone	5	ug/L	0.518	ug/L	20100106														
374	MEK	5	ug/L	0.518	ug/L	20100106														
3280	Methyl ethyl ketone (MEK)	5	ug/L	0.518	ug/L	20100106														
364	n-Butyl alcohol	40	ug/L	12.3	ug/L	20100106														
393	n-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	66	116	20
395	sec-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	72	124	20
398	tert-Butylbenzene	1	ug/L	0.110	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	69	124	20
459	Carbon disulfide	1	ug/L	0.051	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	69	150	20
463	Carbon tetrachloride	1	ug/L	0.125	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	123	20
521	Chlorobenzene	1	ug/L	0.148	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	72	115	20
322	Chlorobromomethane	1	ug/L	0.133	ug/L	20100427														
2765	Chlorobutadiene	1	ug/L	0.097	ug/L	20100427														
531	Chloroprene	1	ug/L	0.097	ug/L	20100427														
530	2-Chloro-1,3-butadiene	1	ug/L	0.097	ug/L	20100427														
534	Chlorodibromomethane	1	ug/L	0.127	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
535	Dibromochloromethane	1	ug/L	0.127	ug/L	20100427														
3361	Ethyl chloride	2	ug/L	0.099	ug/L	20100427														
550	Chloroethane	2	ug/L	0.099	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	58	139	20
568	2-Chloroethyl vinyl ether	2	ug/L	0.165	ug/L	20100106														
569	Chloroform	1	ug/L	0.102	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	74	115	20
575	Methyl chloride	2	ug/L	0.077	ug/L	20100104														

Structured Analysis Code: I-25-VU-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (524.2)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6087							Spike List 6088						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4147	Chloromethane (Methyl Chloride)	2	ug/L	0.077	ug/L	20100104														
574	Chloromethane	2	ug/L	0.077	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	61	120	20
606	Allyl chloride	2	ug/L	0.111	ug/L	20100427														
2766	Chloropropene	2	ug/L	0.111	ug/L	20100427														
604	3-Chloro-1-propene	2	ug/L	0.111	ug/L	20100427														
614	2-Chlorotoluene	1	ug/L	0.078	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	118	20
615	o-Chlorotoluene	0.5	ug/L	0.078	ug/L	20100427														
617	4-Chlorotoluene	1	ug/L	0.081	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	117	20
618	p-Chlorotoluene	0.5	ug/L	0.081	ug/L	20100427														
669	Cyclohexane	1	ug/L	0.067	ug/L	20100427														
676	Cyclohexanone	20	ug/L	5.78	ug/L	20100106														
3260	1,2-Dibromo-3-chloropropane (DBCP)	1	ug/L	0.4110	ug/L	20100106														
539	1,2-Dibromo-3-chloropropane	1	ug/L	0.4110	ug/L	20100106	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	62	115	20
870	1,2-Dibromoethane	1	ug/L	0.128	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
3261	1,2-Dibromoethane (EDB)	1	ug/L	0.128	ug/L	20100104														
889	Methylene bromide	1	ug/L	0.210	ug/L	20100104														
888	Dibromomethane	1	ug/L	0.210	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	72	115	20
906	o-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104														
904	1,2-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	75	115	20
909	m-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427														
907	1,3-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
912	p-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104														
910	1,4-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	8	ug/L	70	115	20
922	trans-1,4-Dichloro-2-butene	2	ug/L	0.290	ug/L	20100106														
924	Dichlorodifluoromethane	2	ug/L	0.084	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	39	131	20
3615	Dichlorodifluoromethane (Freon 12)	2	ug/L	0.084	ug/L	20100427														
933	1,1-Dichloroethane	1	ug/L	0.068	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	115	20
3767	Ethylene dichloride	1	ug/L	0.100	ug/L	20100104														
936	1,2-Dichloroethane	1	ug/L	0.100	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	115	20
949	cis-1,2-Dichloroethylene	1	ug/L	0.087	ug/L	20100427														
948	cis-1,2-Dichloroethene	1	ug/L	0.087	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	66	115	20
951	trans-1,2-Dichloroethylene	1	ug/L	0.083	ug/L	20100104														
950	trans-1,2-Dichloroethene	1	ug/L	0.083	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	65	116	20
946	1,1-Dichloroethylene	1	ug/L	0.083	ug/L	20100427														
943	1,1-Dichloroethene	1	ug/L	0.083	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	56	115	20
952	1,2-Dichloroethene (total)	2	ug/L	0.154	ug/L	20100427														
986	1,2-Dichloropropane	1	ug/L	0.097	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	115	20
989	1,3-Dichloropropane	1	ug/L	0.072	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	71	115	20
990	2,2-Dichloropropane	1	ug/L	0.142	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	58	121	20

Structured Analysis Code: I-25-VU-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (524.2)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6087							Spike List 6088						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
998	cis-1,3-Dichloropropene	1	ug/L	0.073	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	115	20
2769	trans-1,3-Dichloropropylene	1	ug/L	0.083	ug/L	20100104														
1000	trans-1,3-Dichloropropene	1	ug/L	0.083	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
996	1,1-Dichloropropene	1	ug/L	0.079	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	67	116	20
2788	cis-1,3-Dichloropropylene	1	ug/L	0.073	ug/L	20100104														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	4	ug/L	0.135	ug/L	20100427														
3887	Dimethyl disulfide	5	ug/L	0.224	ug/L	20100108														
1199	1,4-Dioxane	80	ug/L	7.56	ug/L	20100106														
1325	Ethyl acetate	2	ug/L	0.176	ug/L	20100106														
1332	Ethylbenzene	1	ug/L	0.086	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	74	118	20
1349	Ethyl ether	1	ug/L	0.260	ug/L	20100104														
1355	Diethyl ether	1	ug/L	0.260	ug/L	20100104														
1360	Ethyl methacrylate	1	ug/L	0.108	ug/L	20100104														
2790	Freon 113	1	ug/L	0.101	ug/L	20100427														
1489	Hexachlorobutadiene	1	ug/L	0.087	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	59	116	20
3445	Hexane	4	ug/L	0.106	ug/L	20100104														
1514	n-Hexane	4	ug/L	0.106	ug/L	20100104														
1515	2-Hexanone	5	ug/L	0.224	ug/L	20100106	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	40	130	20
1536	Iodomethane	2	ug/L	0.092	ug/L	20100104														
1537	Methyl iodide	2	ug/L	0.092	ug/L	20100104														
1552	Isobutanol	80	ug/L	8.702	ug/L	20100106														
1556	Isobutyl alcohol	80	ug/L	8.702	ug/L	20100106														
1578	Isopropylbenzene	1	ug/L	0.083	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	65	123	20
1587	4-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	123	20
1590	p-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427														
1713	Methacrylonitrile	5	ug/L	0.495	ug/L	20100427														
1774	Methyl acetate	5	ug/L	0.367	ug/L	20100430														
3724	Methyl butyl ketone	5	ug/L	0.224	ug/L	20100106														
1799	Methylcyclohexane	4	ug/L	0.104	ug/L	20100104														
1812	Dichloromethane	1	ug/L	0.108	ug/L	20100104														
1811	Methylene chloride	1	ug/L	0.108	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	66	115	20
1823	Methyl methacrylate	1	ug/L	0.257	ug/L	20100104														
1848	Methyl isobutyl ketone	5	ug/L	0.121	ug/L	20100104														
3283	4-Methyl-2-pentanone (MIBK)	5	ug/L	0.121	ug/L	20100104														
1849	MIBK	5	ug/L	0.121	ug/L	20100104														
1845	4-Methyl-2-pentanone	5	ug/L	0.121	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	N	5	ug/L	46	127	20
2773	MTBE	2	ug/L	0.114	ug/L	20100104														
2772	Methyl tert-butyl ether	2	ug/L	0.114	ug/L	20100104														
3794	Methyl tert-butyl ether (MTBE)	2	ug/L	0.114	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	57	115	20

Structured Analysis Code: I-25-VU-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (524.2)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6087							Spike List 6088						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1932	Naphthalene	1	ug/L	0.157	ug/L	20100106	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	38	118	20
2005	2-Nitropropane	10	ug/L	0.397	ug/L	20100106														
5350	Nonanal	5	ug/L	0.412	ug/L	20100111														
2108	Pentachloroethane	2	ug/L	0.343	ug/L	20100430														
2238	Propionitrile	5	ug/L	1.35	ug/L	20100427														
2247	n-Propylbenzene	1	ug/L	0.062	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	127	20
2355	Styrene	1	ug/L	0.074	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
2437	1,1,1,2-Tetrachloroethane	1	ug/L	0.090	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	115	20
2439	1,1,2,2-Tetrachloroethane	1	ug/L	0.098	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	115	20
2446	Tetrachloroethylene	1	ug/L	0.178	ug/L	20100427														
2445	Tetrachloroethene	1	ug/L	0.178	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	120	20
2469	Tetrahydrofuran	10	ug/L	1.14	ug/L	20100106														
2489	Toluene	1	ug/L	0.072	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	119	20
5524	Total Detected VOCs	5	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.128	ug/L	20100108														
2514	1,2,3-Trichlorobenzene	1	ug/L	0.087	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	59	115	20
2515	1,2,4-Trichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	60	115	20
2518	1,1,1-Trichloroethane	1	ug/L	0.069	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	63	123	20
2522	1,1,2-Trichloroethane	1	ug/L	0.150	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	72	115	20
2525	Trichloroethene	1	ug/L	0.212	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	116	20
2526	Trichloroethylene	1	ug/L	0.212	ug/L	20100104														
1427	Fluorotrichloromethane	1	ug/L	0.113	ug/L	20100427														
1428	Trichlorofluoromethane	1	ug/L	0.113	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	75	123	20
2563	1,2,3-Trichloropropane	1	ug/L	0.153	ug/L	20100104	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	68	116	20
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	1	ug/L	0.101	ug/L	20100427														
2764	Trichlorotrifluoroethane	1	ug/L	0.101	ug/L	20100427														
2747	Trihalomethanes (total)	2.0	ug/L	0.61	ug/L	20080924														
2587	1,2,4-Trimethylbenzene	1	ug/L	0.084	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	77	115	20
2592	1,3,5-Trimethylbenzene	1	ug/L	0.081	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	73	125	20
2610	Vinyl acetate	2	ug/L	0.181	ug/L	20100427														
2613	Vinyl chloride	2	ug/L	0.084	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	50	142	20
2940	m-Xylene & p-Xylene	2	ug/L	0.142	ug/L	20100427														
2623	o-Xylene	1	ug/L	0.063	ug/L	20100427														
2627	Xylenes (total)	3	ug/L	0.200	ug/L	20100427	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	71	120	20
337	4-Bromofluorobenzene						X	Y	5	ug/L	85	125	0	X	Y	5	ug/L	78	132	0
2855	1,2-Dichlorobenzene-d4						X	Y	10	ug/L	85	116	0	X	Y	10	ug/L	84	118	0

TAL Reference Data Summary

Structured Analysis Code: **I-15-DN-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	20	ug/L	3.81	ug/L	20060323	C	Y	20	ug/L	47	135	20	C	Y	20	ug/L	16	134	20
20	Acetonitrile	50	ug/L	1.98	ug/L	20060202	C	Y	20	ug/L	58	137	20	C	Y	20	ug/L	30	150	20
39	Acrolein	50	ug/L	3.96	ug/L	20060207	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	50	150	20
46	Acrylonitrile	50	ug/L	4.14	ug/L	20060207	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	23	150	20
196	Benzene	5	ug/L	0.169	ug/L	20060202	C	Y	20	ug/L	74	130	20	C	Y	20	ug/L	57	139	20
220	Benzyl chloride	10	ug/L			0														
318	Bromobenzene	5	ug/L	0.226	ug/L	20060202	C	Y	20	ug/L	77	124	20	C	Y	20	ug/L	52	130	20
321	Bromochloromethane	5	ug/L	0.411	ug/L	20060207	C	Y	20	ug/L	55	140	20	C	Y	20	ug/L	27	148	20
325	Dichlorobromomethane	5	ug/L	0.334	ug/L	20060202														
323	Bromodichloromethane	5	ug/L	0.334	ug/L	20060202	C	Y	20	ug/L	74	131	20	C	Y	20	ug/L	38	150	20
340	Bromoform	5	ug/L	0.244	ug/L	20060202	C	Y	20	ug/L	59	140	20	C	Y	20	ug/L	45	150	20
344	Methyl bromide	10	ug/L	0.312	ug/L	20060207														
343	Bromomethane	10	ug/L	0.312	ug/L	20060207	C	Y	20	ug/L	48	140	20	C	Y	20	ug/L	31	131	20
363	1-Butanol	100	ug/L	3.39	ug/L	20060323	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	150	20
2729	n-Butanol	100	ug/L	3.39	ug/L	20060323														
3271	2-Butanone (MEK)	20	ug/L	1.37	ug/L	20060222														
372	2-Butanone	20	ug/L	1.37	ug/L	20060222	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	150	20
373	Methyl ethyl ketone	20	ug/L	1.37	ug/L	20060222														
374	MEK	20	ug/L	1.37	ug/L	20060222														
3280	Methyl ethyl ketone (MEK)	20	ug/L	1.37	ug/L	20060222														
364	n-Butyl alcohol	100	ug/L	3.39	ug/L	20060323														
1772	tert-Butyl alcohol	5	ug/L	5	ug/L	20040505														
393	n-Butylbenzene	5	ug/L	0.531	ug/L	20060207	C	Y	20	ug/L	72	136	20	C	Y	20	ug/L	53	130	20
395	sec-Butylbenzene	5	ug/L	0.246	ug/L	20060224	C	Y	20	ug/L	73	135	20	C	Y	20	ug/L	55	131	20
398	tert-Butylbenzene	5	ug/L	0.265	ug/L	20060224	C	Y	20	ug/L	73	134	20	C	Y	20	ug/L	53	133	20
459	Carbon disulfide	5	ug/L	0.55	ug/L	20060202	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	70	140	20
463	Carbon tetrachloride	5	ug/L	0.904	ug/L	20060222	C	Y	20	ug/L	70	140	20	C	Y	20	ug/L	70	140	20
521	Chlorobenzene	5	ug/L	0.124	ug/L	20060202	C	Y	20	ug/L	76	122	20	C	Y	20	ug/L	57	131	20
322	Chlorobromomethane	5	ug/L	0.411	ug/L	20060207														
2765	Chlorobutadiene	5	ug/L	0.448	ug/L	20060202														
531	Chloroprene	5	ug/L	0.448	ug/L	20060202														
530	2-Chloro-1,3-butadiene	5	ug/L	0.448	ug/L	20060202	C	Y	20	ug/L	69	136	20	C	Y	20	ug/L	32	150	20
535	Dibromochloromethane	5	ug/L	0.288	ug/L	20060202	C	Y	20	ug/L	72	132	20	C	Y	20	ug/L	53	149	20
534	Chlorodibromomethane	5	ug/L	0.288	ug/L	20060202														
550	Chloroethane	10	ug/L	0.351	ug/L	20060207	C	Y	20	ug/L	55	131	20	C	Y	20	ug/L	35	139	20
3361	Ethyl chloride	10	ug/L	0.351	ug/L	20060207														
5816	Chloroethene	5	ug/L	0.237	ug/L	20060202														

Structured Analysis Code: I-15-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
568	2-Chloroethyl vinyl ether	20	ug/L	0.821	ug/L	20060207	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	70	130	20
569	Chloroform	5	ug/L	0.142	ug/L	20060202	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	55	138	20
574	Chloromethane	10	ug/L	0.444	ug/L	20060202	C	Y	20	ug/L	55	140	20	C	Y	20	ug/L	41	140	20
575	Methyl chloride	10	ug/L	0.444	ug/L	20060202														
4147	Chloromethane (Methyl Chloride)	10	ug/L	0.444	ug/L	20060202														
2766	Chloropropene	10	ug/L	0.300	ug/L	20060207														
606	Allyl chloride	10	ug/L	0.300	ug/L	20060207	C	Y	20	ug/L	61	140	20	C	Y	20	ug/L	33	150	20
604	3-Chloro-1-propene	10	ug/L	0.300	ug/L	20060207														
614	2-Chlorotoluene	5	ug/L	0.456	ug/L	20060202	C	Y	20	ug/L	73	131	20	C	Y	20	ug/L	52	132	20
617	4-Chlorotoluene	5	ug/L	0.881	ug/L	20060207	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	43	139	20
669	Cyclohexane	10	ug/L	0.4	ug/L	20060202	C	Y	20	ug/L	67	136	20	C	Y	20	ug/L	38	143	20
676	Cyclohexanone	100	ug/L	13.6	ug/L	20060207	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	135	20
539	1,2-Dibromo-3-chloropropane	10	ug/L	0.89	ug/L	20060207														
3260	1,2-Dibromo-3-chloropropane (DBCP)	10	ug/L	0.89	ug/L	20060207	C	Y	20	ug/L	59	129	20	C	Y	20	ug/L	31	139	20
3261	1,2-Dibromoethane (EDB)	5	ug/L	0.507	ug/L	20060207	C	Y	20	ug/L	71	126	20	C	Y	20	ug/L	28	148	20
870	1,2-Dibromoethane	5	ug/L	0.507	ug/L	20060207														
889	Methylene bromide	5	ug/L	0.351	ug/L	20060207														
888	Dibromomethane	5	ug/L	0.351	ug/L	20060207														
906	o-Dichlorobenzene	5	ug/L	0.15	ug/L	20060202														
904	1,2-Dichlorobenzene	5	ug/L	0.15	ug/L	20060202	C	Y	20	ug/L	76	124	20	C	Y	20	ug/L	52	136	20
909	m-Dichlorobenzene	5	ug/L	0.13	ug/L	20060202														
907	1,3-Dichlorobenzene	5	ug/L	0.13	ug/L	20060202	C	Y	20	ug/L	77	126	20	C	Y	20	ug/L	59	134	20
910	1,4-Dichlorobenzene	5	ug/L	0.108	ug/L	20060202	C	Y	20	ug/L	76	118	20	C	Y	20	ug/L	53	128	20
922	trans-1,4-Dichloro-2-butene	10	ug/L	0.606	ug/L	20060207	C	Y	20	ug/L	46	140	20	C	Y	20	ug/L	22	148	20
3615	Dichlorodifluoromethane (Freon 12)	10	ug/L	0.374	ug/L	20060202	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	24	130	20
924	Dichlorodifluoromethane	10	ug/L	0.374	ug/L	20060202														
933	1,1-Dichloroethane	5	ug/L	0.952	ug/L	20060222	C	Y	20	ug/L	73	129	20	C	Y	20	ug/L	59	148	20
936	1,2-Dichloroethane	5	ug/L	0.438	ug/L	20060207	C	Y	20	ug/L	68	128	20	C	Y	20	ug/L	49	150	20
3767	Ethylene dichloride	5	ug/L	0.438	ug/L	20060207														
949	cis-1,2-Dichloroethylene	5	ug/L	0.428	ug/L	20060207														
948	cis-1,2-Dichloroethene	5	ug/L	0.428	ug/L	20060207	C	Y	20	ug/L	71	129	20	C	Y	20	ug/L	42	142	20
951	trans-1,2-Dichloroethylene	5	ug/L	0.221	ug/L	20060207														
950	trans-1,2-Dichloroethene	5	ug/L	0.221	ug/L	20060207	C	Y	20	ug/L	73	125	20	C	Y	20	ug/L	54	140	20
946	1,1-Dichloroethylene	5	ug/L	0.549	ug/L	20060207														
943	1,1-Dichloroethene	5	ug/L	0.549	ug/L	20060207	C	Y	20	ug/L	72	132	20	C	Y	20	ug/L	37	146	20
953	1,2-Dichloroethylene	10	ug/L	0.543	ug/L	20060207														
952	1,2-Dichloroethene (total)	10	ug/L	0.543	ug/L	20060207	C	Y	20	ug/L	73	125	20	C	Y	20	ug/L	38	143	20
986	1,2-Dichloropropane	5	ug/L	0.373	ug/L	20060202	C	Y	20	ug/L	71	131	20	C	Y	20	ug/L	42	150	20
989	1,3-Dichloropropane	5	ug/L	0.179	ug/L	20060202	C	Y	20	ug/L	72	127	20	C	Y	20	ug/L	41	144	20

Structured Analysis Code: I-15-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
990	2,2-Dichloropropane	5	ug/L	0.173	ug/L	20060202	C	Y	20	ug/L	47	140	20	C	Y	20	ug/L	20	150	20
998	cis-1,3-Dichloropropene	5	ug/L	0.728	ug/L	20060207	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	50	150	20
1000	trans-1,3-Dichloropropene	5	ug/L	0.202	ug/L	20060202	C	Y	20	ug/L	64	132	20	C	Y	20	ug/L	28	150	20
2769	trans-1,3-Dichloropropylene	5	ug/L	0.202	ug/L	20060202														
996	1,1-Dichloropropene	5	ug/L	0.291	ug/L	20060202	C	Y	20	ug/L	71	131	20	C	Y	20	ug/L	42	138	20
2788	cis-1,3-Dichloropropylene	5	ug/L	0.728	ug/L	20060207														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	5	ug/L	0.287	ug/L	20060207	C	Y	20	ug/L	59	140	20	C	Y	20	ug/L	33	145	20
3887	Dimethyl disulfide	5	ug/L	0.27	ug/L	20050418														
1199	1,4-Dioxane	400	ug/L	21.02	ug/L	20060323	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	30	150	20
3766	Epichlorohydrin	25	ug/L			0														
1290	Ethanol	20	ug/L	1.69	ug/L	20030212														
1325	Ethyl acetate	20	ug/L	0.884	ug/L	20060207	C	Y	20	ug/L	45	140	20	C	Y	20	ug/L	50	145	20
1332	Ethylbenzene	5	ug/L	0.186	ug/L	20060202	C	Y	20	ug/L	75	126	20	C	Y	20	ug/L	53	135	20
1349	Ethyl ether	10	ug/L	0.825	ug/L	20060207	C	Y	20	ug/L	61	140	20	C	Y	20	ug/L	37	150	20
1355	Diethyl ether	10	ug/L	0.825	ug/L	20060207														
1360	Ethyl methacrylate	5	ug/L	0.337	ug/L	20060202	C	Y	20	ug/L	62	140	20	C	Y	20	ug/L	26	150	20
2790	Freon 113	5	ug/L	0.535	ug/L	20060222	C	Y	20	ug/L	74	134	20	C	Y	20	ug/L	35	147	20
1489	Hexachlorobutadiene	5	ug/L	0.216	ug/L	20060207	C	Y	20	ug/L	67	114	20	C	Y	20	ug/L	25	127	20
3445	Hexane	10	ug/L	0.452	ug/L	20060207														
1514	n-Hexane	10	ug/L	0.452	ug/L	20060207	C	Y	20	ug/L	72	133	20	C	Y	20	ug/L	31	141	20
1515	2-Hexanone	20	ug/L	0.281	ug/L	20060202	C	Y	20	ug/L	65	130	20	C	Y	20	ug/L	29	150	20
1536	Iodomethane	5	ug/L	0.257	ug/L	20060202	C	Y	20	ug/L	51	140	20	C	Y	20	ug/L	33	138	20
1537	Methyl iodide	5	ug/L	0.257	ug/L	20060202														
1552	Isobutanol	200	ug/L	22.1	ug/L	20060207	C	Y	20	ug/L	49	140	20	C	Y	20	ug/L	14	150	20
1556	Isobutyl alcohol	200	ug/L	22.1	ug/L	20060207														
1578	Isopropylbenzene	5	ug/L	0.177	ug/L	20060224	C	Y	20	ug/L	72	136	20	C	Y	20	ug/L	54	132	20
1579	Cumene	5	ug/L	0.177	ug/L	20060224														
1587	4-Isopropyltoluene	5	ug/L	0.238	ug/L	20060224	C	Y	20	ug/L	72	135	20	C	Y	20	ug/L	53	129	20
1590	p-Isopropyltoluene	5	ug/L	0.238	ug/L	20060224														
1713	Methacrylonitrile	25	ug/L	0.585	ug/L	20060202	C	Y	20	ug/L	68	138	20	C	Y	20	ug/L	36	150	20
1774	Methyl acetate	10	ug/L	0.66	ug/L	20060222	C	Y	20	ug/L	56	139	20	C	Y	20	ug/L	26	143	20
3724	Methyl butyl ketone	20	ug/L	0.281	ug/L	20060202														
1799	Methylcyclohexane	10	ug/L	0.711	ug/L	20060222	C	Y	20	ug/L	73	131	20	C	Y	20	ug/L	36	142	20
1812	Dichloromethane	5	ug/L	2.5	ug/L	20060207														
1811	Methylene chloride	5	ug/L	2.5	ug/L	20060207	C	Y	20	ug/L	66	130	20	C	Y	20	ug/L	42	143	20
1823	Methyl methacrylate	5	ug/L	0.507	ug/L	20060207	C	Y	20	ug/L	55	138	20	C	Y	20	ug/L	35	145	20
1845	4-Methyl-2-pentanone	20	ug/L	1.61	ug/L	20060207	C	Y	20	ug/L	74	122	20	C	Y	20	ug/L	36	150	20
3283	4-Methyl-2-pentanone (MIBK)	20	ug/L	1.61	ug/L	20060207														
1848	Methyl isobutyl ketone	20	ug/L	1.61	ug/L	20060207														

Structured Analysis Code: I-15-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1849	MIBK	20	ug/L	1.61	ug/L	20060207														
2773	MTBE	5	ug/L	0.46	ug/L	20060202														
2772	Methyl tert-butyl ether	5	ug/L	0.46	ug/L	20060202														
3794	Methyl tert-butyl ether (MTBE)	5	ug/L	0.46	ug/L	20060202	C	Y	20	ug/L	66	135	20	C	Y	20	ug/L	35	150	20
1932	Naphthalene	5	ug/L	0.35	ug/L	20060207	C	Y	20	ug/L	52	139	20	C	Y	20	ug/L	50	150	20
2005	2-Nitropropane	10	ug/L	1.74	ug/L	20060222	C	Y	20	ug/L	59	128	20	C	Y	20	ug/L	37	134	20
5350	Nonanal	10	ug/L	0.88	ug/L	20011107														
2108	Pentachloroethane	5	ug/L	0.211	ug/L	20060202	C	Y	20	ug/L	32	135	20	C	Y	20	ug/L	53	111	20
2238	Propionitrile	25	ug/L	7.74	ug/L	20060222	C	Y	20	ug/L	58	136	20	C	Y	20	ug/L	37	149	20
2247	n-Propylbenzene	5	ug/L	0.945	ug/L	20060202	C	Y	20	ug/L	70	140	20	C	Y	20	ug/L	55	131	20
2355	Styrene	5	ug/L	1.2	ug/L	20060202	C	Y	20	ug/L	75	140	20	C	Y	20	ug/L	32	150	20
2437	1,1,1,2-Tetrachloroethane	5	ug/L	0.224	ug/L	20060224	C	Y	20	ug/L	69	132	20	C	Y	20	ug/L	39	140	20
2439	1,1,2,2-Tetrachloroethane	5	ug/L	0.141	ug/L	20060202	C	Y	20	ug/L	57	135	20	C	Y	20	ug/L	46	150	20
2445	Tetrachloroethene	5	ug/L	0.274	ug/L	20060202	C	Y	20	ug/L	64	140	20	C	Y	20	ug/L	64	148	20
2446	Tetrachloroethylene	5	ug/L	0.274	ug/L	20060202														
2469	Tetrahydrofuran	25	ug/L	6.63	ug/L	20060207	C	Y	20	ug/L	60	131	20	C	Y	20	ug/L	35	149	20
2489	Toluene	5	ug/L	0.131	ug/L	20060202	C	Y	20	ug/L	73	129	20	C	Y	20	ug/L	60	130	20
5524	Total Detected VOCs	20	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.733	ug/L	20060202														
2514	1,2,3-Trichlorobenzene	5	ug/L	0.779	ug/L	20060202	C	Y	20	ug/L	44	140	20	C	Y	20	ug/L	50	150	20
2515	1,2,4-Trichlorobenzene	5	ug/L	0.733	ug/L	20060202	C	Y	20	ug/L	62	134	20	C	Y	20	ug/L	26	150	20
2518	1,1,1-Trichloroethane	5	ug/L	0.146	ug/L	20060202	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	55	138	20
2522	1,1,2-Trichloroethane	5	ug/L	0.283	ug/L	20060202	C	Y	20	ug/L	72	124	20	C	Y	20	ug/L	62	129	20
2526	Trichloroethylene	5	ug/L	0.358	ug/L	20060207														
2525	Trichloroethene	5	ug/L	0.358	ug/L	20060207	C	Y	20	ug/L	71	140	20	C	Y	20	ug/L	71	150	20
1428	Trichlorofluoromethane	5	ug/L	0.503	ug/L	20060202	C	Y	20	ug/L	64	128	20	C	Y	20	ug/L	25	149	20
1427	Fluorotrichloromethane	5	ug/L	0.503	ug/L	20060202														
2563	1,2,3-Trichloropropane	5	ug/L	0.556	ug/L	20060207														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/L	0.535	ug/L	20060222														
2764	Trichlorotrifluoroethane	5	ug/L	0.535	ug/L	20060222														
2587	1,2,4-Trimethylbenzene	5	ug/L	0.218	ug/L	20060207														
2592	1,3,5-Trimethylbenzene	5	ug/L	0.211	ug/L	20060224	C	Y	20	ug/L	73	138	20	C	Y	20	ug/L	52	136	20
2610	Vinyl acetate	5	ug/L	0.177	ug/L	20060202	C	Y	20	ug/L	45	140	20	C	Y	20	ug/L	25	150	20
2613	Vinyl chloride	5	ug/L	0.237	ug/L	20060202	C	Y	20	ug/L	57	123	20	C	Y	20	ug/L	40	128	20
2940	m-Xylene & p-Xylene	5	ug/L	0.567	ug/L	20060202	C	Y	20	ug/L	76	132	20	C	Y	20	ug/L	53	138	20
2623	o-Xylene	5	ug/L	0.306	ug/L	20060202	C	Y	20	ug/L	75	129	20	C	Y	20	ug/L	39	145	20
2627	Xylenes (total)	10	ug/L	0.857	ug/L	20060202														
5397	2,2,2-Trifluoroethanol	100	ug/L	44.49	ug/L	20020811														
337	4-Bromofluorobenzene						X	Y	50	ug/L	73	125	0	X	Y	50	ug/L	64	126	0

Structured Analysis Code: I-15-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	60	124	0	X	Y	50	ug/L	51	137	0
2740	Toluene-d8						X	Y	50	ug/L	74	121	0	X	Y	50	ug/L	67	122	0

TAL Reference Data Summary

Structured Analysis Code: **I-25-DN-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	2	ug/L	0.344	ug/L	20100104	C	Y	20	ug/L	47	135	20	C	Y	20	ug/L	16	134	20
20	Acetonitrile	10	ug/L	2.039	ug/L	20100106	C	Y	20	ug/L	58	137	20	C	Y	20	ug/L	30	150	20
39	Acrolein	10	ug/L	2.75	ug/L	20100108	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	50	150	20
46	Acrylonitrile	10	ug/L	0.583	ug/L	20100104	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	23	150	20
196	Benzene	1	ug/L	0.064	ug/L	20100427	C	Y	20	ug/L	74	130	20	C	Y	20	ug/L	57	139	20
318	Bromobenzene	1	ug/L	0.076	ug/L	20100427	C	Y	20	ug/L	77	124	20	C	Y	20	ug/L	52	130	20
321	Bromochloromethane	1	ug/L	0.133	ug/L	20100427	C	Y	20	ug/L	55	140	20	C	Y	20	ug/L	27	148	20
325	Dichlorobromomethane	1	ug/L	0.088	ug/L	20100427														
323	Bromodichloromethane	1	ug/L	0.088	ug/L	20100427	C	Y	20	ug/L	74	131	20	C	Y	20	ug/L	38	150	20
340	Bromoform	1	ug/L	0.166	ug/L	20100427	C	Y	20	ug/L	59	140	20	C	Y	20	ug/L	45	150	20
344	Methyl bromide	2	ug/L	0.126	ug/L	20100427														
343	Bromomethane	2	ug/L	0.126	ug/L	20100427	C	Y	20	ug/L	48	140	20	C	Y	20	ug/L	31	131	20
363	1-Butanol	40	ug/L	12.3	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	150	20
2729	n-Butanol	40	ug/L	12.3	ug/L	20100106														
3271	2-Butanone (MEK)	5	ug/L	0.518	ug/L	20100106														
372	2-Butanone	5	ug/L	0.518	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	150	20
373	Methyl ethyl ketone	5	ug/L	0.518	ug/L	20100106														
374	MEK	5	ug/L	0.518	ug/L	20100106														
3280	Methyl ethyl ketone (MEK)	5	ug/L	0.518	ug/L	20100106														
364	n-Butyl alcohol	40	ug/L	12.3	ug/L	20100106														
1772	tert-Butyl alcohol	50	ug/L	1.080	ug/L	20081204														
393	n-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	20	ug/L	72	136	20	C	Y	20	ug/L	53	130	20
395	sec-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	20	ug/L	73	135	20	C	Y	20	ug/L	55	131	20
398	tert-Butylbenzene	1	ug/L	0.110	ug/L	20100427	C	Y	20	ug/L	73	134	20	C	Y	20	ug/L	53	133	20
459	Carbon disulfide	1	ug/L	0.051	ug/L	20100427	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	70	140	20
463	Carbon tetrachloride	1	ug/L	0.125	ug/L	20100427	C	Y	20	ug/L	70	140	20	C	Y	20	ug/L	70	140	20
521	Chlorobenzene	1	ug/L	0.148	ug/L	20100104	C	Y	20	ug/L	76	122	20	C	Y	20	ug/L	57	131	20
322	Chlorobromomethane	1	ug/L	0.133	ug/L	20100427														
2765	Chlorobutadiene	1	ug/L	0.097	ug/L	20100427														
531	Chloroprene	1	ug/L	0.097	ug/L	20100427														
530	2-Chloro-1,3-butadiene	1	ug/L	0.097	ug/L	20100427	C	Y	20	ug/L	69	136	20	C	Y	20	ug/L	32	150	20
535	Dibromochloromethane	1	ug/L	0.127	ug/L	20100427	C	Y	20	ug/L	72	132	20	C	Y	20	ug/L	53	149	20
534	Chlorodibromomethane	1	ug/L	0.127	ug/L	20100427														
550	Chloroethane	2	ug/L	0.099	ug/L	20100427	C	Y	20	ug/L	55	131	20	C	Y	20	ug/L	35	139	20
3361	Ethyl chloride	2	ug/L	0.099	ug/L	20100427														
568	2-Chloroethyl vinyl ether	2	ug/L	0.165	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	70	130	20
569	Chloroform	1	ug/L	0.102	ug/L	20100104	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	55	138	20

Structured Analysis Code: I-25-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4147	Chloromethane (Methyl Chloride)	2	ug/L	0.077	ug/L	20100104														
574	Chloromethane	2	ug/L	0.077	ug/L	20100104	C	Y	20	ug/L	55	140	20	C	Y	20	ug/L	41	140	20
575	Methyl chloride	2	ug/L	0.077	ug/L	20100104														
2766	Chloropropene	2	ug/L	0.111	ug/L	20100427														
606	Allyl chloride	2	ug/L	0.111	ug/L	20100427	C	Y	20	ug/L	61	140	20	C	Y	20	ug/L	33	150	20
604	3-Chloro-1-propene	2	ug/L	0.111	ug/L	20100427														
614	2-Chlorotoluene	1	ug/L	0.078	ug/L	20100427	C	Y	20	ug/L	73	131	20	C	Y	20	ug/L	52	132	20
617	4-Chlorotoluene	1	ug/L	0.081	ug/L	20100427	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	43	139	20
669	Cyclohexane	1	ug/L	0.067	ug/L	20100427	C	Y	20	ug/L	67	136	20	C	Y	20	ug/L	38	143	20
676	Cyclohexanone	20	ug/L	5.78	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	20	135	20
539	1,2-Dibromo-3-chloropropane	1	ug/L	0.4110	ug/L	20100106														
3260	1,2-Dibromo-3-chloropropane (DBCP)	1	ug/L	0.4110	ug/L	20100106	C	Y	20	ug/L	59	129	20	C	Y	20	ug/L	31	139	20
3261	1,2-Dibromoethane (EDB)	1	ug/L	0.128	ug/L	20100104	C	Y	20	ug/L	71	126	20	C	Y	20	ug/L	28	148	20
870	1,2-Dibromoethane	1	ug/L	0.128	ug/L	20100104														
888	Dibromomethane	1	ug/L	0.210	ug/L	20100104														
889	Methylene bromide	1	ug/L	0.210	ug/L	20100104														
904	1,2-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104	C	Y	20	ug/L	76	124	20	C	Y	20	ug/L	52	136	20
906	o-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104														
907	1,3-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	20	ug/L	77	126	20	C	Y	20	ug/L	59	134	20
909	m-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427														
910	1,4-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104	C	Y	20	ug/L	76	118	20	C	Y	20	ug/L	53	128	20
912	p-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104														
922	trans-1,4-Dichloro-2-butene	2	ug/L	0.290	ug/L	20100106	C	Y	20	ug/L	46	140	20	C	Y	20	ug/L	22	148	20
3615	Dichlorodifluoromethane (Freon 12)	2	ug/L	0.084	ug/L	20100427	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	24	130	20
924	Dichlorodifluoromethane	2	ug/L	0.084	ug/L	20100427														
933	1,1-Dichloroethane	1	ug/L	0.068	ug/L	20100104	C	Y	20	ug/L	73	129	20	C	Y	20	ug/L	59	148	20
936	1,2-Dichloroethane	1	ug/L	0.100	ug/L	20100104	C	Y	20	ug/L	68	128	20	C	Y	20	ug/L	49	150	20
3767	Ethylene dichloride	1	ug/L	0.100	ug/L	20100104														
948	cis-1,2-Dichloroethene	1	ug/L	0.087	ug/L	20100427	C	Y	20	ug/L	71	129	20	C	Y	20	ug/L	42	142	20
949	cis-1,2-Dichloroethylene	1	ug/L	0.087	ug/L	20100427														
950	trans-1,2-Dichloroethene	1	ug/L	0.083	ug/L	20100104	C	Y	20	ug/L	73	125	20	C	Y	20	ug/L	54	140	20
951	trans-1,2-Dichloroethylene	1	ug/L	0.083	ug/L	20100104														
943	1,1-Dichloroethene	1	ug/L	0.083	ug/L	20100427	C	Y	20	ug/L	72	132	20	C	Y	20	ug/L	37	146	20
946	1,1-Dichloroethylene	1	ug/L	0.083	ug/L	20100427														
952	1,2-Dichloroethene (total)	2	ug/L	0.154	ug/L	20100427	C	Y	20	ug/L	73	125	20	C	Y	20	ug/L	38	143	20
986	1,2-Dichloropropane	1	ug/L	0.097	ug/L	20100104	C	Y	20	ug/L	71	131	20	C	Y	20	ug/L	42	150	20
989	1,3-Dichloropropane	1	ug/L	0.072	ug/L	20100104	C	Y	20	ug/L	72	127	20	C	Y	20	ug/L	41	144	20
990	2,2-Dichloropropane	1	ug/L	0.142	ug/L	20100427	C	Y	20	ug/L	47	140	20	C	Y	20	ug/L	20	150	20
998	cis-1,3-Dichloropropene	1	ug/L	0.073	ug/L	20100104	C	Y	20	ug/L	60	140	20	C	Y	20	ug/L	50	150	20

Structured Analysis Code: I-25-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1000	trans-1,3-Dichloropropene	1	ug/L	0.083	ug/L	20100104	C	Y	20	ug/L	64	132	20	C	Y	20	ug/L	28	150	20
2769	trans-1,3-Dichloropropylene	1	ug/L	0.083	ug/L	20100104														
996	1,1-Dichloropropene	1	ug/L	0.079	ug/L	20100427	C	Y	20	ug/L	71	131	20	C	Y	20	ug/L	42	138	20
2788	cis-1,3-Dichloropropylene	1	ug/L	0.073	ug/L	20100104														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	4	ug/L	0.135	ug/L	20100427	C	Y	20	ug/L	59	140	20	C	Y	20	ug/L	33	145	20
3887	Dimethyl disulfide	5	ug/L	0.224	ug/L	20100108														
1199	1,4-Dioxane	80	ug/L	7.56	ug/L	20100106	C	Y	20	ug/L	40	140	20	C	Y	20	ug/L	30	150	20
1290	Ethanol	500	ug/L			0														
1325	Ethyl acetate	2	ug/L	0.176	ug/L	20100106	C	Y	20	ug/L	45	140	20	C	Y	20	ug/L	50	145	20
1332	Ethylbenzene	1	ug/L	0.086	ug/L	20100104	C	Y	20	ug/L	75	126	20	C	Y	20	ug/L	53	135	20
1355	Diethyl ether	1	ug/L	0.260	ug/L	20100104														
1349	Ethyl ether	1	ug/L	0.260	ug/L	20100104	C	Y	20	ug/L	61	140	20	C	Y	20	ug/L	37	150	20
1360	Ethyl methacrylate	1	ug/L	0.108	ug/L	20100104	C	Y	20	ug/L	62	140	20	C	Y	20	ug/L	26	150	20
2790	Freon 113	1	ug/L	0.101	ug/L	20100427	C	Y	20	ug/L	74	134	20	C	Y	20	ug/L	35	147	20
1489	Hexachlorobutadiene	1	ug/L	0.087	ug/L	20100104	C	Y	20	ug/L	67	114	20	C	Y	20	ug/L	25	127	20
3445	Hexane	4	ug/L	0.106	ug/L	20100104														
1514	n-Hexane	4	ug/L	0.106	ug/L	20100104	C	Y	20	ug/L	72	133	20	C	Y	20	ug/L	31	141	20
1515	2-Hexanone	5	ug/L	0.224	ug/L	20100106	C	Y	20	ug/L	65	130	20	C	Y	20	ug/L	29	150	20
1536	Iodomethane	2	ug/L	0.092	ug/L	20100104	C	Y	20	ug/L	51	140	20	C	Y	20	ug/L	33	138	20
1537	Methyl iodide	2	ug/L	0.092	ug/L	20100104														
1552	Isobutanol	80	ug/L	8.702	ug/L	20100106	C	Y	20	ug/L	49	140	20	C	Y	20	ug/L	14	150	20
1556	Isobutyl alcohol	80	ug/L	8.702	ug/L	20100106														
1578	Isopropylbenzene	1	ug/L	0.083	ug/L	20100427	C	Y	20	ug/L	72	136	20	C	Y	20	ug/L	54	132	20
1587	4-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427	C	Y	20	ug/L	72	135	20	C	Y	20	ug/L	53	129	20
1590	p-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427														
1713	Methacrylonitrile	5	ug/L	0.495	ug/L	20100427	C	Y	20	ug/L	68	138	20	C	Y	20	ug/L	36	150	20
1774	Methyl acetate	5	ug/L	0.367	ug/L	20100430	C	Y	20	ug/L	56	139	20	C	Y	20	ug/L	26	143	20
3724	Methyl butyl ketone	5	ug/L	0.224	ug/L	20100106														
1799	Methylcyclohexane	4	ug/L	0.104	ug/L	20100104	C	Y	20	ug/L	73	131	20	C	Y	20	ug/L	36	142	20
1812	Dichloromethane	1	ug/L	0.108	ug/L	20100104														
1811	Methylene chloride	1	ug/L	0.108	ug/L	20100104	C	Y	20	ug/L	66	130	20	C	Y	20	ug/L	42	143	20
1823	Methyl methacrylate	1	ug/L	0.257	ug/L	20100104	C	Y	20	ug/L	55	138	20	C	Y	20	ug/L	35	145	20
1848	Methyl isobutyl ketone	5	ug/L	0.121	ug/L	20100104														
3283	4-Methyl-2-pentanone (MIBK)	5	ug/L	0.121	ug/L	20100104														
1849	MIBK	5	ug/L	0.121	ug/L	20100104														
1845	4-Methyl-2-pentanone	5	ug/L	0.121	ug/L	20100104	C	Y	20	ug/L	74	122	20	C	Y	20	ug/L	36	150	20
2773	MTBE	2	ug/L	0.114	ug/L	20100104														
2772	Methyl tert-butyl ether	2	ug/L	0.114	ug/L	20100104														
3794	Methyl tert-butyl ether (MTBE)	2	ug/L	0.114	ug/L	20100104	C	Y	20	ug/L	66	135	20	C	Y	20	ug/L	35	150	20

Structured Analysis Code: I-25-DN-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (624) - preserved
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6029							Spike List 6077						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1932	Naphthalene	1	ug/L	0.157	ug/L	20100106	C	Y	20	ug/L	52	139	20	C	Y	20	ug/L	50	150	20
2005	2-Nitropropane	10	ug/L	0.397	ug/L	20100106	C	Y	20	ug/L	59	128	20	C	Y	20	ug/L	37	134	20
5350	Nonanal	5	ug/L	0.412	ug/L	20100111														
2108	Pentachloroethane	1	ug/L	0.343	ug/L	20100430	C	Y	20	ug/L	32	135	20	C	Y	20	ug/L	53	111	20
2238	Propionitrile	5	ug/L	1.35	ug/L	20100427	C	Y	20	ug/L	58	136	20	C	Y	20	ug/L	37	149	20
2247	n-Propylbenzene	1	ug/L	0.062	ug/L	20100427	C	Y	20	ug/L	70	140	20	C	Y	20	ug/L	55	131	20
2355	Styrene	1	ug/L	0.074	ug/L	20100427	C	Y	20	ug/L	75	140	20	C	Y	20	ug/L	32	150	20
2437	1,1,1,2-Tetrachloroethane	1	ug/L	0.090	ug/L	20100104	C	Y	20	ug/L	69	132	20	C	Y	20	ug/L	39	140	20
2439	1,1,2,2-Tetrachloroethane	1	ug/L	0.098	ug/L	20100104	C	Y	20	ug/L	57	135	20	C	Y	20	ug/L	46	150	20
2445	Tetrachloroethene	1	ug/L	0.178	ug/L	20100427	C	Y	20	ug/L	64	140	20	C	Y	20	ug/L	64	148	20
2446	Tetrachloroethylene	1	ug/L	0.178	ug/L	20100427														
2469	Tetrahydrofuran	10	ug/L	1.14	ug/L	20100106	C	Y	20	ug/L	60	131	20	C	Y	20	ug/L	35	149	20
2489	Toluene	1	ug/L	0.072	ug/L	20100427	C	Y	20	ug/L	73	129	20	C	Y	20	ug/L	60	130	20
5524	Total Detected VOCs	5	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.128	ug/L	20100108														
2514	1,2,3-Trichlorobenzene	1	ug/L	0.087	ug/L	20100427	C	Y	20	ug/L	44	140	20	C	Y	20	ug/L	50	150	20
2515	1,2,4-Trichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	20	ug/L	62	134	20	C	Y	20	ug/L	26	150	20
2518	1,1,1-Trichloroethane	1	ug/L	0.069	ug/L	20100427	C	Y	20	ug/L	74	129	20	C	Y	20	ug/L	55	138	20
2522	1,1,2-Trichloroethane	1	ug/L	0.150	ug/L	20100427	C	Y	20	ug/L	72	124	20	C	Y	20	ug/L	62	129	20
2526	Trichloroethylene	1	ug/L	0.212	ug/L	20100104														
2525	Trichloroethene	1	ug/L	0.212	ug/L	20100104	C	Y	20	ug/L	71	140	20	C	Y	20	ug/L	71	150	20
1428	Trichlorofluoromethane	1	ug/L	0.113	ug/L	20100427	C	Y	20	ug/L	64	128	20	C	Y	20	ug/L	25	149	20
1427	Fluorotrichloromethane	1	ug/L	0.113	ug/L	20100427														
2563	1,2,3-Trichloropropane	1	ug/L	0.153	ug/L	20100104														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	1	ug/L	0.101	ug/L	20100427														
2764	Trichlorotrifluoroethane	1	ug/L	0.101	ug/L	20100427														
2587	1,2,4-Trimethylbenzene	1	ug/L	0.084	ug/L	20100427														
2592	1,3,5-Trimethylbenzene	1	ug/L	0.081	ug/L	20100427	C	Y	20	ug/L	73	138	20	C	Y	20	ug/L	52	136	20
2610	Vinyl acetate	2	ug/L	0.181	ug/L	20100427	C	Y	20	ug/L	45	140	20	C	Y	20	ug/L	25	150	20
2613	Vinyl chloride	2	ug/L	0.084	ug/L	20100427	C	Y	20	ug/L	57	123	20	C	Y	20	ug/L	40	128	20
2940	m-Xylene & p-Xylene	2	ug/L	0.142	ug/L	20100427	C	Y	20	ug/L	76	132	20	C	Y	20	ug/L	53	138	20
2623	o-Xylene	1	ug/L	0.063	ug/L	20100427	C	Y	20	ug/L	75	129	20	C	Y	20	ug/L	39	145	20
2627	Xylenes (total)	3	ug/L	0.200	ug/L	20100427														
5397	2,2,2-Trifluoroethanol	20	ug/L			0														
337	4-Bromofluorobenzene						X	Y	50	ug/L	73	125	0	X	Y	50	ug/L	64	126	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	60	124	0	X	Y	50	ug/L	51	137	0
2740	Toluene-d8						X	Y	50	ug/L	74	121	0	X	Y	50	ug/L	67	122	0

TAL Reference Data Summary

Structured Analysis Code: **I-15-QK-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	20	ug/L	6.67	ug/L	20110624	C	Y	50	ug/L	40	140	20	C	Y	50	ug/L	30	126	20
20	Acetonitrile	50	ug/L	7.29	ug/L	20110330	C	Y	250	ug/L	50	137	20	C	Y	250	ug/L	55	135	20
39	Acrolein	50	ug/L	3.13	ug/L	20110117	C	Y	250	ug/L	40	140	20	C	Y	250	ug/L	50	150	20
46	Acrylonitrile	50	ug/L	1.66	ug/L	20110117	C	Y	250	ug/L	63	140	20	C	Y	250	ug/L	66	139	20
196	Benzene	5	ug/L	0.253	ug/L	20100113	C	Y	50	ug/L	84	115	20	C	Y	50	ug/L	85	115	20
220	Benzyl chloride	10	ug/L			0														
318	Bromobenzene	5	ug/L	0.334	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	116	20
321	Bromochloromethane	5	ug/L	0.552	ug/L	20100113	C	Y	50	ug/L	80	125	20	C	Y	50	ug/L	76	128	20
325	Dichlorobromomethane	5	ug/L	0.254	ug/L	20100113														
323	Bromodichloromethane	5	ug/L	0.254	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
340	Bromoform	5	ug/L	0.366	ug/L	20100113	C	Y	50	ug/L	82	133	20	C	Y	50	ug/L	78	130	20
344	Methyl bromide	10	ug/L	0.396	ug/L	20090302														
343	Bromomethane	10	ug/L	0.396	ug/L	20090302	C	Y	50	ug/L	59	132	20	C	Y	50	ug/L	68	115	20
363	1-Butanol	100	ug/L	18.7	ug/L	20110117	C	Y	500	ug/L	52	138	20	C	Y	500	ug/L	61	135	20
2729	n-Butanol	100	ug/L	18.7	ug/L	20110117														
3271	2-Butanone (MEK)	20	ug/L	0.389	ug/L	20100113														
372	2-Butanone	20	ug/L	0.389	ug/L	20100113	C	Y	50	ug/L	52	131	20	C	Y	50	ug/L	49	132	20
373	Methyl ethyl ketone	20	ug/L	0.389	ug/L	20100113														
374	MEK	20	ug/L	0.389	ug/L	20100113														
3280	Methyl ethyl ketone (MEK)	20	ug/L	0.389	ug/L	20100113														
364	n-Butyl alcohol	100	ug/L	18.7	ug/L	20110117														
393	n-Butylbenzene	5	ug/L	0.232	ug/L	20100113	C	Y	50	ug/L	79	120	20	C	Y	50	ug/L	82	116	20
395	sec-Butylbenzene	5	ug/L	0.310	ug/L	20100113	C	Y	50	ug/L	82	122	20	C	Y	50	ug/L	81	122	20
398	tert-Butylbenzene	5	ug/L	0.311	ug/L	20100113	C	Y	50	ug/L	82	120	20	C	Y	50	ug/L	80	121	20
459	Carbon disulfide	5	ug/L	0.369	ug/L	20100113	C	Y	50	ug/L	76	125	20	C	Y	50	ug/L	73	131	20
463	Carbon tetrachloride	5	ug/L	0.360	ug/L	20100113	C	Y	50	ug/L	84	122	20	C	Y	50	ug/L	79	121	20
521	Chlorobenzene	5	ug/L	0.382	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
322	Chlorobromomethane	5	ug/L	0.552	ug/L	20100113														
2765	Chlorobutadiene	5	ug/L	0.388	ug/L	20100113														
531	Chloroprene	5	ug/L	0.388	ug/L	20100113														
530	2-Chloro-1,3-butadiene	5	ug/L	0.388	ug/L	20100113	C	Y	50	ug/L	85	118	20	C	Y	50	ug/L	84	120	20
534	Chlorodibromomethane	5	ug/L	0.329	ug/L	20100113														
535	Dibromochloromethane	5	ug/L	0.329	ug/L	20100113	C	Y	50	ug/L	85	118	20	C	Y	50	ug/L	85	117	20
3361	Ethyl chloride	10	ug/L	0.382	ug/L	20100113														
550	Chloroethane	10	ug/L	0.382	ug/L	20100113	C	Y	50	ug/L	54	133	20	C	Y	50	ug/L	74	117	20
568	2-Chloroethyl vinyl ether	20	ug/L	0.523	ug/L	20100113	C	Y	50	ug/L	65	140	20	C	Y	50	ug/L	30	150	20
569	Chloroform	5	ug/L	0.147	ug/L	20110119	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20

Structured Analysis Code: I-15-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
575	Methyl chloride	10	ug/L	0.553	ug/L	20090303														
4147	Chloromethane (Methyl Chloride)	10	ug/L	0.553	ug/L	20090303														
574	Chloromethane	10	ug/L	0.553	ug/L	20090303	C	Y	50	ug/L	65	115	20	C	Y	50	ug/L	60	119	20
606	Allyl chloride	10	ug/L	0.391	ug/L	20110119	C	Y	50	ug/L	77	125	20	C	Y	50	ug/L	79	119	20
2766	Chloropropene	10	ug/L	0.391	ug/L	20110119														
604	3-Chloro-1-propene	10	ug/L	0.391	ug/L	20110119														
614	2-Chlorotoluene	5	ug/L	0.336	ug/L	20100113	C	Y	50	ug/L	82	118	20	C	Y	50	ug/L	84	115	20
617	4-Chlorotoluene	5	ug/L	0.305	ug/L	20100113	C	Y	50	ug/L	83	117	20	C	Y	50	ug/L	85	115	20
669	Cyclohexane	10	ug/L	0.363	ug/L	20100113	C	Y	50	ug/L	85	120	20	C	Y	50	ug/L	85	120	20
676	Cyclohexanone	100	ug/L	17.97	ug/L	20110117	C	Y	50	ug/L	50	134	20	C	Y	50	ug/L	25	136	20
3260	1,2-Dibromo-3-chloropropane (DBCP)	10	ug/L	1.150	ug/L	20100113	C	Y	50	ug/L	72	134	20	C	Y	50	ug/L	70	139	20
539	1,2-Dibromo-3-chloropropane	10	ug/L	1.150	ug/L	20100113														
870	1,2-Dibromoethane	5	ug/L	0.437	ug/L	20100113														
3261	1,2-Dibromoethane (EDB)	5	ug/L	0.437	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
889	Methylene bromide	5	ug/L	0.405	ug/L	20100113														
888	Dibromomethane	5	ug/L	0.405	ug/L	20100113	C	Y	50	ug/L	84	115	20	C	Y	50	ug/L	85	115	20
906	o-Dichlorobenzene	5	ug/L	0.280	ug/L	20100113														
904	1,2-Dichlorobenzene	5	ug/L	0.280	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
909	m-Dichlorobenzene	5	ug/L	0.234	ug/L	20100113														
907	1,3-Dichlorobenzene	5	ug/L	0.234	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
910	1,4-Dichlorobenzene	5	ug/L	0.35	ug/L	20110614	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	10	ug/L	0.946	ug/L	20110117	C	Y	50	ug/L	71	119	20	C	Y	50	ug/L	66	121	20
924	Dichlorodifluoromethane	10	ug/L	0.449	ug/L	20100113														
3615	Dichlorodifluoromethane (Freon 12)	10	ug/L	0.449	ug/L	20100113	C	Y	50	ug/L	40	131	20	C	Y	50	ug/L	49	124	20
933	1,1-Dichloroethane	5	ug/L	0.392	ug/L	20100113	C	Y	50	ug/L	80	115	20	C	Y	50	ug/L	82	116	20
3767	Ethylene dichloride	5	ug/L	0.372	ug/L	20100113														
936	1,2-Dichloroethane	5	ug/L	0.372	ug/L	20100113	C	Y	50	ug/L	82	115	20	C	Y	50	ug/L	83	116	20
948	cis-1,2-Dichloroethene	5	ug/L	0.159	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	84	117	20
950	trans-1,2-Dichloroethene	5	ug/L	0.178	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	82	115	20
943	1,1-Dichloroethene	5	ug/L	0.365	ug/L	20100113	C	Y	50	ug/L	80	119	20	C	Y	50	ug/L	64	135	20
952	1,2-Dichloroethene (total)	10	ug/L	0.237	ug/L	20100113	C	Y	100	ug/L	85	115	20	C	Y	100	ug/L	80	117	20
986	1,2-Dichloropropane	5	ug/L	0.317	ug/L	20100113	C	Y	50	ug/L	80	115	20	C	Y	50	ug/L	85	115	20
989	1,3-Dichloropropane	5	ug/L	0.238	ug/L	20100113	C	Y	50	ug/L	81	115	20	C	Y	50	ug/L	80	118	20
990	2,2-Dichloropropane	5	ug/L	0.539	ug/L	20100113	C	Y	50	ug/L	84	119	20	C	Y	50	ug/L	77	119	20
998	cis-1,3-Dichloropropene	5	ug/L	0.339	ug/L	20100113	C	Y	50	ug/L	85	117	20	C	Y	50	ug/L	85	117	20
2769	trans-1,3-Dichloropropylene	5	ug/L	0.349	ug/L	20100113														
1000	trans-1,3-Dichloropropene	5	ug/L	0.349	ug/L	20100113	C	Y	50	ug/L	85	118	20	C	Y	50	ug/L	85	122	20
996	1,1-Dichloropropene	5	ug/L	0.300	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
2788	cis-1,3-Dichloropropylene	5	ug/L	0.339	ug/L	20100113														

Structured Analysis Code: I-15-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	5	ug/L	0.332	ug/L	20100113	C	Y	50	ug/L	67	140	20	C	Y	50	ug/L	70	150	20
3887	Dimethyl disulfide	5	ug/L	0.476	ug/L	20090305														
1199	1,4-Dioxane	400	ug/L	22.860	ug/L	20100130	C	Y	1000	ug/L	57	135	20	C	Y	1000	ug/L	63	134	20
1290	Ethanol	250	ug/L	61.38	ug/L	20090305														
1325	Ethyl acetate	20	ug/L	5.931	ug/L	20100130	C	Y	100	ug/L	62	126	20	C	Y	100	ug/L	66	125	20
1332	Ethylbenzene	5	ug/L	0.299	ug/L	20100113	C	Y	50	ug/L	82	116	20	C	Y	50	ug/L	85	115	20
1349	Ethyl ether	10	ug/L	1.617	ug/L	20100113	C	Y	100	ug/L	66	130	20	C	Y	100	ug/L	73	132	20
1355	Diethyl ether	10	ug/L	1.617	ug/L	20100113														
1360	Ethyl methacrylate	5	ug/L	0.246	ug/L	20110119	C	Y	50	ug/L	74	123	20	C	Y	50	ug/L	70	130	20
2790	Freon 113	5	ug/L	0.246	ug/L	20090303	C	Y	50	ug/L	72	140	20	C	Y	50	ug/L	69	139	20
1489	Hexachlorobutadiene	5	ug/L	0.254	ug/L	20110119	C	Y	50	ug/L	79	118	20	C	Y	50	ug/L	67	120	20
3445	Hexane	10	ug/L	0.455	ug/L	20100113														
1514	n-Hexane	10	ug/L	0.455	ug/L	20100113	C	Y	50	ug/L	83	121	20	C	Y	50	ug/L	85	117	20
1515	2-Hexanone	20	ug/L	0.593	ug/L	20110117	C	Y	50	ug/L	57	127	20	C	Y	50	ug/L	58	122	20
1536	Iodomethane	5	ug/L	1.511	ug/L	20100113	C	Y	50	ug/L	76	127	20	C	Y	50	ug/L	71	125	20
1537	Methyl iodide	5	ug/L	1.511	ug/L	20100113														
1552	Isobutanol	200	ug/L	7.34	ug/L	20100113	C	Y	1000	ug/L	47	138	20	C	Y	1000	ug/L	54	136	20
1556	Isobutyl alcohol	200	ug/L	7.34	ug/L	20100113														
1578	Isopropylbenzene	5	ug/L	0.258	ug/L	20100113	C	Y	50	ug/L	84	120	20	C	Y	50	ug/L	84	119	20
1587	4-Isopropyltoluene	5	ug/L	0.319	ug/L	20100113	C	Y	50	ug/L	85	119	20	C	Y	50	ug/L	85	118	20
1590	p-Isopropyltoluene	5	ug/L	0.319	ug/L	20100113														
1713	Methacrylonitrile	25	ug/L	2.10	ug/L	20110119	C	Y	250	ug/L	64	131	20	C	Y	250	ug/L	69	132	20
1774	Methyl acetate	5	ug/L	2.29	ug/L	20110330	C	Y	50	ug/L	66	140	20	C	Y	50	ug/L	61	148	20
3724	Methyl butyl ketone	20	ug/L	0.593	ug/L	20110117														
1799	Methylcyclohexane	10	ug/L	0.259	ug/L	20100113	C	Y	50	ug/L	71	122	20	C	Y	50	ug/L	82	115	20
1812	Dichloromethane	5	ug/L	1.67	ug/L	20110624														
1811	Methylene chloride	5	ug/L	1.67	ug/L	20110624	C	Y	50	ug/L	75	115	20	C	Y	50	ug/L	69	115	20
1823	Methyl methacrylate	5	ug/L	0.514	ug/L	20110117	C	Y	50	ug/L	73	123	20	C	Y	50	ug/L	75	120	20
1848	Methyl isobutyl ketone	20	ug/L	0.326	ug/L	20100113														
3283	4-Methyl-2-pentanone (MIBK)	20	ug/L	0.326	ug/L	20100113														
1849	MIBK	20	ug/L	0.326	ug/L	20100113														
1845	4-Methyl-2-pentanone	20	ug/L	0.326	ug/L	20100113	C	Y	50	ug/L	59	122	20	C	Y	50	ug/L	55	129	20
2773	MTBE	5	ug/L	0.401	ug/L	20100113														
2772	Methyl tert-butyl ether	5	ug/L	0.401	ug/L	20100113														
3794	Methyl tert-butyl ether (MTBE)	5	ug/L	0.401	ug/L	20100113	C	Y	50	ug/L	79	122	20	C	Y	50	ug/L	73	129	20
1932	Naphthalene	5	ug/L	0.85	ug/L	20110624	C	Y	50	ug/L	74	127	20	C	Y	50	ug/L	76	119	20
2005	2-Nitropropane	10	ug/L	0.636	ug/L	20100113	C	Y	100	ug/L	66	118	20	C	Y	100	ug/L	57	131	20
5350	Nonanal	10	ug/L	0.715	ug/L	20100113														
2108	Pentachloroethane	5	ug/L	0.423	ug/L	20110303	C	Y	50	ug/L	64	135	20	C	Y	50	ug/L	42	142	20

Structured Analysis Code: I-15-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2238	Propionitrile	25	ug/L	2.43	ug/L	20110117	C	Y	250	ug/L	59	136	20	C	Y	250	ug/L	62	137	20
2247	n-Propylbenzene	5	ug/L	0.298	ug/L	20100113	C	Y	50	ug/L	81	123	20	C	Y	50	ug/L	83	121	20
2355	Styrene	5	ug/L	0.347	ug/L	20100113	C	Y	50	ug/L	81	122	20	C	Y	50	ug/L	82	121	20
2437	1,1,1,2-Tetrachloroethane	5	ug/L	0.254	ug/L	20110119	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	82	117	20
2439	1,1,2,2-Tetrachloroethane	5	ug/L	0.425	ug/L	20110119	C	Y	50	ug/L	79	115	20	C	Y	50	ug/L	74	124	20
2446	Tetrachloroethylene	5	ug/L	0.280	ug/L	20100113														
2445	Tetrachloroethene	5	ug/L	0.280	ug/L	20100113	C	Y	50	ug/L	85	116	20	C	Y	50	ug/L	85	117	20
2469	Tetrahydrofuran	25	ug/L	1.670	ug/L	20100113	C	Y	250	ug/L	66	132	20	C	Y	250	ug/L	65	138	20
2489	Toluene	5	ug/L	1.00	ug/L	20110624	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	82	115	20
5524	Total Detected VOCs	20	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.507	ug/L	20090305														
2514	1,2,3-Trichlorobenzene	5	ug/L	0.65	ug/L	20110624	C	Y	50	ug/L	78	120	20	C	Y	50	ug/L	72	120	20
2515	1,2,4-Trichlorobenzene	5	ug/L	0.55	ug/L	20110624	C	Y	50	ug/L	83	116	20	C	Y	50	ug/L	79	115	20
2518	1,1,1-Trichloroethane	5	ug/L	0.291	ug/L	20100113	C	Y	50	ug/L	85	117	20	C	Y	50	ug/L	82	119	20
2522	1,1,2-Trichloroethane	5	ug/L	0.573	ug/L	20100113	C	Y	50	ug/L	83	115	20	C	Y	50	ug/L	83	115	20
2525	Trichloroethene	5	ug/L	0.290	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
1428	Trichlorofluoromethane	5	ug/L	0.221	ug/L	20110116	C	Y	50	ug/L	68	124	20	C	Y	50	ug/L	69	118	20
1427	Fluorotrichloromethane	5	ug/L	0.221	ug/L	20110116														
2563	1,2,3-Trichloropropane	5	ug/L	0.559	ug/L	20100113	C	Y	50.0	ug/L	75	119	20	C	Y	50	ug/L	69	126	20
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/L	0.246	ug/L	20090303														
2764	Trichlorotrifluoroethane	5	ug/L	0.246	ug/L	20090303														
2587	1,2,4-Trimethylbenzene	5	ug/L	0.401	ug/L	20100113	C	Y	50	ug/L	85	116	20		Y	50	ug/L	85	115	20
2592	1,3,5-Trimethylbenzene	5	ug/L	0.284	ug/L	20100113	C	Y	50	ug/L	85	119	20	C	Y	50	ug/L	85	118	20
2610	Vinyl acetate	5	ug/L	0.605	ug/L	20110117	C	Y	50	ug/L	62	130	20	C	Y	50	ug/L	73	135	20
2613	Vinyl chloride	5	ug/L	0.428	ug/L	20100113	C	Y	50	ug/L	55	118	20	C	Y	50	ug/L	59	115	20
2940	m-Xylene & p-Xylene	5	ug/L	0.569	ug/L	20100113	C	Y	100	ug/L	85	115	20	C	Y	100	ug/L	85	115	20
2623	o-Xylene	5	ug/L	0.318	ug/L	20100113	C	Y	50	ug/L	85	115	20	C	Y	50	ug/L	85	115	20
2627	Xylenes (total)	10	ug/L	0.854	ug/L	20100113														
337	4-Bromofluorobenzene						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	83	115	0	X	Y	50	ug/L	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2863	Dibromofluoromethane						X	Y	50	ug/L	85	117	0	X	Y	50	ug/L	80	121	0

TAL Reference Data Summary

Structured Analysis Code: **I-25-QK-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6173							Spike List 6174						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	2	ug/L	0.344	ug/L	20100104	C	Y	50	ug/L	34	140	20	C	Y	50	ug/L	30	150	20
20	Acetonitrile	10	ug/L	2.039	ug/L	20100106	C	Y	50	ug/L	47	149	20	C	Y	50	ug/L	13	150	20
39	Acrolein	10	ug/L	2.75	ug/L	20100108	C	Y	50	ug/L	27	140	20	C	Y	50	ug/L	50	150	20
46	Acrylonitrile	10	ug/L	0.583	ug/L	20100104	C	Y	50	ug/L	64	137	20	C	Y	50	ug/L	32	150	20
196	Benzene	1	ug/L	0.064	ug/L	20100427	C	Y	50	ug/L	76	122	20	C	Y	50	ug/L	45	148	20
318	Bromobenzene	1	ug/L	0.076	ug/L	20100427	C	Y	50	ug/L	74	123	20	C	Y	50	ug/L	43	139	20
321	Bromochloromethane	1	ug/L	0.133	ug/L	20100427	C	Y	50	ug/L	69	129	20	C	Y	50	ug/L	45	144	20
325	Dichlorobromomethane	1	ug/L	0.088	ug/L	20100427														
323	Bromodichloromethane	1	ug/L	0.088	ug/L	20100427	C	Y	50	ug/L	73	129	20	C	Y	50	ug/L	43	150	20
340	Bromoform	1	ug/L	0.166	ug/L	20100427	C	Y	50	ug/L	61	142	20	C	Y	50	ug/L	31	150	20
344	Methyl bromide	2	ug/L	0.250	ug/L	20100727								C	Y	50	ug/L	50	150	20
343	Bromomethane	2	ug/L	0.250	ug/L	20100727	C	Y	50	ug/L	35	140	20	C	Y	50	ug/L	50	150	20
363	1-Butanol	40	ug/L	12.3	ug/L	20100106	C	Y	100	ug/L	35	140	20	C	Y	100	ug/L	20	150	20
2729	n-Butanol	40	ug/L	12.3	ug/L	20100106														
3271	2-Butanone (MEK)	5	ug/L	0.518	ug/L	20100106														
372	2-Butanone	5	ug/L	0.518	ug/L	20100106	C	Y	50	ug/L	42	150	20	C	Y	50	ug/L	17	150	20
373	Methyl ethyl ketone	5	ug/L	0.518	ug/L	20100106														
374	MEK	5	ug/L	0.518	ug/L	20100106														
3280	Methyl ethyl ketone (MEK)	5	ug/L	0.518	ug/L	20100106														
364	n-Butyl alcohol	40	ug/L	12.3	ug/L	20100106														
393	n-Butylbenzene	1	ug/L	0.25	ug/L	20100727	C	Y	50	ug/L	70	136	20	C	Y	50	ug/L	35	148	20
395	sec-Butylbenzene	1	ug/L	0.086	ug/L	20100427	C	Y	50	ug/L	72	133	20	C	Y	50	ug/L	41	147	20
398	tert-Butylbenzene	1	ug/L	0.110	ug/L	20100427	C	Y	50	ug/L	72	131	20	C	Y	50	ug/L	42	144	20
459	Carbon disulfide	1	ug/L	0.051	ug/L	20100427	C	Y	50	ug/L	63	135	20	C	Y	50	ug/L	44	147	20
463	Carbon tetrachloride	1	ug/L	0.125	ug/L	20100427	C	Y	50	ug/L	71	132	20	C	Y	50	ug/L	42	150	20
521	Chlorobenzene	1	ug/L	0.148	ug/L	20100104	C	Y	50	ug/L	79	119	20	C	Y	50	ug/L	46	140	20
322	Chlorobromomethane	1	ug/L	0.133	ug/L	20100427														
2765	Chlorobutadiene	1	ug/L	0.097	ug/L	20100427														
531	Chloroprene	1	ug/L	0.097	ug/L	20100427														
530	2-Chloro-1,3-butadiene	1	ug/L	0.097	ug/L	20100427	C	Y	10	ug/L	74	132	20	C	Y	10	ug/L	34	150	20
534	Chlorodibromomethane	1	ug/L	0.127	ug/L	20100427								C	Y	50	ug/L	35	150	20
535	Dibromochloromethane	1	ug/L	0.127	ug/L	20100427	C	Y	50	ug/L	75	128	20	C	Y	50	ug/L	35	150	20
3361	Ethyl chloride	2	ug/L	0.099	ug/L	20100427														
550	Chloroethane	2	ug/L	0.099	ug/L	20100427	C	Y	50	ug/L	55	135	20	C	Y	50	ug/L	33	146	20
568	2-Chloroethyl vinyl ether	2	ug/L	0.165	ug/L	20100106	C	Y	10	ug/L	31	147	20	C	Y	10	ug/L	20	150	20
569	Chloroform	1	ug/L	0.102	ug/L	20100104	C	Y	50	ug/L	76	121	20	C	Y	50	ug/L	47	146	20
575	Methyl chloride	2	ug/L	0.077	ug/L	20100104														

Structured Analysis Code: I-25-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6173							Spike List 6174						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4147	Chloromethane (Methyl Chloride)	2	ug/L	0.077	ug/L	20100104														
574	Chloromethane	2	ug/L	0.077	ug/L	20100104	C	Y	50	ug/L	59	128	20	C	Y	50	ug/L	30	144	20
606	Allyl chloride	2	ug/L	0.111	ug/L	20100427	C	Y	50	ug/L	66	141	20	C	Y	50	ug/L	31	150	20
2766	Chloropropene	2	ug/L	0.111	ug/L	20100427														
604	3-Chloro-1-propene	2	ug/L	0.111	ug/L	20100427														
614	2-Chlorotoluene	1	ug/L	0.078	ug/L	20100427	C	Y	50	ug/L	71	129	20	C	Y	50	ug/L	41	145	20
617	4-Chlorotoluene	1	ug/L	0.081	ug/L	20100427	C	Y	50	ug/L	71	132	20	C	Y	50	ug/L	41	147	20
669	Cyclohexane	1	ug/L	0.067	ug/L	20100427	C	Y	10	ug/L	76	128	20	C	Y	10	ug/L	35	150	20
676	Cyclohexanone	20	ug/L	5.78	ug/L	20100106	C	Y	50	ug/L	41	140	20	C	Y	50	ug/L	10	149	20
3260	1,2-Dibromo-3-chloropropane (DBCP)	1	ug/L	0.4110	ug/L	20100106	C	Y	50	ug/L	63	129	20	C	Y	50	ug/L	30	146	20
539	1,2-Dibromo-3-chloropropane	1	ug/L	0.4110	ug/L	20100106								C	Y	50	ug/L	30	146	20
870	1,2-Dibromoethane	1	ug/L	0.128	ug/L	20100104								C	Y	50	ug/L	38	149	20
3261	1,2-Dibromoethane (EDB)	1	ug/L	0.128	ug/L	20100104	C	Y	50	ug/L	73	128	20	C	Y	50	ug/L	38	149	20
889	Methylene bromide	1	ug/L	0.210	ug/L	20100104														
888	Dibromomethane	1	ug/L	0.210	ug/L	20100104	C	Y			70	130	20	C	Y			50	150	20
906	o-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104														
904	1,2-Dichlorobenzene	1	ug/L	0.060	ug/L	20100104	C	Y	50	ug/L	74	123	20	C	Y	50	ug/L	47	137	20
909	m-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427														
907	1,3-Dichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	50	ug/L	74	126	20	C	Y	50	ug/L	47	137	20
912	p-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104														
910	1,4-Dichlorobenzene	1	ug/L	0.116	ug/L	20100104	C	Y	50	ug/L	75	118	20	C	Y	50	ug/L	45	134	20
922	trans-1,4-Dichloro-2-butene	2	ug/L	0.290	ug/L	20100106	C	Y	50	ug/L	50	140	20	C	Y	50	ug/L	20	146	20
924	Dichlorodifluoromethane	2	ug/L	0.084	ug/L	20100427														
3615	Dichlorodifluoromethane (Freon 12)	2	ug/L	0.084	ug/L	20100427	C	Y	50	ug/L	44	140	20	C	Y	50	ug/L	14	150	20
933	1,1-Dichloroethane	1	ug/L	0.068	ug/L	20100104	C	Y	50	ug/L	74	122	20	C	Y	50	ug/L	48	143	20
3767	Ethylene dichloride	1	ug/L	0.100	ug/L	20100104														
936	1,2-Dichloroethane	1	ug/L	0.100	ug/L	20100104	C	Y	50	ug/L	68	128	20	C	Y	50	ug/L	44	149	20
949	cis-1,2-Dichloroethylene	1	ug/L	0.087	ug/L	20100427								C	Y	50	ug/L	39	150	20
948	cis-1,2-Dichloroethene	1	ug/L	0.087	ug/L	20100427	C	Y	50	ug/L	76	122	20	C	Y	50	ug/L	39	150	20
951	trans-1,2-Dichloroethylene	1	ug/L	0.083	ug/L	20100104								C	Y	50	ug/L	42	142	20
950	trans-1,2-Dichloroethene	1	ug/L	0.083	ug/L	20100104	C	Y	50	ug/L	74	120	20	C	Y	50	ug/L	42	142	20
946	1,1-Dichloroethylene	1	ug/L	0.083	ug/L	20100427								C	Y	50	ug/L	38	146	20
943	1,1-Dichloroethene	1	ug/L	0.083	ug/L	20100427	C	Y	50	ug/L	71	123	20	C	Y	50	ug/L	38	146	20
952	1,2-Dichloroethene (total)	2	ug/L	0.154	ug/L	20100427	C	Y	100	ug/L	76	120	20	C	Y	100	ug/L	41	147	20
986	1,2-Dichloropropane	1	ug/L	0.097	ug/L	20100104	C	Y	50	ug/L	74	125	20	C	Y	50	ug/L	44	150	20
989	1,3-Dichloropropane	1	ug/L	0.072	ug/L	20100104	C	Y	50	ug/L	72	126	20	C	Y	50	ug/L	42	148	20
990	2,2-Dichloropropane	1	ug/L	0.142	ug/L	20100427	C	Y	50	ug/L	54	140	20	C	Y	50	ug/L	17	150	20
998	cis-1,3-Dichloropropene	1	ug/L	0.073	ug/L	20100104	C	Y	50	ug/L	65	139	20	C	Y	50	ug/L	30	150	20
2769	trans-1,3-Dichloropropylene	1	ug/L	0.083	ug/L	20100104														

Structured Analysis Code: I-25-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6173							Spike List 6174						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1000	trans-1,3-Dichloropropene	1	ug/L	0.083	ug/L	20100104	C	Y	50	ug/L	65	140	20	C	Y	50	ug/L	30	150	20
996	1,1-Dichloropropene	1	ug/L	0.079	ug/L	20100427	C	Y	50	ug/L	77	123	20	C	Y	50	ug/L	41	150	20
2788	cis-1,3-Dichloropropylene	1	ug/L	0.073	ug/L	20100104														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	4	ug/L	0.135	ug/L	20100427														
3887	Dimethyl disulfide	5	ug/L	0.224	ug/L	20100108														
1199	1,4-Dioxane	80	ug/L	7.56	ug/L	20100106	C	Y	200	ug/L	40	140	20	C	Y	200	ug/L	20	150	20
1325	Ethyl acetate	2	ug/L	0.176	ug/L	20100106	C	Y	20	ug/L	61	136	20	C	Y	20	ug/L	25	150	20
1332	Ethylbenzene	1	ug/L	0.086	ug/L	20100104	C	Y	50	ug/L	78	124	20	C	Y	50	ug/kg	43	143	20
1349	Ethyl ether	1	ug/L	0.260	ug/L	20100104	C	Y	20	ug/L	66	134	20	C	Y	20	ug/L	32	150	20
1355	Diethyl ether	1	ug/L	0.260	ug/L	20100104														
1360	Ethyl methacrylate	1	ug/L	0.108	ug/L	20100104	C	Y	50	ug/L	64	140	20	C	Y	50	ug/L	27	150	20
2790	Freon 113	1	ug/L	0.101	ug/L	20100427	C	Y	50	ug/L	74	127	20	C	Y	50	ug/L	29	150	20
1489	Hexachlorobutadiene	1	ug/L	0.087	ug/L	20100104	C	Y	50	ug/L	62	129	20	C	Y	50	ug/L	30	131	20
3445	Hexane	4	ug/L	0.106	ug/L	20100104														
1514	n-Hexane	4	ug/L	0.106	ug/L	20100104	C	Y	50	ug/L	74	135	20	C	Y	50	ug/L	26	150	20
1515	2-Hexanone	5	ug/L	0.224	ug/L	20100106	C	Y	50	ug/L	46	150	20	C	Y	50	ug/L	19	150	20
1536	Iodomethane	2	ug/L	0.092	ug/L	20100104	C	Y	10	ug/L	29	140	20	C	Y	10	ug/L	50	150	20
1537	Methyl iodide	2	ug/L	0.092	ug/L	20100104														
1552	Isobutanol	80	ug/L	8.702	ug/L	20100106	C	Y	200	ug/L	45	140	20	C	Y	200	ug/L	14	150	20
1556	Isobutyl alcohol	80	ug/L	8.702	ug/L	20100106														
1578	Isopropylbenzene	1	ug/L	0.083	ug/L	20100427	C	Y	50	ug/L	71	132	20	C	Y	50	ug/L	40	147	20
1587	4-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427	C	Y	50	ug/L	72	132	20	C	Y	50	ug/L	41	143	20
1590	p-Isopropyltoluene	1	ug/L	0.085	ug/L	20100427														
1713	Methacrylonitrile	5	ug/L	0.495	ug/L	20100427	C	Y	50	ug/L	63	141	20	C	Y	50	ug/L	32	150	20
1774	Methyl acetate	5	ug/L	0.367	ug/L	20100430	C	Y	10	ug/L	50	140	20	C	Y	10	ug/L	23	150	20
3724	Methyl butyl ketone	5	ug/L	0.224	ug/L	20100106														
1799	Methylcyclohexane	4	ug/L	0.104	ug/L	20100104	C	Y	10	ug/L	75	127	20	C	Y	10	ug/L	28	150	20
1812	Dichloromethane	1	ug/L	0.27	ug/L	20110624														
1811	Methylene chloride	1	ug/L	0.27	ug/L	20110624	C	Y	50	ug/L	67	124	20	C	Y	50	ug/L	37	150	20
1823	Methyl methacrylate	1	ug/L	0.257	ug/L	20100104	C	Y	50	ug/L	57	128	20	C	Y	50	ug/L	28	149	20
1848	Methyl isobutyl ketone	5	ug/L	0.121	ug/L	20100104														
3283	4-Methyl-2-pentanone (MIBK)	5	ug/L	0.121	ug/L	20100104														
1849	MIBK	5	ug/L	0.121	ug/L	20100104														
1845	4-Methyl-2-pentanone	5	ug/L	0.121	ug/L	20100104	C	Y	50	ug/L	60	137	20	C	Y	50	ug/L	31	150	20
2773	MTBE	2	ug/L	0.114	ug/L	20100104														
2772	Methyl tert-butyl ether	2	ug/L	0.114	ug/L	20100104														
3794	Methyl tert-butyl ether (MTBE)	2	ug/L	0.114	ug/L	20100104	C	Y	50	ug/L	48	140	20	C	Y	50	ug/L	20	150	20
1932	Naphthalene	1	ug/L	0.157	ug/L	20100106	C	Y	50	ug/L	40	140	20	C	Y	50	ug/L	40	150	20
2005	2-Nitropropane	10	ug/L	0.397	ug/L	20100106	C	Y	20	ug/L	57	135	20	C	Y	20	ug/L	36	140	20

Structured Analysis Code: I-25-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - 25 mL purge (Waters)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6173							Spike List 6174						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5350	Nonanal	5	ug/L	0.412	ug/L	20100111														
2108	Pentachloroethane	2	ug/L	0.343	ug/L	20100430	C	Y	10	ug/L	18	140	20	C	Y	10	ug/L	50	150	20
2238	Propionitrile	5	ug/L	1.35	ug/L	20100427	C	Y	50	ug/L	61	136	20	C	Y	50	ug/L	30	150	20
2247	n-Propylbenzene	1	ug/L	0.062	ug/L	20100427	C	Y	50	ug/L	71	136	20	C	Y	50	ug/L	41	149	20
2355	Styrene	1	ug/L	0.074	ug/L	20100427	C	Y	50	ug/L	78	140	20	C	Y	50	ug/L	34	150	20
2437	1,1,1,2-Tetrachloroethane	1	ug/L	0.090	ug/L	20100104	C	Y	50	ug/L	71	129	20	C	Y	50	ug/L	38	150	20
2439	1,1,2,2-Tetrachloroethane	1	ug/L	0.098	ug/L	20100104	C	Y	50	ug/L	59	131	20	C	Y	50	ug/L	35	150	20
2445	Tetrachloroethene	1	ug/L	0.178	ug/L	20100427	C	Y	50	ug/L	66	133	20	C	Y	50	ug/L	33	143	20
2446	Tetrachloroethylene	1	ug/L	0.178	ug/L	20100427	C	Y	50	ug/L	70	130	20	C	Y	50	ug/L	33	143	20
2469	Tetrahydrofuran	10	ug/L	1.14	ug/L	20100106	C	Y	50	ug/L	61	135	20	C	Y	50	ug/L	25	150	20
2489	Toluene	1	ug/L	0.072	ug/L	20100427	C	Y	50	ug/L	78	126	20	C	Y	50	ug/L	43	148	20
5524	Total Detected VOCs	5	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.128	ug/L	20100108														
2514	1,2,3-Trichlorobenzene	1	ug/L	0.087	ug/L	20100427	C	Y	50	ug/L	41	140	20	C	Y	50	ug/L	20	149	20
2515	1,2,4-Trichlorobenzene	1	ug/L	0.078	ug/L	20100427	C	Y	50	ug/L	54	140	20	C	Y	50	ug/L	26	144	20
2518	1,1,1-Trichloroethane	1	ug/L	0.069	ug/L	20100427	C	Y	50	ug/L	77	125	20	C	Y	50	ug/L	44	148	20
2522	1,1,2-Trichloroethane	1	ug/L	0.150	ug/L	20100427	C	Y	50	ug/L	74	124	20	C	Y	50	ug/L	45	146	20
2526	Trichloroethylene	1	ug/L	0.25	ug/L	20100727								C	Y	50	ug/L	32	150	20
2525	Trichloroethene	1	ug/L	0.25	ug/L	20100727	C	Y	50	ug/L	67	123	20	C	Y	50	ug/L	32	150	20
1428	Trichlorofluoromethane	1	ug/L	0.113	ug/L	20100427	C	Y	50	ug/L	58	134	20	C	Y	50	ug/L	27	142	20
1427	Fluorotrichloromethane	1	ug/L	0.113	ug/L	20100427														
2563	1,2,3-Trichloropropane	1	ug/L	0.153	ug/L	20100104	C	Y			70	130	20	C	Y			50	150	20
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	1	ug/L	0.101	ug/L	20100427	C	Y			70	130	20	C	Y			50	150	20
2764	Trichlorotrifluoroethane	1	ug/L	0.101	ug/L	20100427														
2587	1,2,4-Trimethylbenzene	1	ug/L	0.084	ug/L	20100427	C	Y			70	130	20	C	Y			50	150	20
2592	1,3,5-Trimethylbenzene	1	ug/L	0.081	ug/L	20100427	C	Y	50	ug/L	72	135	20	C	Y	50	ug/L	37	150	20
2610	Vinyl acetate	2	ug/L	0.181	ug/L	20100427	C	Y	10	ug/L	55	140	20	C	Y	10	ug/L	24	150	20
2613	Vinyl chloride	2	ug/L	0.084	ug/L	20100427	C	Y	50	ug/L	58	129	20	C	Y	50	ug/L	31	143	20
2940	m-Xylene & p-Xylene	2	ug/L	0.142	ug/L	20100427	C	Y	100	ug/L	80	127	20	C	Y	100	ug/L	44	146	20
2623	o-Xylene	1	ug/L	0.063	ug/L	20100427	C	Y	50	ug/L	78	129	20	C	Y	50	ug/L	41	150	20
2627	Xylenes (total)	3	ug/L	0.200	ug/L	20100427														
337	4-Bromofluorobenzene						X	Y	50	ug/L	74	120	0	X	Y	50	ug/L	68	122	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	66	125	0	X	Y	50	ug/L	69	121	0
2740	Toluene-d8						X	Y	50	ug/L	76	123	0	X	Y	50	ug/L	68	123	0
2863	Dibromofluoromethane						X	Y	50	ug/L	77	118	0	X	Y	50	ug/L	71	123	0

TAL Reference Data Summary

Structured Analysis Code: **I-4B-QK-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	1000	ug/L	85.0	ug/L	20080402	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	150	20
20	Acetonitrile	2500	ug/L	81.27	ug/L	20100108														
39	Acrolein	2500	ug/L	93.68	ug/L	20100108														
46	Acrylonitrile	2500	ug/L	75.18	ug/L	20100108														
196	Benzene	250	ug/L	9.890	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	61	126	30
318	Bromobenzene	250	ug/L	15.51	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
321	Bromochloromethane	250	ug/L	27.59	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	66	125	20
323	Bromodichloromethane	250	ug/L	10.78	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	68	124	20
340	Bromoform	250	ug/L	16.25	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	67	138	20
343	Bromomethane	500	ug/L	24.16	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	138	30
363	1-Butanol	5000	ug/L	1017.31	ug/L	20100131														
2729	n-Butanol	5000	ug/L	1017.31	ug/L	20100131														
3271	2-Butanone (MEK)	500	ug/L	66.32	ug/L	20100131														
3280	Methyl ethyl ketone (MEK)	500	ug/L	66.32	ug/L	20100131														
372	2-Butanone	500	ug/L	66.32	ug/L	20100131	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	61	140	20
373	Methyl ethyl ketone	500	ug/L	66.32	ug/L	20100131														
374	MEK	500	ug/L	66.32	ug/L	20100131														
365	Butyl alcohol	5000	ug/L	1017.31	ug/L	20100131														
364	n-Butyl alcohol	5000	ug/L	1017.31	ug/L	20100131														
1772	tert-Butyl alcohol	250	ug/L	250	ug/L	20040505														
393	n-Butylbenzene	250	ug/L	11.32	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
395	sec-Butylbenzene	250	ug/L	11.81	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
398	tert-Butylbenzene	250	ug/L	9.192	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
459	Carbon disulfide	250	ug/L	12.31	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	147	20
463	Carbon tetrachloride	250	ug/L	17.45	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	53	136	20
521	Chlorobenzene	250	ug/L	10.34	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	65	126	20
322	Chlorobromomethane	250	ug/L	27.59	ug/L	20100108														
2765	Chlorobutadiene	250	ug/L	8.829	ug/L	20100108														
531	Chloroprene	250	ug/L	8.829	ug/L	20100108														
530	2-Chloro-1,3-butadiene	250	ug/L	8.829	ug/L	20100108														
535	Dibromochloromethane	250	ug/L	10.12	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	67	134	20
534	Chlorodibromomethane	250	ug/L	10.12	ug/L	20100108														
550	Chloroethane	500	ug/L	13.37	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	150	20
3361	Ethyl chloride	500	ug/L	13.37	ug/L	20100108														
568	2-Chloroethyl vinyl ether	1000	ug/L	41.39	ug/L	20100108														
569	Chloroform	250	ug/L	10.51	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	132	20
4147	Chloromethane (Methyl Chloride)	500	ug/L	25.00	ug/L	20100131														

Structured Analysis Code: I-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
574	Chloromethane	500	ug/L	25.00	ug/L	20100131	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	43	133	20
2766	Chloropropene	500	ug/L	30.26	ug/L	20100108														
606	Allyl chloride	500	ug/L	30.26	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
604	3-Chloro-1-propene	500	ug/L	30.26	ug/L	20100108														
614	2-Chlorotoluene	250	ug/L	10.17	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
617	4-Chlorotoluene	250	ug/L	5.000	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
669	Cyclohexane	500	ug/L	12.21	ug/L	20100108														
676	Cyclohexanone	5000	ug/L	266.65	ug/L	20100108														
539	1,2-Dibromo-3-chloropropane	500	ug/L	65.31	ug/L	20100131														
3260	1,2-Dibromo-3-chloropropane (DBCP)	500	ug/L	65.31	ug/L	20100131	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
3261	1,2-Dibromoethane (EDB)	250	ug/L	17.01	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
870	1,2-Dibromoethane	250	ug/L	17.01	ug/L	20100108														
888	Dibromomethane	250	ug/L	23.13	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
904	1,2-Dichlorobenzene	250	ug/L	13.36	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	65	133	20
907	1,3-Dichlorobenzene	250	ug/L	7.572	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	63	131	20
910	1,4-Dichlorobenzene	250	ug/L	15.04	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	128	20
922	trans-1,4-Dichloro-2-butene	500	ug/L	31.95	ug/L	20100108														
3615	Dichlorodifluoromethane (Freon 12)	500	ug/L	28.60	ug/L	20100131	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
924	Dichlorodifluoromethane	500	ug/L	28.60	ug/L	20100131														
933	1,1-Dichloroethane	250	ug/L	10.11	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	58	129	20
936	1,2-Dichloroethane	250	ug/L	11.07	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	59	128	20
3767	Ethylene dichloride	250	ug/L	11.07	ug/L	20100108														
948	cis-1,2-Dichloroethene	250	ug/L	10.43	ug/L	20100108														
950	trans-1,2-Dichloroethene	250	ug/L	8.122	ug/L	20100108														
943	1,1-Dichloroethene	250	ug/L	24.21	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	139	20
952	1,2-Dichloroethene (total)	500	ug/L	17.65	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	134	20
986	1,2-Dichloropropane	250	ug/L	15.67	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	57	130	20
989	1,3-Dichloropropane	250	ug/L	7.310	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
990	2,2-Dichloropropane	250	ug/L	24.14	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
998	cis-1,3-Dichloropropene	500	ug/L	6.397	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	65	128	20
1000	trans-1,3-Dichloropropene	250	ug/L	9.66	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	74	132	20
2769	trans-1,3-Dichloropropylene	250	ug/L	9.66	ug/L	20100108														
996	1,1-Dichloropropene	250	ug/L	11.20	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2788	cis-1,3-Dichloropropylene	500	ug/L	6.397	ug/L	20100108														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	250	ug/L	11.32	ug/L	20100108														
3887	Dimethyl disulfide	250	ug/L	8.8	ug/L	20080108														
1199	1,4-Dioxane	20000	ug/L	1937.63	ug/L	20100131														
1325	Ethyl acetate	1000	ug/L	202.15	ug/L	20100108														
1332	Ethylbenzene	250	ug/L	8.298	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	128	20

Structured Analysis Code: I-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1355	Diethyl ether	500	ug/L	117.75	ug/L	20100108														
1349	Ethyl ether	500	ug/L	117.75	ug/L	20100108														
1360	Ethyl methacrylate	250	ug/L	11.84	ug/L	20100108														
2790	Freon 113	250	ug/L	28.30	ug/L	20100108														
1489	Hexachlorobutadiene	250	ug/L	16.92	ug/L	20100108														
3445	Hexane	2500	ug/L	36.42	ug/L	20100108														
1514	n-Hexane	2500	ug/L	36.42	ug/L	20100108														
1515	2-Hexanone	1000	ug/L	12.59	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	43	150	20
1536	Iodomethane	250	ug/L	20.23	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1537	Methyl iodide	250	ug/L	20.23	ug/L	20100108														
1552	Isobutanol	10000	ug/L	434.38	ug/L	20100108														
1556	Isobutyl alcohol	10000	ug/L	434.38	ug/L	20100108														
1578	Isopropylbenzene	250	ug/L	9.717	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1587	4-Isopropyltoluene	250	ug/L	9.151	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1590	p-Isopropyltoluene	250	ug/L	9.151	ug/L	20100108														
1713	Methacrylonitrile	1250	ug/L	59.31	ug/L	20100108														
1774	Methyl acetate	500	ug/L	53.97	ug/L	20100108														
3724	Methyl butyl ketone	1000	ug/L	12.59	ug/L	20100108														
1799	Methylcyclohexane	500	ug/L	12.56	ug/L	20100108														
1812	Dichloromethane	250	ug/L	50.58	ug/L	20100108														
1811	Methylene chloride	250	ug/L	50.58	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	150	20
1823	Methyl methacrylate	250	ug/L	49.22	ug/L	20100108														
1848	Methyl isobutyl ketone	1000	ug/L	20.36	ug/L	20100108														
3283	4-Methyl-2-pentanone (MIBK)	1000	ug/L	20.36	ug/L	20100108														
1849	MIBK	1000	ug/L	20.36	ug/L	20100108														
1845	4-Methyl-2-pentanone	1000	ug/L	20.36	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	51	150	20
3794	Methyl tert-butyl ether (MTBE)	250	ug/L	9.878	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1932	Naphthalene	250	ug/L	10.20	ug/L	20100108														
2005	2-Nitropropane	500	ug/L	24.20	ug/L	20100108														
5350	Nonanal	500	ug/L	32.41	ug/L	20100108														
2108	Pentachloroethane	250	ug/L	15.09	ug/L	20100108														
2238	Propionitrile	1250	ug/L	140.38	ug/L	20100108														
2247	n-Propylbenzene	250	ug/L	10.25	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2355	Styrene	250	ug/L	14.38	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	137	20
2437	1,1,1,2-Tetrachloroethane	250	ug/L	14.06	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2439	1,1,2,2-Tetrachloroethane	250	ug/L	15.17	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	141	20
2445	Tetrachloroethene	250	ug/L	20.05	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	41	150	20
2469	Tetrahydrofuran	1250	ug/L	206.00	ug/L	20100108														
2489	Toluene	250	ug/L	12.78	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	64	128	20

Structured Analysis Code: I-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5524	Total Detected VOCs	1000	ug/L			0														
3090	1,3,5-Trichlorobenzene	250	ug/L	18.5	ug/L	20080107														
2514	1,2,3-Trichlorobenzene	250	ug/L	15.70	ug/L	20100108														
2515	1,2,4-Trichlorobenzene	250	ug/L	14.61	ug/L	20100108														
2518	1,1,1-Trichloroethane	250	ug/L	9.984	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	129	20
2522	1,1,2-Trichloroethane	250	ug/L	29.73	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	67	124	20
2525	Trichloroethene	250	ug/L	17.60	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	48	132	20
1428	Trichlorofluoromethane	250	ug/L	13.65	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
1427	Fluorotrichloromethane	250	ug/L	13.65	ug/L	20100108														
2564	Trichloropropane	250	ug/L	51.80	ug/L	20100108														
2563	1,2,3-Trichloropropane	250	ug/L	51.80	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	250	ug/L	28.30	ug/L	20100108														
2764	Trichlorotrifluoroethane	250	ug/L	28.30	ug/L	20100108														
2587	1,2,4-Trimethylbenzene	250	ug/L	13.46	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	70	130	20
2592	1,3,5-Trimethylbenzene	250	ug/L	12.47	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	50	150	20
2610	Vinyl acetate	250	ug/L	9.782	ug/L	20100108														
2613	Vinyl chloride	250	ug/L	27.60	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	30	150	20
2940	m-Xylene & p-Xylene	500	ug/L	15.08	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	60	134	20
2621	m-Xylene	125	ug/L	8.29	ug/L	20071226														
2623	o-Xylene	250	ug/L	16.48	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	45	144	20
2627	Xylenes (total)	750	ug/L	29.05	ug/L	20100108	C	Y	2500	ug/L	70	130	20	C	Y	2500	ug/L	52	140	20
337	4-Bromofluorobenzene						X	Y	2500	ug/L	70	130	0	X	Y	2500	ug/L	30	150	0
2735	1,2-Dichloroethane-d4						X	Y	2500	ug/L	70	130	0	X	Y	2500	ug/L	51	141	0
2740	Toluene-d8						X	Y	2500	ug/L	70	130	0	X	Y	2500	ug/L	57	139	0
2863	Dibromofluoromethane						X	Y	2500	ug/L	70	130	0	X	Y	2500	ug/L	30	150	0

TAL Reference Data Summary

Structured Analysis Code: **I-5A-QK-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LEACHATE, Citrate Buffer, CA Title 22 WET ->PURGE/TR/
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
46	Acrylonitrile	500	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	50	ug/L	3.96	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	50	ug/L	3.89	ug/L	20100326														
372	2-Butanone	50	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
373	Methyl ethyl ketone	50	ug/L	3.89	ug/L	20100326														
374	MEK	50	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	50	ug/L	3.89	ug/L	20100326														
364	n-Butyl alcohol	1000	ug/L	49.07	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
531	Chloroprene	50	ug/L	3.88	ug/L	20100326														
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	50	ug/L	3.82	ug/L	20100326														
568	2-Chloroethyl vinyl ether	50	ug/L	5.23	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
574	Chloromethane	50	ug/L	5.53	ug/L	20100326														
606	Allyl chloride	50	ug/L	3.52	ug/L	20100326														
676	Cyclohexanone	500	ug/L	53.13	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
888	Dibromomethane	50	ug/L	4.05	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
924	Dichlorodifluoromethane	50	ug/L	4.49	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20

Structured Analysis Code: I-5A-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LEACHATE, Citrate Buffer, CA Title 22 WET ->PURGE/TR/
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
998	cis-1,3-Dichloropropene	50	ug/L	3.39	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
1325	Ethyl acetate	200	ug/L	59.31	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1349	Ethyl ether	1000	ug/L	16.17	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1536	Iodomethane	50	ug/L	15.11	ug/L	20100326														
1552	Isobutanol	1000	ug/L	73.4	ug/L	20100326														
1556	Isobutyl alcohol	1000	ug/L	73.4	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1849	MIBK	200	ug/L	3.26	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
1848	Methyl isobutyl ketone	200	ug/L	3.26	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2563	1,2,3-Trichloropropane	50	ug/L	5.59	ug/L	20100326														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	50	ug/L	2.46	ug/L	20100326														
2764	Trichlorotrifluoroethane	50	ug/L	2.46	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2940	m-Xylene & p-Xylene	50	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	50	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2740	Toluene-d8						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2863	Dibromofluoromethane						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0

TAL Reference Data Summary

Structured Analysis Code: **I-58-QK-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
20	Acetonitrile	500	ug/L	39.42	ug/L	20100326														
46	Acrylonitrile	500	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	50	ug/L	3.96	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	50	ug/L	3.89	ug/L	20100326														
372	2-Butanone	50	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
373	Methyl ethyl ketone	50	ug/L	3.89	ug/L	20100326														
374	MEK	50	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	50	ug/L	3.89	ug/L	20100326														
364	n-Butyl alcohol	1000	ug/L	49.07	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
531	Chloroprene	50	ug/L	3.88	ug/L	20100326														
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	50	ug/L	3.82	ug/L	20100326														
568	2-Chloroethyl vinyl ether	50	ug/L	5.23	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
574	Chloromethane	50	ug/L	5.53	ug/L	20100326														
606	Allyl chloride	50	ug/L	3.52	ug/L	20100326														
676	Cyclohexanone	500	ug/L	53.13	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
888	Dibromomethane	50	ug/L	4.05	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
924	Dichlorodifluoromethane	50	ug/L	4.49	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														

Structured Analysis Code: I-58-QK-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
998	cis-1,3-Dichloropropene	50	ug/L	3.39	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
1325	Ethyl acetate	200	ug/L	59.31	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1349	Ethyl ether	1000	ug/L	16.17	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1536	Iodomethane	50	ug/L	15.11	ug/L	20100326														
1552	Isobutanol	1000	ug/L	73.4	ug/L	20100326														
1556	Isobutyl alcohol	1000	ug/L	73.4	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1849	MIBK	200	ug/L	3.26	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
1848	Methyl isobutyl ketone	200	ug/L	3.26	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2563	1,2,3-Trichloropropane	50	ug/L	5.59	ug/L	20100326														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	50	ug/L	2.46	ug/L	20100326														
2764	Trichlorotrifluoroethane	50	ug/L	2.46	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	70	130	20	C	Y	500	ug/L	50	150	20
2940	m-Xylene & p-Xylene	50	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	50	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2740	Toluene-d8						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0
2863	Dibromofluoromethane						X	Y	50	ug/L	70	130	0	X	Y	50	ug/L	50	150	0

TAL Reference Data Summary

Structured Analysis Code: **A-KS-QK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)-2
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	20	ug/L	6.47	ug/L	20090306														
20	Acetonitrile	50	ug/L	3.942	ug/L	20100130														
39	Acrolein	50	ug/L	2.901	ug/L	20100113														
46	Acrylonitrile	50	ug/L	1.126	ug/L	20100113														
196	Benzene	5	ug/L	0.253	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	84	115	20
220	Benzyl chloride	10	ug/L			0														
318	Bromobenzene	5	ug/L	0.334	ug/L	20100113														
321	Bromochloromethane	5	ug/L	0.552	ug/L	20100113														
325	Dichlorobromomethane	5	ug/L	0.254	ug/L	20100113														
323	Bromodichloromethane	5	ug/L	0.254	ug/L	20100113														
340	Bromoform	5	ug/L	0.366	ug/L	20100113														
344	Methyl bromide	10	ug/L	0.396	ug/L	20090302														
343	Bromomethane	10	ug/L	0.396	ug/L	20090302														
363	1-Butanol	100	ug/L	4.907	ug/L	20100113														
2729	n-Butanol	100	ug/L	4.907	ug/L	20100113														
3271	2-Butanone (MEK)	20	ug/L	0.389	ug/L	20100113														
372	2-Butanone	20	ug/L	0.389	ug/L	20100113	C	Y	500	ug/L	66	115	20	C	Y	500	ug/L	59	121	20
373	Methyl ethyl ketone	20	ug/L	0.389	ug/L	20100113														
374	MEK	20	ug/L	0.389	ug/L	20100113														
3280	Methyl ethyl ketone (MEK)	20	ug/L	0.389	ug/L	20100113														
364	n-Butyl alcohol	100	ug/L	4.907	ug/L	20100113														
393	n-Butylbenzene	5	ug/L	0.232	ug/L	20100113														
395	sec-Butylbenzene	5	ug/L	0.310	ug/L	20100113														
398	tert-Butylbenzene	5	ug/L	0.311	ug/L	20100113														
459	Carbon disulfide	5	ug/L	0.369	ug/L	20100113														
463	Carbon tetrachloride	5	ug/L	0.360	ug/L	20100113	C	Y	500	ug/L	84	127	20	C	Y	500	ug/L	84	123	20
521	Chlorobenzene	5	ug/L	0.382	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
322	Chlorobromomethane	5	ug/L	0.552	ug/L	20100113														
2765	Chlorobutadiene	5	ug/L	0.388	ug/L	20100113														
531	Chloroprene	5	ug/L	0.388	ug/L	20100113														
530	2-Chloro-1,3-butadiene	5	ug/L	0.388	ug/L	20100113														
534	Chlorodibromomethane	5	ug/L	0.329	ug/L	20100113														
535	Dibromochloromethane	5	ug/L	0.329	ug/L	20100113														
3361	Ethyl chloride	10	ug/L	0.382	ug/L	20100113														
550	Chloroethane	10	ug/L	0.382	ug/L	20100113														
568	2-Chloroethyl vinyl ether	20	ug/L	0.523	ug/L	20100113														
569	Chloroform	5	ug/L	0.092	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20

Structured Analysis Code: A-KS-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)-2
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
575	Methyl chloride	10	ug/L	0.553	ug/L	20090303														
4147	Chloromethane (Methyl Chloride)	10	ug/L	0.553	ug/L	20090303														
574	Chloromethane	10	ug/L	0.553	ug/L	20090303														
606	Allyl chloride	10	ug/L	0.352	ug/L	20100113														
2766	Chloropropene	10	ug/L	0.352	ug/L	20100113														
604	3-Chloro-1-propene	10	ug/L	0.352	ug/L	20100113														
614	2-Chlorotoluene	5	ug/L	0.336	ug/L	20100113														
617	4-Chlorotoluene	5	ug/L	0.305	ug/L	20100113														
669	Cyclohexane	10	ug/L	0.363	ug/L	20100113														
676	Cyclohexanone	100	ug/L	5.313	ug/L	20100113														
3260	1,2-Dibromo-3-chloropropane (DBCP)	10	ug/L	1.150	ug/L	20100113														
539	1,2-Dibromo-3-chloropropane	10	ug/L	1.150	ug/L	20100113														
870	1,2-Dibromoethane	5	ug/L	0.437	ug/L	20100113														
3261	1,2-Dibromoethane (EDB)	5	ug/L	0.437	ug/L	20100113														
889	Methylene bromide	5	ug/L	0.405	ug/L	20100113														
888	Dibromomethane	5	ug/L	0.405	ug/L	20100113														
906	o-Dichlorobenzene	5	ug/L	0.280	ug/L	20100113														
904	1,2-Dichlorobenzene	5	ug/L	0.280	ug/L	20100113														
909	m-Dichlorobenzene	5	ug/L	0.234	ug/L	20100113														
907	1,3-Dichlorobenzene	5	ug/L	0.234	ug/L	20100113														
910	1,4-Dichlorobenzene	5	ug/L	0.260	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	10	ug/L	0.397	ug/L	20100113														
924	Dichlorodifluoromethane	10	ug/L	0.449	ug/L	20100113														
3615	Dichlorodifluoromethane (Freon 12)	10	ug/L	0.449	ug/L	20100113														
933	1,1-Dichloroethane	5	ug/L	0.392	ug/L	20100113														
3767	Ethylene dichloride	5	ug/L	0.372	ug/L	20100113														
936	1,2-Dichloroethane	5	ug/L	0.372	ug/L	20100113	C	Y	500	ug/L	84	115	20	C	Y	500	ug/L	85	115	20
948	cis-1,2-Dichloroethene	5	ug/L	0.159	ug/L	20100113														
950	trans-1,2-Dichloroethene	5	ug/L	0.178	ug/L	20100113														
943	1,1-Dichloroethene	5	ug/L	0.365	ug/L	20100113	C	Y	500	ug/L	81	120	20	C	Y	500	ug/L	79	115	20
952	1,2-Dichloroethene (total)	10	ug/L	0.237	ug/L	20100113														
986	1,2-Dichloropropane	5	ug/L	0.317	ug/L	20100113														
989	1,3-Dichloropropane	5	ug/L	0.238	ug/L	20100113														
990	2,2-Dichloropropane	5	ug/L	0.539	ug/L	20100113														
998	cis-1,3-Dichloropropene	5	ug/L	0.339	ug/L	20100113														
2769	trans-1,3-Dichloropropylene	5	ug/L	0.349	ug/L	20100113														
1000	trans-1,3-Dichloropropene	5	ug/L	0.349	ug/L	20100113														
996	1,1-Dichloropropene	5	ug/L	0.300	ug/L	20100113														
2788	cis-1,3-Dichloropropylene	5	ug/L	0.339	ug/L	20100113														

Structured Analysis Code: A-KS-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)-2
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	5	ug/L	0.332	ug/L	20100113														
3887	Dimethyl disulfide	5	ug/L	0.476	ug/L	20090305														
1199	1,4-Dioxane	400	ug/L	22.860	ug/L	20100130														
3766	Epichlorohydrin	25	ug/L			0														
1290	Ethanol	20	ug/L	61.38	ug/L	20090305														
1325	Ethyl acetate	20	ug/L	5.931	ug/L	20100130														
1332	Ethylbenzene	5	ug/L	0.299	ug/L	20100113														
1355	Diethyl ether	10	ug/L	1.617	ug/L	20100113														
1349	Ethyl ether	10	ug/L	1.617	ug/L	20100113														
1360	Ethyl methacrylate	5	ug/L	0.240	ug/L	20100113														
2790	Freon 113	5	ug/L	0.246	ug/L	20090303														
1489	Hexachlorobutadiene	5	ug/L	0.179	ug/L	20100113														
3445	Hexane	10	ug/L	0.455	ug/L	20100113														
1514	n-Hexane	10	ug/L	0.455	ug/L	20100113														
1515	2-Hexanone	20	ug/L	0.261	ug/L	20100113														
1537	Methyl iodide	5	ug/L	1.511	ug/L	20100113														
1536	Iodomethane	5	ug/L	1.511	ug/L	20100113														
1552	Isobutanol	200	ug/L	7.34	ug/L	20100113														
1556	Isobutyl alcohol	200	ug/L	7.34	ug/L	20100113														
1578	Isopropylbenzene	5	ug/L	0.258	ug/L	20100113														
1587	4-Isopropyltoluene	5	ug/L	0.319	ug/L	20100113														
1588	p-Cymene	5	ug/L	0.319	ug/L	20100113														
1590	p-Isopropyltoluene	5	ug/L	0.319	ug/L	20100113														
1713	Methacrylonitrile	25	ug/L	1.497	ug/L	20100113														
1774	Methyl acetate	10	ug/L	0.611	ug/L	20090302														
3724	Methyl butyl ketone	20	ug/L	0.261	ug/L	20100113														
1799	Methylcyclohexane	10	ug/L	0.259	ug/L	20100113														
1811	Methylene chloride	5	ug/L	0.801	ug/L	20100113														
1812	Dichloromethane	5	ug/L	0.801	ug/L	20100113														
1823	Methyl methacrylate	5	ug/L	0.499	ug/L	20100113														
1849	MIBK	20	ug/L	0.326	ug/L	20100113														
3283	4-Methyl-2-pentanone (MIBK)	20	ug/L	0.326	ug/L	20100113														
1845	4-Methyl-2-pentanone	20	ug/L	0.326	ug/L	20100113														
1848	Methyl isobutyl ketone	20	ug/L	0.326	ug/L	20100113														
2773	MTBE	5	ug/L	0.401	ug/L	20100113														
2772	Methyl tert-butyl ether	5	ug/L	0.401	ug/L	20100113														
3794	Methyl tert-butyl ether (MTBE)	5	ug/L	0.401	ug/L	20100113														
1932	Naphthalene	5	ug/L	0.492	ug/L	20100113														
2005	2-Nitropropane	10	ug/L	0.636	ug/L	20100113														

Structured Analysis Code: A-KS-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)-2
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5350	Nonanal	10	ug/L	0.715	ug/L	20100113														
2108	Pentachloroethane	5	ug/L	0.239	ug/L	20100113														
2238	Propionitrile	50	ug/L	1.143	ug/L	20100113														
2247	n-Propylbenzene	5	ug/L	0.298	ug/L	20100113														
2355	Styrene	5	ug/L	0.347	ug/L	20100113														
2437	1,1,1,2-Tetrachloroethane	5	ug/L	0.238	ug/L	20100113														
2439	1,1,2,2-Tetrachloroethane	5	ug/L	0.272	ug/L	20100113														
2445	Tetrachloroethene	5	ug/L	0.280	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	117	20
2446	Tetrachloroethylene	5	ug/L	0.280	ug/L	20100113														
2469	Tetrahydrofuran	50	ug/L	1.670	ug/L	20100113														
2489	Toluene	5	ug/L	0.303	ug/L	20100113														
5524	Total Detected VOCs	20	ug/L			0														
3090	1,3,5-Trichlorobenzene	5	ug/L	0.507	ug/L	20090305														
2514	1,2,3-Trichlorobenzene	5	ug/L	0.326	ug/L	20100113														
2515	1,2,4-Trichlorobenzene	5	ug/L	0.264	ug/L	20100113														
2518	1,1,1-Trichloroethane	5	ug/L	0.291	ug/L	20100113														
2522	1,1,2-Trichloroethane	5	ug/L	0.573	ug/L	20100113														
2526	Trichloroethylene	5	ug/L	0.290	ug/L	20100113														
2525	Trichloroethene	5	ug/L	0.290	ug/L	20100113	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
1428	Trichlorofluoromethane	5	ug/L	0.167	ug/L	20100113														
1427	Fluorotrichloromethane	5	ug/L	0.167	ug/L	20100113														
2563	1,2,3-Trichloropropane	5	ug/L	0.559	ug/L	20100113														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/L	0.246	ug/L	20090303														
2764	Trichlorotrifluoroethane	5	ug/L	0.246	ug/L	20090303														
2587	1,2,4-Trimethylbenzene	5	ug/L	0.401	ug/L	20100113														
2592	1,3,5-Trimethylbenzene	5	ug/L	0.284	ug/L	20100113														
2610	Vinyl acetate	5	ug/L	0.305	ug/L	20100113														
2613	Vinyl chloride	5	ug/L	0.428	ug/L	20100113	C	Y	500	ug/L	63	115	20	C	Y	500	ug/L	67	115	20
2940	m-Xylene & p-Xylene	10	ug/L	0.569	ug/L	20100113														
2623	o-Xylene	5	ug/L	0.318	ug/L	20100113														
2627	Xylenes (total)	10	ug/L	0.854	ug/L	20100113														
5397	2,2,2-Trifluoroethanol	100	ug/L	44.49	ug/L	20020811														
337	4-Bromofluorobenzene						X	Y	50	ug/L	81	117	0	X	Y	50	ug/L	78	116	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	82	115	0	X	Y	50	ug/kg	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2863	Dibromofluoromethane						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0

TAL Reference Data Summary

Structured Analysis Code: **A-15-QK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	20	ug/kg	6.47	ug/kg	20090306	C	Y	50	ug/kg	49	140	20	C	Y	50	ug/kg	40	150	30
20	Acetonitrile	50	ug/kg	20.4	ug/kg	20110216	C	Y	250	ug/kg	70	123	20	C	Y	250	ug/kg	30	150	30
39	Acrolein	50	ug/kg	12.2	ug/kg	20110216	C	Y	250	ug/kg	40	140	20	C	Y	250	ug/kg	10	150	30
46	Acrylonitrile	50	ug/kg	3.85	ug/kg	20100719	C	Y	250	ug/kg	77	125	20	C	Y	250	ug/kg	30	150	30
196	Benzene	5	ug/kg	0.253	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	81	123	30
318	Bromobenzene	5	ug/kg	0.368	ug/kg	20110216	C	Y	50	ug/kg	85	117	20	C	Y	50	ug/kg	47	150	30
321	Bromochloromethane	5	ug/kg	0.823	ug/kg	20110222	C	Y	50	ug/kg	85	118	20	C	Y	50	ug/kg	68	144	30
325	Dichlorobromomethane	5	ug/kg	0.254	ug/kg	20100113														
323	Bromodichloromethane	5	ug/kg	0.254	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	65	135	30
340	Bromoform	5	ug/kg	0.366	ug/kg	20100113	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	35	150	30
344	Methyl bromide	10	ug/kg	1.10	ug/kg	20110216														
343	Bromomethane	10	ug/kg	1.10	ug/kg	20110216	C	Y	50	ug/kg	60	133	20	C	Y	50	ug/kg	30	150	30
363	1-Butanol	100	ug/kg	16.4	ug/kg	20110216	C	Y	500	ug/kg	56	129	20	C	Y	500	ug/kg	35	150	30
2729	n-Butanol	100	ug/kg	16.4	ug/kg	20110216														
3271	2-Butanone (MEK)	20	ug/kg	1.92	ug/kg	20110222														
372	2-Butanone	20	ug/kg	1.92	ug/kg	20110222	C	Y	50	ug/kg	65	124	20	C	Y	50	ug/kg	20	150	30
373	Methyl ethyl ketone	20	ug/kg	1.92	ug/kg	20110222														
374	MEK	20	ug/kg	1.92	ug/kg	20110222														
3280	Methyl ethyl ketone (MEK)	20	ug/kg	1.92	ug/kg	20110222														
364	n-Butyl alcohol	100	ug/kg	16.4	ug/kg	20110216														
393	n-Butylbenzene	5	ug/kg	0.600	ug/kg	20100727	C	Y	50	ug/kg	84	126	20	C	Y	50	ug/kg	19	150	30
395	sec-Butylbenzene	5	ug/kg	0.310	ug/kg	20100113	C	Y	50	ug/kg	85	128	20	C	Y	50	ug/kg	28	150	30
398	tert-Butylbenzene	5	ug/kg	0.311	ug/kg	20100113	C	Y	50	ug/kg	85	127	20	C	Y	50	ug/kg	34	150	30
459	Carbon disulfide	5	ug/kg	0.685	ug/kg	20100719	C	Y	50	ug/kg	78	128	20	C	Y	50	ug/kg	21	150	30
463	Carbon tetrachloride	5	ug/kg	0.513	ug/kg	20100719	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	47	143	30
521	Chlorobenzene	5	ug/kg	0.382	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	71	128	30
322	Chlorobromomethane	5	ug/kg	0.823	ug/kg	20110222														
2765	Chlorobutadiene	5	ug/kg	0.388	ug/kg	20100113														
531	Chloroprene	5	ug/kg	0.388	ug/kg	20100113														
530	2-Chloro-1,3-butadiene	5	ug/kg	0.388	ug/kg	20100113	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	73	130	30
534	Chlorodibromomethane	5	ug/kg	0.406	ug/kg	20110216														
535	Dibromochloromethane	5	ug/kg	0.406	ug/kg	20110216	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	50	150	30
3361	Ethyl chloride	10	ug/kg	0.516	ug/kg	20100719														
550	Chloroethane	10	ug/kg	0.516	ug/kg	20100719	C	Y	50	ug/kg	63	130	20	C	Y	50	ug/kg	40	150	30
568	2-Chloroethyl vinyl ether	20	ug/kg	1.37	ug/kg	20100719	C	Y	50	ug/kg	60	136	20	C	Y	50	ug/kg	46	150	30
569	Chloroform	5	ug/kg	0.376	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	77	132	30
575	Methyl chloride	10	ug/kg	0.650	ug/kg	20110222														

Structured Analysis Code: A-15-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4147	Chloromethane (Methyl Chloride)	10	ug/kg	0.650	ug/kg	20110222														
574	Chloromethane	10	ug/kg	0.650	ug/kg	20110222	C	Y	50	ug/kg	64	123	20	C	Y	50	ug/kg	29	150	30
606	Allyl chloride	10	ug/kg	2.67	ug/kg	20110222	C	Y	50	ug/kg	81	123	20	C	Y	50	ug/kg	31	150	30
2766	Chloropropene	10	ug/kg	2.67	ug/kg	20110222														
604	3-Chloro-1-propene	10	ug/kg	2.67	ug/kg	20110222														
614	2-Chlorotoluene	5	ug/kg	0.336	ug/kg	20100113	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	39	150	30
617	4-Chlorotoluene	5	ug/kg	0.375	ug/kg	20100719	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	39	150	30
669	Cyclohexane	10	ug/kg	0.363	ug/kg	20100113	C	Y	50	ug/kg	85	122	20	C	Y	50	ug/kg	19	150	30
676	Cyclohexanone	100	ug/kg	17.8	ug/kg	20110222	C	Y	50	ug/kg	62	130	20	C	Y	50	ug/kg	40	150	30
3260	1,2-Dibromo-3-chloropropane (DBCP)	10	ug/kg	1.45	ug/kg	20110222	C	Y	50	ug/kg	79	124	20	C	Y	50	ug/kg	23	150	30
539	1,2-Dibromo-3-chloropropane	10	ug/kg	1.45	ug/kg	20110222														
870	1,2-Dibromoethane	5	ug/kg	0.699	ug/kg	20110222														
3261	1,2-Dibromoethane (EDB)	5	ug/kg	0.699	ug/kg	20110222	C	Y	50	ug/kg	85	116	20	C	Y	50	ug/kg	50	150	30
889	Methylene bromide	5	ug/kg	0.966	ug/kg	20110222														
888	Dibromomethane	5	ug/kg	0.966	ug/kg	20110222	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	65	141	30
906	o-Dichlorobenzene	5	ug/kg	0.282	ug/kg	20100719														
904	1,2-Dichlorobenzene	5	ug/kg	0.282	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	55	143	30
909	m-Dichlorobenzene	5	ug/kg	0.280	ug/kg	20110216														
907	1,3-Dichlorobenzene	5	ug/kg	0.280	ug/kg	20110216	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	57	141	30
910	1,4-Dichlorobenzene	5	ug/kg	0.600	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	55	141	30
922	trans-1,4-Dichloro-2-butene	10	ug/kg	1.78	ug/kg	20110222	C	Y	50	ug/kg	76	121	20	C	Y	50	ug/kg	32	150	30
924	Dichlorodifluoromethane	10	ug/kg	1.31	ug/kg	20100719														
3615	Dichlorodifluoromethane (Freon 12)	10	ug/kg	1.31	ug/kg	20100719	C	Y	50	ug/kg	40	136	20	C	Y	50	ug/kg	35	150	30
933	1,1-Dichloroethane	5	ug/kg	0.392	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	70	143	30
3767	Ethylene dichloride	5	ug/kg	0.867	ug/kg	20100719														
936	1,2-Dichloroethane	5	ug/kg	0.867	ug/kg	20100719	C	Y	50	ug/kg	80	119	20	C	Y	50	ug/kg	65	146	30
948	cis-1,2-Dichloroethene	5	ug/kg	0.597	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	74	135	30
950	trans-1,2-Dichloroethene	5	ug/kg	0.943	ug/kg	20110216	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	63	145	30
943	1,1-Dichloroethene	5	ug/kg	1.61	ug/kg	20100719	C	Y	50	ug/kg	83	117	20	C	Y	50	ug/kg	70	143	30
952	1,2-Dichloroethene (total)	10	ug/kg	0.958	ug/kg	20110216	C	Y	100	ug/kg	85	115	20	C	Y	100	ug/kg	70	137	30
986	1,2-Dichloropropane	5	ug/kg	0.383	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	72	132	30
989	1,3-Dichloropropane	5	ug/kg	0.322	ug/kg	20110216	C	Y	50	ug/kg	83	117	20	C	Y	50	ug/kg	46	150	30
990	2,2-Dichloropropane	5	ug/kg	0.539	ug/kg	20100113	C	Y	50	ug/kg	77	132	20	C	Y	50	ug/kg	46	150	30
998	cis-1,3-Dichloropropene	5	ug/kg	0.595	ug/kg	20100719	C	Y	50	ug/kg	85	118	20	C	Y	50	ug/kg	51	146	30
2769	trans-1,3-Dichloropropylene	5	ug/kg	0.349	ug/kg	20100113														
1000	trans-1,3-Dichloropropene	5	ug/kg	0.349	ug/kg	20100113	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	47	150	30
996	1,1-Dichloropropene	5	ug/kg	0.300	ug/kg	20100113	C	Y	50	ug/kg	85	116	20	C	Y	50	ug/kg	64	128	30
2788	cis-1,3-Dichloropropylene	5	ug/kg	0.595	ug/kg	20100719														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	5	ug/kg	0.741	ug/kg	20110216	C	Y	50	ug/kg	62	140	20	C	Y	50	ug/kg	45	150	30

Structured Analysis Code: A-15-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3887	Dimethyl disulfide	5	ug/kg	0.476	ug/kg	20090305														
1199	1,4-Dioxane	400	ug/kg	35.8	ug/kg	20110216	C	Y	1000	ug/L	62	132	20	C	Y	1000	ug/kg	23	150	30
1290	Ethanol	250	ug/kg	61.38	ug/kg	20090305														
1325	Ethyl acetate	20	ug/kg	8.86	ug/kg	20100719	C	Y	100	ug/kg	78	122	20	C	Y	100	ug/kg	30	150	30
1332	Ethylbenzene	5	ug/kg	0.299	ug/kg	20100113	C	Y	50	ug/kg	85	120	20	C	Y	50	ug/kg	55	141	30
1349	Ethyl ether	10	ug/kg	2.21	ug/kg	20110216	C	Y	100	ug/kg	77	129	20	C	Y	100	ug/kg	43	150	30
1355	Diethyl ether	10	ug/kg	2.21	ug/kg	20110216														
1360	Ethyl methacrylate	5	ug/kg	0.994	ug/kg	20110222	C	Y	50	ug/kg	68	123	20	C	Y	50	ug/kg	30	150	30
2790	Freon 113	5	ug/kg	1.682	ug/kg	20100719	C	Y	50	ug/kg	85	123	20	C	Y	50	ug/kg	45	150	30
1489	Hexachlorobutadiene	5	ug/kg	0.682	ug/kg	20110216	C	Y	50	ug/kg	78	126	20	C	Y	50	ug/kg	10	150	30
3445	Hexane	10	ug/kg	0.455	ug/kg	20100113														
1514	n-Hexane	10	ug/kg	0.455	ug/kg	20100113	C	Y	50	ug/kg	85	127	20	C	Y	50	ug/kg	30	150	30
1515	2-Hexanone	20	ug/kg	1.77	ug/kg	20110222	C	Y	50	ug/kg	58	133	20	C	Y	50	ug/kg	28	150	30
1536	Iodomethane	5	ug/kg	1.511	ug/kg	20100113	C	Y	50	ug/kg	74	122	20	C	Y	50	ug/kg	46	150	30
1537	Methyl iodide	5	ug/kg	1.511	ug/kg	20100113														
1552	Isobutanol	200	ug/kg	25.4	ug/kg	20110222	C	Y	1000	ug/kg	62	128	20	C	Y	1000	ug/kg	40	150	30
1556	Isobutyl alcohol	200	ug/kg	25.4	ug/kg	20110222														
1578	Isopropylbenzene	5	ug/kg	0.258	ug/kg	20100113	C	Y	50	ug/kg	85	128	20	C	Y	50	ug/kg	36	150	30
1590	p-Isopropyltoluene	5	ug/kg	0.319	ug/kg	20100113														
1587	4-Isopropyltoluene	5	ug/kg	0.319	ug/kg	20100113	C	Y	50	ug/kg	85	124	20	C	Y	50	ug/kg	21	150	30
1588	p-Cymene	5	ug/kg	0.319	ug/kg	20100113														
1713	Methacrylonitrile	25	ug/kg	3.73	ug/kg	20100719	C	Y	250	ug/kg	78	124	20	C	Y	250	ug/kg	38	150	30
1774	Methyl acetate	5	ug/kg	1.38	ug/kg	20110222	C	Y	50	ug/kg	63	140	20	C	Y	50	ug/kg	46	150	30
3724	Methyl butyl ketone	20	ug/kg	1.77	ug/kg	20110222														
1799	Methylcyclohexane	10	ug/kg	0.260	ug/kg	20100719	C	Y	50	ug/kg	85	117	20	C	Y	50	ug/kg	30	150	30
1812	Dichloromethane	5	ug/kg	1.58	ug/kg	20100719														
1811	Methylene chloride	5	ug/kg	1.58	ug/kg	20100719	C	Y	50	ug/kg	81	115	20	C	Y	50	ug/kg	39	150	30
1823	Methyl methacrylate	5	ug/kg	1.80	ug/kg	20110222	C	Y	50	ug/kg	70	123	20	C	Y	50	ug/kg	24	150	30
1848	Methyl isobutyl ketone	20	ug/kg	0.732	ug/kg	20100719														
3283	4-Methyl-2-pentanone (MIBK)	20	ug/kg	0.732	ug/kg	20100719														
1849	MIBK	20	ug/kg	0.732	ug/kg	20100719														
1845	4-Methyl-2-pentanone	20	ug/kg	0.732	ug/kg	20100719	C	Y	50	ug/kg	73	125	20	C	Y	50	ug/kg	34	150	30
2773	MTBE	5	ug/kg	0.476	ug/kg	20100719														
2772	Methyl tert-butyl ether	5	ug/kg	0.476	ug/kg	20100719														
3794	Methyl tert-butyl ether (MTBE)	5	ug/kg	0.476	ug/kg	20100719	C	Y	50	ug/kg	82	121	20	C	Y	50	ug/kg	46	150	30
1932	Naphthalene	5	ug/kg	0.492	ug/kg	20100113	C	Y	50	ug/kg	75	129	20	C	Y	50	ug/kg	24	150	30
2005	2-Nitropropane	10	ug/kg	1.80	ug/kg	20110222	C	Y	100	ug/kg	50	140	20	C	Y	100	ug/kg	30	150	30
5350	Nonanal	10	ug/kg	1.98	ug/kg	20110222														
2108	Pentachloroethane	5	ug/kg	0.270	ug/kg	20110303	C	Y	50	ug/kg	40	140	20	C	Y	50	ug/kg	10	150	30

Structured Analysis Code: A-15-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6147							Spike List 6148						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2238	Propionitrile	25	ug/kg	6.58	ug/kg	20110216	C	Y	250	ug/kg	77	122	20	C	Y	250	ug/kg	21	150	30
2247	n-Propylbenzene	5	ug/kg	0.320	ug/kg	20100719	C	Y	50	ug/kg	85	128	20	C	Y	50	ug/kg	41	150	30
2355	Styrene	5	ug/kg	0.347	ug/kg	20100113	C	Y	50	ug/kg	85	124	20	C	Y	50	ug/kg	58	140	30
2437	1,1,1,2-Tetrachloroethane	5	ug/kg	0.346	ug/kg	20110216	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	68	144	30
2439	1,1,2,2-Tetrachloroethane	5	ug/kg	0.401	ug/kg	20100719	C	Y	50	ug/L	78	119	20	C	Y	50	ug/kg	27	150	30
2446	Tetrachloroethylene	5	ug/kg	0.322	ug/kg	20110216														
2445	Tetrachloroethene	5	ug/kg	0.322	ug/kg	20110216	C	Y	50	ug/kg	85	119	20	C	Y	50	ug/kg	47	146	30
2469	Tetrahydrofuran	25	ug/kg	6.54	ug/kg	20100719	C	Y	250	ug/kg	73	128	20	C	Y	250	ug/kg	22	150	30
2489	Toluene	5	ug/kg	0.700	ug/kg	20110624	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	62	148	30
5524	Total Detected VOCs	20	ug/kg			0														
3090	1,3,5-Trichlorobenzene	5	ug/kg	0.507	ug/kg	20090305														
2514	1,2,3-Trichlorobenzene	5	ug/kg	0.444	ug/kg	20110216	C	Y	50	ug/kg	81	123	20	C	Y	50	ug/kg	30	150	30
2515	1,2,4-Trichlorobenzene	5	ug/kg	0.425	ug/kg	20110216	C	Y	50	ug/kg	84	122	20	C	Y	50	ug/kg	30	148	30
2518	1,1,1-Trichloroethane	5	ug/kg	0.431	ug/kg	20100719	C	Y	50	ug/kg	85	118	20	C	Y	50	ug/kg	37	139	30
2522	1,1,2-Trichloroethane	5	ug/kg	0.573	ug/kg	20100113	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	29	150	30
2525	Trichloroethene	5	ug/kg	0.385	ug/kg	20100719	C	Y	50	ug/kg	85	115	20	C	Y	50	ug/kg	29	150	30
1428	Trichlorofluoromethane	5	ug/kg	0.50	ug/kg	20110222	C	Y	50	ug/kg	72	128	20	C	Y	50	ug/kg	49	150	30
1427	Fluorotrichloromethane	5	ug/kg	0.50	ug/kg	20110222														
2563	1,2,3-Trichloropropane	5	ug/kg	0.559	ug/kg	20100113	C	Y	50	ug/kg	75	118	20	C	Y	50	ug/kg	32	150	30
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/kg	1.682	ug/kg	20100719														
2764	Trichlorotrifluoroethane	5	ug/kg	1.682	ug/kg	20100719														
2587	1,2,4-Trimethylbenzene	5	ug/kg	0.600	ug/kg	20100727	C	Y	50	ug/kg	85	125	20		Y	50	ug/kg	50	150	30
2592	1,3,5-Trimethylbenzene	5	ug/kg	0.313	ug/kg	20100719	C	Y	50	ug/kg	85	129	20	C	Y	50	ug/kg	42	150	30
2610	Vinyl acetate	5	ug/kg	0.784	ug/kg	20100719	C	Y	50	ug/kg	68	131	20	C	Y	50	ug/kg	10	150	30
2613	Vinyl chloride	5	ug/kg	0.428	ug/kg	20100113	C	Y	50	ug/kg	63	125	20	C	Y	50	ug/kg	31	150	30
2940	m-Xylene & p-Xylene	5	ug/kg	0.569	ug/kg	20100113	C	Y	100	ug/kg	85	120	20	C	Y	100	ug/kg	53	140	30
2623	o-Xylene	5	ug/kg	0.336	ug/kg	20100719	C	Y	50	ug/kg	85	121	20	C	Y	50	ug/kg	52	143	30
2627	Xylenes (total)	10	ug/kg	0.854	ug/kg	20100113														
337	4-Bromofluorobenzene						X	Y	50	ug/kg	85	116	0	X	Y	50	ug/kg	44	150	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	81	117	0	X	Y	50	ug/kg	69	142	0
2740	Toluene-d8						X	Y	50	ug/kg	85	119	0	X	Y	50	ug/kg	62	150	0
2863	Dibromofluoromethane						X	Y	50	ug/kg	85	115	0	X	Y	50	ug/kg	49	150	0

TAL Reference Data Summary

Structured Analysis Code: **A-4B-QK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	1000	ug/kg	85.0	ug/kg	20080402	C	Y	2500	ug/kg	44	150	20	C	Y	2500	ug/kg	30	150	30
20	Acetonitrile	2500	ug/kg	81.27	ug/kg	20100108														
39	Acrolein	2500	ug/kg	93.68	ug/kg	20100108														
46	Acrylonitrile	2500	ug/kg	75.18	ug/kg	20100108														
196	Benzene	250	ug/kg	9.890	ug/kg	20100108	C	Y	2500	ug/kg	83	115	20	C	Y	2500	ug/kg	85	115	30
318	Bromobenzene	250	ug/kg	15.51	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	250	ug/kg	50	150	30
321	Bromochloromethane	250	ug/kg	27.59	ug/kg	20100108	C	Y	2500	ug/kg	83	117	20	C	Y	2500	ug/kg	85	115	30
323	Bromodichloromethane	250	ug/kg	10.78	ug/kg	20100108	C	Y	2500	ug/kg	83	115	20	C	Y	2500	ug/kg	85	115	30
340	Bromoform	250	ug/kg	16.25	ug/kg	20100108	C	Y	2500	ug/kg	71	128	20	C	Y	2500	ug/kg	79	129	30
343	Bromomethane	500	ug/kg	24.16	ug/kg	20100108	C	Y	2500	ug/kg	58	150	20	C	Y	2500	ug/kg	69	127	30
363	1-Butanol	5000	ug/kg	1017.31	ug/kg	20100131														
2729	n-Butanol	5000	ug/kg	1017.31	ug/kg	20100131														
3271	2-Butanone (MEK)	500	ug/kg	66.32	ug/kg	20100131														
3280	Methyl ethyl ketone (MEK)	500	ug/kg	66.32	ug/kg	20100131														
372	2-Butanone	500	ug/kg	66.32	ug/kg	20100131	C	Y	2500	ug/kg	76	137	20	C	Y	2500	ug/kg	77	143	30
373	Methyl ethyl ketone	500	ug/kg	66.32	ug/kg	20100131														
374	MEK	500	ug/kg	66.32	ug/kg	20100131														
365	Butyl alcohol	5000	ug/kg	1017.31	ug/kg	20100131														
364	n-Butyl alcohol	5000	ug/kg	1017.31	ug/kg	20100131														
393	n-Butylbenzene	250	ug/kg	11.32	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
395	sec-Butylbenzene	250	ug/kg	11.81	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
398	tert-Butylbenzene	250	ug/kg	9.192	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
459	Carbon disulfide	250	ug/kg	12.31	ug/kg	20100108	C	Y	2500	ug/kg	78	120	20	C	Y	2500	ug/kg	76	129	30
463	Carbon tetrachloride	250	ug/kg	17.45	ug/kg	20100108	C	Y	2500	ug/kg	73	129	20	C	Y	2500	ug/kg	77	123	30
521	Chlorobenzene	250	ug/kg	10.34	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	81	115	30
322	Chlorobromomethane	250	ug/kg	27.59	ug/kg	20100108														
2765	Chlorobutadiene	250	ug/kg	8.829	ug/kg	20100108														
531	Chloroprene	250	ug/kg	8.829	ug/kg	20100108														
530	2-Chloro-1,3-butadiene	250	ug/kg	8.829	ug/kg	20100108														
534	Chlorodibromomethane	250	ug/kg	10.12	ug/kg	20100108														
535	Dibromochloromethane	250	ug/kg	10.12	ug/kg	20100108	C	Y	2500	ug/kg	69	119	20	C	Y	2500	ug/kg	81	125	30
3361	Ethyl chloride	500	ug/kg	13.37	ug/kg	20100108														
550	Chloroethane	500	ug/kg	13.37	ug/kg	20100108	C	Y	2500	ug/kg	41	150	20	C	Y	2500	ug/kg	77	115	30
568	2-Chloroethyl vinyl ether	1000	ug/kg	41.39	ug/kg	20100108														
569	Chloroform	250	ug/kg	10.51	ug/kg	20100108	C	Y	2500	ug/kg	81	117	20	C	Y	2500	ug/kg	85	115	30
574	Chloromethane	500	ug/kg	25.00	ug/kg	20100131	C	Y	2500	ug/kg	67	147	20	C	Y	2500	ug/kg	66	120	30
4147	Chloromethane (Methyl Chloride)	500	ug/kg	25.00	ug/kg	20100131														

Structured Analysis Code: A-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
606	Allyl chloride	500	ug/kg	30.26	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2766	Chloropropene	500	ug/kg	30.26	ug/kg	20100108														
604	3-Chloro-1-propene	500	ug/kg	30.26	ug/kg	20100108														
614	2-Chlorotoluene	250	ug/kg	10.17	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
617	4-Chlorotoluene	250	ug/kg	5.000	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
669	Cyclohexane	500	ug/kg	12.21	ug/kg	20100108														
676	Cyclohexanone	5000	ug/kg	266.65	ug/kg	20100108														
3260	1,2-Dibromo-3-chloropropane (DBCP)	500	ug/kg	65.31	ug/kg	20100131	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
539	1,2-Dibromo-3-chloropropane	500	ug/kg	65.31	ug/kg	20100131														
870	1,2-Dibromoethane	250	ug/kg	17.01	ug/kg	20100108														
3261	1,2-Dibromoethane (EDB)	250	ug/kg	17.01	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
888	Dibromomethane	250	ug/kg	23.13	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
904	1,2-Dichlorobenzene	250	ug/kg	13.36	ug/kg	20100108	C	Y	2500	ug/kg	79	115	20	C	Y	2500	ug/kg	65	134	30
907	1,3-Dichlorobenzene	250	ug/kg	7.572	ug/kg	20100108	C	Y	2500	ug/kg	81	115	20	C	Y	2500	ug/kg	84	115	30
910	1,4-Dichlorobenzene	250	ug/kg	15.04	ug/kg	20100108	C	Y	2500	ug/kg	81	115	20	C	Y	2500	ug/kg	85	115	30
922	trans-1,4-Dichloro-2-butene	500	ug/kg	31.95	ug/kg	20100108														
924	Dichlorodifluoromethane	500	ug/kg	28.60	ug/kg	20100131														
3615	Dichlorodifluoromethane (Freon 12)	500	ug/kg	28.60	ug/kg	20100131	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
933	1,1-Dichloroethane	250	ug/kg	10.11	ug/kg	20100108	C	Y	2500	ug/kg	82	121	20	C	Y	2500	ug/kg	83	121	30
3767	Ethylene dichloride	250	ug/kg	11.07	ug/kg	20100108														
936	1,2-Dichloroethane	250	ug/kg	11.07	ug/kg	20100108	C	Y	2500	ug/kg	72	126	20	C	Y	2500	ug/kg	85	115	30
948	cis-1,2-Dichloroethene	250	ug/kg	10.43	ug/kg	20100108														
950	trans-1,2-Dichloroethene	250	ug/kg	8.122	ug/kg	20100108														
943	1,1-Dichloroethene	250	ug/kg	24.21	ug/kg	20100108	C	Y	2500	ug/kg	71	125	20	C	Y	2500	ug/kg	79	127	30
952	1,2-Dichloroethene (total)	500	ug/kg	17.65	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	83	126	30
986	1,2-Dichloropropane	250	ug/kg	15.67	ug/kg	20100108	C	Y	2500	ug/kg	85	115	20	C	Y	2500	ug/kg	83	115	30
989	1,3-Dichloropropane	250	ug/kg	7.310	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
990	2,2-Dichloropropane	250	ug/kg	24.14	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
998	cis-1,3-Dichloropropene	500	ug/kg	6.397	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	85	121	30
2769	trans-1,3-Dichloropropylene	250	ug/kg	9.66	ug/kg	20100108														
1000	trans-1,3-Dichloropropene	250	ug/kg	9.66	ug/kg	20100108	C	Y	2500	ug/kg	79	123	20	C	Y	2500	ug/kg	76	128	30
996	1,1-Dichloropropene	250	ug/kg	11.20	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2788	cis-1,3-Dichloropropylene	500	ug/kg	6.397	ug/kg	20100108														
1015	1,2-Dichloro-1,1,2,2-tetrafluoroethane	250	ug/kg	11.32	ug/kg	20100108														
3887	Dimethyl disulfide	250	ug/kg	8.8	ug/kg	20080108														
1199	1,4-Dioxane	20000	ug/kg	1937.63	ug/kg	20100131														
1325	Ethyl acetate	1000	ug/kg	202.15	ug/kg	20100108														
1332	Ethylbenzene	250	ug/kg	8.298	ug/kg	20100108	C	Y	2500	ug/kg	85	115	20	C	Y	2500	ug/kg	65	147	30
1349	Ethyl ether	500	ug/kg	117.75	ug/kg	20100108														

Structured Analysis Code: A-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1355	Diethyl ether	500	ug/kg	117.75	ug/kg	20100108														
1360	Ethyl methacrylate	250	ug/kg	11.84	ug/kg	20100108														
2790	Freon 113	250	ug/kg	28.30	ug/kg	20100108														
1489	Hexachlorobutadiene	250	ug/kg	16.92	ug/kg	20100108														
1514	n-Hexane	2500	ug/kg	36.42	ug/kg	20100108														
1515	2-Hexanone	1000	ug/kg	12.59	ug/kg	20100108	C	Y	2500	ug/kg	66	124	20	C	Y	2500	ug/kg	55	150	30
1536	Iodomethane	250	ug/kg	20.23	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1552	Isobutanol	10000	ug/kg	434.38	ug/kg	20100108														
1556	Isobutyl alcohol	10000	ug/kg	434.38	ug/kg	20100108														
1578	Isopropylbenzene	250	ug/kg	9.717	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1588	p-Cymene	250	ug/kg	9.151	ug/kg	20100108														
1590	p-Isopropyltoluene	250	ug/kg	9.151	ug/kg	20100108														
1587	4-Isopropyltoluene	250	ug/kg	9.151	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1713	Methacrylonitrile	1250	ug/kg	59.31	ug/kg	20100108														
1774	Methyl acetate	500	ug/kg	53.97	ug/kg	20100108														
3724	Methyl butyl ketone	1000	ug/kg	12.59	ug/kg	20100108														
1799	Methylcyclohexane	500	ug/kg	12.56	ug/kg	20100108														
1811	Methylene chloride	250	ug/kg	50.58	ug/kg	20100108	C	Y	2500	ug/kg	68	123	20	C	Y	2500	ug/kg	71	133	30
1812	Dichloromethane	250	ug/kg	50.58	ug/kg	20100108														
1823	Methyl methacrylate	250	ug/kg	49.22	ug/kg	20100108														
1849	MIBK	1000	ug/kg	20.36	ug/kg	20100108														
1845	4-Methyl-2-pentanone	1000	ug/kg	20.36	ug/kg	20100108	C	Y	2500	ug/kg	62	125	20	C	Y	2500	ug/kg	59	150	30
1848	Methyl isobutyl ketone	1000	ug/kg	20.36	ug/kg	20100108														
3794	Methyl tert-butyl ether (MTBE)	250	ug/kg	9.878	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1932	Naphthalene	250	ug/kg	10.20	ug/kg	20100108														
2005	2-Nitropropane	500	ug/kg	24.20	ug/kg	20100108														
5350	Nonanal	500	ug/kg	32.41	ug/kg	20100108														
2108	Pentachloroethane	250	ug/kg	15.09	ug/kg	20100108														
2238	Propionitrile	1250	ug/kg	140.38	ug/kg	20100108														
2247	n-Propylbenzene	250	ug/kg	10.25	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2355	Styrene	250	ug/kg	14.38	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	81	121	30
2437	1,1,1,2-Tetrachloroethane	250	ug/kg	14.06	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2439	1,1,2,2-Tetrachloroethane	250	ug/kg	15.17	ug/kg	20100108	C	Y	2500	ug/kg	80	115	20	C	Y	2500	ug/kg	63	133	30
2445	Tetrachloroethene	250	ug/kg	20.05	ug/kg	20100108	C	Y	2500	ug/kg	58	137	20	C	Y	2500	ug/kg	35	150	30
2469	Tetrahydrofuran	1250	ug/kg	206.00	ug/kg	20100108														
2489	Toluene	250	ug/kg	12.78	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	81	124	30
5524	Total Detected VOCs	1000	ug/kg			0														
3090	1,3,5-Trichlorobenzene	250	ug/kg	18.5	ug/kg	20080107														
2514	1,2,3-Trichlorobenzene	250	ug/kg	15.70	ug/kg	20100108														

Structured Analysis Code: A-4B-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: PURGE AND TRAP - Lab MEOH Ext. (Solids or Wastes)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6163							Spike List 6164						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2515	1,2,4-Trichlorobenzene	250	ug/kg	14.61	ug/kg	20100108														
2518	1,1,1-Trichloroethane	250	ug/kg	9.984	ug/kg	20100108	C	Y	2500	ug/kg	78	126	20	C	Y	2500	ug/kg	81	128	30
2522	1,1,2-Trichloroethane	250	ug/kg	29.73	ug/kg	20100108	C	Y	2500	ug/kg	83	115	20	C	Y	2500	ug/kg	78	123	30
2525	Trichloroethene	250	ug/kg	17.60	ug/kg	20100108	C	Y	2500	ug/kg	81	115	20	C	Y	2500	ug/kg	32	150	30
1428	Trichlorofluoromethane	250	ug/kg	13.65	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
1427	Fluorotrichloromethane	250	ug/kg	13.65	ug/kg	20100108														
2563	1,2,3-Trichloropropane	250	ug/kg	51.80	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	250	ug/kg	28.30	ug/kg	20100108														
2764	Trichlorotrifluoroethane	250	ug/kg	28.30	ug/kg	20100108														
2587	1,2,4-Trimethylbenzene	250	ug/kg	13.46	ug/kg	20100108	C	Y	2500	ug/kg	66	124	20	C	Y	2500	ug/kg	70	130	30
2592	1,3,5-Trimethylbenzene	250	ug/kg	12.47	ug/kg	20100108	C	Y	2500	ug/kg	50	150	20	C	Y	2500	ug/kg	50	150	30
2610	Vinyl acetate	250	ug/kg	9.782	ug/kg	20100108														
2613	Vinyl chloride	250	ug/kg	27.60	ug/kg	20100108	C	Y	2500	ug/kg	49	150	20	C	Y	2500	ug/kg	57	117	30
2940	m-Xylene & p-Xylene	500	ug/kg	15.08	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	75	136	30
2623	o-Xylene	250	ug/kg	16.48	ug/kg	20100108	C	Y	2500	ug/kg	83	115	20	C	Y	2500	ug/kg	71	138	30
2627	Xylenes (total)	750	ug/kg	29.05	ug/kg	20100108	C	Y	2500	ug/kg	84	115	20	C	Y	2500	ug/kg	74	137	30
337	4-Bromofluorobenzene						X	Y	2500	ug/kg	73	124	0	X	Y	2500	ug/kg	70	115	0
2735	1,2-Dichloroethane-d4						X	Y	2500	ug/kg	71	128	0	X	Y	2500	ug/kg	38	128	0
2740	Toluene-d8						X	Y	2500	ug/kg	76	128	0	X	Y	2500	ug/kg	66	115	0
2863	Dibromofluoromethane						X	Y	2500	ug/kg	79	119	0	X	Y	2500	ug/kg	30	135	0

TAL Reference Data Summary

Structured Analysis Code: **A-5A-QK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, Citrate Buffer, CA Title 22 WET ->PURGE/TR/
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
46	Acrylonitrile	500	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	84	115	20
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	50	ug/L	3.96	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	50	ug/L	3.89	ug/L	20100326														
372	2-Butanone	50	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	66	115	20	C	Y	500	ug/L	59	121	20
373	Methyl ethyl ketone	50	ug/L	3.89	ug/L	20100326														
374	MEK	50	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	50	ug/L	3.89	ug/L	20100326														
364	n-Butyl alcohol	1000	ug/L	49.07	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	84	127	20	C	Y	500	ug/L	84	123	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
531	Chloroprene	50	ug/L	3.88	ug/L	20100326														
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	50	ug/L	3.82	ug/L	20100326														
568	2-Chloroethyl vinyl ether	50	ug/L	5.23	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
574	Chloromethane	50	ug/L	5.53	ug/L	20100326														
606	Allyl chloride	50	ug/L	3.52	ug/L	20100326														
676	Cyclohexanone	500	ug/L	53.13	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
888	Dibromomethane	50	ug/L	4.05	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
924	Dichlorodifluoromethane	50	ug/L	4.49	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	84	115	20	C	Y	500	ug/L	85	115	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	81	120	20	C	Y	500	ug/L	79	115	20

Structured Analysis Code: A-5A-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, Citrate Buffer, CA Title 22 WET ->PURGE/TR/
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
998	cis-1,3-Dichloropropene	50	ug/L	3.39	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
1325	Ethyl acetate	200	ug/L	59.31	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1349	Ethyl ether	1000	ug/L	16.17	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1536	Iodomethane	50	ug/L	15.11	ug/L	20100326														
1552	Isobutanol	1000	ug/L	73.4	ug/L	20100326														
1556	Isobutyl alcohol	1000	ug/L	73.4	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1849	MIBK	200	ug/L	3.26	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
1848	Methyl isobutyl ketone	200	ug/L	3.26	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	117	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2563	1,2,3-Trichloropropane	50	ug/L	5.59	ug/L	20100326														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	50	ug/L	2.46	ug/L	20100326														
2764	Trichlorotrifluoroethane	50	ug/L	2.46	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	63	115	20	C	Y	500	ug/L	67	115	20
2940	m-Xylene & p-Xylene	50	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	50	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	81	117	0	X	Y	50	ug/L	78	116	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	82	115	0	X	Y	50	ug/kg	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2863	Dibromofluoromethane						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0

TAL Reference Data Summary

Structured Analysis Code: **A-58-QK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
20	Acetonitrile	500	ug/L	39.42	ug/L	20100326														
46	Acrylonitrile	500	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	84	115	20
321	Bromochloromethane	50	ug/L	5.52	ug/L	20100326														
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	50	ug/L	3.96	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	50	ug/L	3.89	ug/L	20100326														
372	2-Butanone	50	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	66	115	20	C	Y	500	ug/L	59	121	20
373	Methyl ethyl ketone	50	ug/L	3.89	ug/L	20100326														
374	MEK	50	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	50	ug/L	3.89	ug/L	20100326														
364	n-Butyl alcohol	1000	ug/L	49.07	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	84	127	20	C	Y	500	ug/L	84	123	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
531	Chloroprene	50	ug/L	3.88	ug/L	20100326														
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	50	ug/L	3.82	ug/L	20100326														
568	2-Chloroethyl vinyl ether	50	ug/L	5.23	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
574	Chloromethane	50	ug/L	5.53	ug/L	20100326														
606	Allyl chloride	50	ug/L	3.52	ug/L	20100326														
676	Cyclohexanone	500	ug/L	53.13	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
888	Dibromomethane	50	ug/L	4.05	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
924	Dichlorodifluoromethane	50	ug/L	4.49	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	84	115	20	C	Y	500	ug/L	85	115	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														

Structured Analysis Code: A-58-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311-ZHE/filter) -> PURGE-AND-TRAP (Low Level)
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	81	120	20	C	Y	500	ug/L	79	115	20
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
998	cis-1,3-Dichloropropene	50	ug/L	3.39	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
1325	Ethyl acetate	200	ug/L	59.31	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1349	Ethyl ether	1000	ug/L	16.17	ug/L	20100326														
1489	Hexachlorobutadiene	50	ug/L	1.79	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1536	Iodomethane	50	ug/L	15.11	ug/L	20100326														
1556	Isobutyl alcohol	1000	ug/L	73.4	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1849	MIBK	200	ug/L	3.26	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
1848	Methyl isobutyl ketone	200	ug/L	3.26	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	117	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2515	1,2,4-Trichlorobenzene	50	ug/L	2.64	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2563	1,2,3-Trichloropropane	50	ug/L	5.59	ug/L	20100326														
2566	1,1,2-Trichloro-1,2,2-trifluoroethane	50	ug/L	2.46	ug/L	20100326														
2764	Trichlorotrifluoroethane	50	ug/L	2.46	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	63	115	20	C	Y	500	ug/L	67	115	20
2940	m-Xylene & p-Xylene	50	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	50	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	81	117	0	X	Y	50	ug/L	78	116	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	82	115	0	X	Y	50	ug/kg	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0

TAL Reference Data Summary

Structured Analysis Code: **A-67-QK-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312 - ZHE) -> PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
11	Acetone	200	ug/L	64.7	ug/L	20100326														
20	Acetonitrile	200	ug/L	39.42	ug/L	20100326														
39	Acrolein	200	ug/L	29.01	ug/L	20100326														
46	Acrylonitrile	200	ug/L	11.26	ug/L	20100326														
196	Benzene	50	ug/L	2.53	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	84	115	20
323	Bromodichloromethane	50	ug/L	2.54	ug/L	20100326														
340	Bromoform	50	ug/L	3.66	ug/L	20100326														
343	Bromomethane	100	ug/L	3.96	ug/L	20100326														
372	2-Butanone	200	ug/L	3.89	ug/L	20100326	C	Y	500	ug/L	66	115	20	C	Y	500	ug/L	59	121	20
373	Methyl ethyl ketone	200	ug/L	3.89	ug/L	20100326														
374	MEK	200	ug/L	3.89	ug/L	20100326														
3280	Methyl ethyl ketone (MEK)	200	ug/L	3.89	ug/L	20100326														
3271	2-Butanone (MEK)	200	ug/L	3.89	ug/L	20100326														
393	n-Butylbenzene	50	ug/L	2.32	ug/L	20100326														
395	sec-Butylbenzene	50	ug/L	3.1	ug/L	20100326														
398	tert-Butylbenzene	50	ug/L	3.11	ug/L	20100326														
459	Carbon disulfide	50	ug/L	3.69	ug/L	20100326														
463	Carbon tetrachloride	50	ug/L	3.6	ug/L	20100326	C	Y	500	ug/L	84	127	20	C	Y	500	ug/L	84	123	20
521	Chlorobenzene	50	ug/L	3.82	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
535	Dibromochloromethane	50	ug/L	5.52	ug/L	20100326														
550	Chloroethane	100	ug/L	3.82	ug/L	20100326														
569	Chloroform	50	ug/L	0.92	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
574	Chloromethane	100	ug/L	5.53	ug/L	20100326														
614	2-Chlorotoluene	50	ug/L	3.36	ug/L	20100326														
617	4-Chlorotoluene	50	ug/L	3.05	ug/L	20100326														
539	1,2-Dibromo-3-chloropropane	50	ug/L	11.5	ug/L	20100326														
870	1,2-Dibromoethane	50	ug/L	4.37	ug/L	20100326														
904	1,2-Dichlorobenzene	50	ug/L	2.8	ug/L	20100326														
907	1,3-Dichlorobenzene	50	ug/L	2.34	ug/L	20100326														
910	1,4-Dichlorobenzene	50	ug/L	2.6	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
922	trans-1,4-Dichloro-2-butene	50	ug/L	3.97	ug/L	20100326														
933	1,1-Dichloroethane	50	ug/L	3.92	ug/L	20100326														
936	1,2-Dichloroethane	50	ug/L	3.72	ug/L	20100326	C	Y	500	ug/L	84	115	20	C	Y	500	ug/L	85	115	20
3767	Ethylene dichloride	50	ug/L	3.72	ug/L	20100326														
948	cis-1,2-Dichloroethene	50	ug/L	1.59	ug/L	20100326														
950	trans-1,2-Dichloroethene	50	ug/L	1.78	ug/L	20100326														
943	1,1-Dichloroethene	50	ug/L	3.65	ug/L	20100326	C	Y	500	ug/L	81	120	20	C	Y	500	ug/L	79	115	20

Structured Analysis Code: A-67-QK-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312 - ZHE) -> PURGE AND TRAP - 5 mL purge
Method: Volatile Organics, GC/MS (8260B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6032							Spike List 6083						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
986	1,2-Dichloropropane	50	ug/L	3.17	ug/L	20100326														
1000	trans-1,3-Dichloropropene	50	ug/L	3.49	ug/L	20100326														
2788	cis-1,3-Dichloropropylene	50	ug/L	3.39	ug/L	20100326														
1332	Ethylbenzene	50	ug/L	2.99	ug/L	20100326														
1489	Hexachlorobutadiene	50	ug/L	1.79	ug/L	20100326														
1515	2-Hexanone	200	ug/L	2.61	ug/L	20100326														
1552	Isobutanol	1000	ug/L	73.4	ug/L	20100326														
1578	Isopropylbenzene	50	ug/L	2.58	ug/L	20100326														
1587	4-Isopropyltoluene	50	ug/L	3.19	ug/L	20100326														
1811	Methylene chloride	50	ug/L	8.01	ug/L	20100326														
1845	4-Methyl-2-pentanone	200	ug/L	3.26	ug/L	20100326														
2772	Methyl tert-butyl ether	50	ug/L	4.01	ug/L	20100326														
1932	Naphthalene	50	ug/L	4.92	ug/L	20100326														
2005	2-Nitropropane	100	ug/L	6.36	ug/L	20100326														
2247	n-Propylbenzene	50	ug/L	2.98	ug/L	20100326														
2355	Styrene	50	ug/L	3.47	ug/L	20100326														
2437	1,1,1,2-Tetrachloroethane	50	ug/L	2.38	ug/L	20100326														
2439	1,1,2,2-Tetrachloroethane	50	ug/L	2.72	ug/L	20100326														
2445	Tetrachloroethene	50	ug/L	2.8	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	117	20
2446	Tetrachloroethylene	50	ug/L	2.8	ug/L	20100326														
2489	Toluene	50	ug/L	3.03	ug/L	20100326														
2515	1,2,4-Trichlorobenzene	50	ug/L	2.64	ug/L	20100326														
2518	1,1,1-Trichloroethane	50	ug/L	2.91	ug/L	20100326														
2522	1,1,2-Trichloroethane	50	ug/L	5.73	ug/L	20100326														
2525	Trichloroethene	50	ug/L	2.9	ug/L	20100326	C	Y	500	ug/L	85	115	20	C	Y	500	ug/L	85	115	20
2526	Trichloroethylene	50	ug/L	2.9	ug/L	20100326														
1428	Trichlorofluoromethane	50	ug/L	1.67	ug/L	20100326														
2587	1,2,4-Trimethylbenzene	50	ug/L	4.01	ug/L	20100326														
2592	1,3,5-Trimethylbenzene	50	ug/L	2.84	ug/L	20100326														
2613	Vinyl chloride	100	ug/L	4.28	ug/L	20100326	C	Y	500	ug/L	63	115	20	C	Y	500	ug/L	67	115	20
2940	m-Xylene & p-Xylene	100	ug/L	5.69	ug/L	20100326														
2623	o-Xylene	50	ug/L	3.18	ug/L	20100326														
2627	Xylenes (total)	100	ug/L	8.54	ug/L	20100326														
337	4-Bromofluorobenzene						X	Y	50	ug/L	81	117	0	X	Y	50	ug/L	78	116	0
2735	1,2-Dichloroethane-d4						X	Y	50	ug/kg	82	115	0	X	Y	50	ug/kg	85	115	0
2740	Toluene-d8						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0
2863	Dibromofluoromethane						X	Y	50	ug/L	85	115	0	X	Y	50	ug/L	85	115	0

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 847 to 878

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

TAL Reference Data Summary

Structured Analysis Code: **I-0U-DP-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (B/N/A) - Base->Acid
Method: Base/Neutrals and Acids (625)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6159							Spike List 6160						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	10	ug/L	1.00	ug/L	20100108	C	Y			51	89	20	C	Y			49	87	20
5	Acenaphthylene	10	ug/L	1.00	ug/L	20100108	C	Y			46	98	20	C	Y			53	94	20
24	Acetophenone	10	ug/L	1.00	ug/L	20100113														
30	2-Acetylaminofluorene	100	ug/L	1.00	ug/L	20100112														
93	4-Aminobiphenyl	50	ug/L	1.05	ug/L	20100112														
115	Aniline	10	ug/L	1.00	ug/L	20100108														
122	Anthracene	10	ug/L	1.00	ug/L	20100108	C	Y			54	111	20	C	Y			53	92	20
132	Aramite (total)	20	ug/L	5.00	ug/L	20100108														
3303	Aramite 1	20	ug/L	1.35	ug/L	20030225														
3304	Aramite 2	20	ug/L	1.27	ug/L	20030225														
158	Atrazine	10	ug/L	1.00	ug/L	20100113														
3352	Azobenzene	10	ug/L	1.00	ug/L	20100108														
3398	Benzaldehyde	10	ug/L	1.00	ug/L	20100113														
2932	Benzenethiol	10	ug/L	10	ug/L	20040521														
199	Benzidine	100	ug/L	20.0	ug/L	20080925														
202	Benzo(a)anthracene	10	ug/L	1.00	ug/L	20100108	C	Y			68	108	20	C	Y			56	101	20
3378	Benzo(a)phenanthrene	10	ug/L	1.00	ug/L	20100108														
205	Benzo(b)fluoranthene	10	ug/L	1.00	ug/L	20100108	C	Y			57	114	20	C	Y			57	101	20
208	Benzo(k)fluoranthene	10	ug/L	1.00	ug/L	20100108	C	Y			59	112	20	C	Y			50	99	20
209	Benzoic acid	50	ug/L	5.00	ug/L	20051220														
210	Benzo(ghi)perylene	10	ug/L	1.00	ug/L	20100108	C	Y			58	120	20	C	Y			36	112	20
211	Benzo(a)pyrene	10	ug/L	1.00	ug/L	20100108	C	Y			55	108	20	C	Y			53	94	20
3890	Benzothiazole	10	ug/L	1.00	ug/L	20100112														
215	Benzyl alcohol	10	ug/L	1.00	ug/L	20100108														
3474	1,1'-Biphenyl	10	ug/L	1.00	ug/L	20100113														
5682	Bis(p-chlorophenyl)-disulfide	10	ug/L	10	ug/L	20040521														
289	bis(2-Chloroethoxy)methane	10	ug/L	1.00	ug/L	20100108	C	Y			53	99	20	C	Y			48	90	20
293	bis(2-Chloroethyl) ether	10	ug/L	1.00	ug/L	20100108	C	Y			50	97	20	C	Y			40	91	20
298	bis(2-Chloroisopropyl) ether	10	ug/L	1.00	ug/L	20100108														
302	bis(2-Ethylhexyl) phthalate	10	ug/L	1.00	ug/L	20100108	C	Y			54	116	20	C	Y			39	113	20
348	4-Bromophenyl phenyl ether	10	ug/L	1.00	ug/L	20100108	C	Y			54	111	20	C	Y			53	127	20
5359	n-Butylbenzenesulfonamide	20	ug/L	2.74	ug/L	20011119														
403	Butyl benzyl phthalate	10	ug/L	1.00	ug/L	20100108	C	Y			52	126	20	C	Y			50	105	20
5101	Caprolactam	10	ug/L	2.00	ug/L	20100113														
2751	Carbazole	10	ug/L	1.00	ug/L	20100108														
518	4-Chloroaniline	10	ug/L	1.00	ug/L	20100108														
2768	Chlorobenzilate	10	ug/L	1.00	ug/L	20100112														

Structured Analysis Code: I-0U-DP-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (B/N/A) - Base->Acid
Method: Base/Neutrals and Acids (625)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6159							Spike List 6160						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
525	p-Chlorobenzilate	10	ug/L	1.00	ug/L	20100112														
578	4-Chloro-3-methylphenol	10	ug/L	1.00	ug/L	20100108	C	Y			45	106	20	C	Y			45	94	20
589	2-Chloronaphthalene	10	ug/L	1.00	ug/L	20100108	C	Y			45	95	20	C	Y			49	85	20
600	2-Chlorophenol	10	ug/L	1.00	ug/L	20100108	C	Y			56	93	20	C	Y			37	92	20
602	4-Chlorophenyl phenyl ether	10	ug/L	1.00	ug/L	20100108	C	Y			53	100	20	C	Y			50	91	20
633	Chrysene	10	ug/L	1.00	ug/L	20100108	C	Y			58	112	20	C	Y			41	108	20
673	Cyclohexanol	10	ug/L	2.00	ug/L	20100108														
824	Diallate	20	ug/L	2.00	ug/L	20100112														
860	Dibenz(a,h)anthracene	10	ug/L	1.00	ug/L	20100108														
2669	Dibenzo(a,h)anthracene	10	ug/L	1.00	ug/L	20100108	C	Y			56	122	20	C	Y			40	111	20
863	Dibenzofuran	10	ug/L	1.00	ug/L	20100108														
865	Dibenzo(a,e)pyrene	10	ug/L			0														
891	Di-n-butyl phthalate	10	ug/L	1.00	ug/L	20100108	C	Y			57	108	20	C	Y			52	97	20
904	1,2-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108														
907	1,3-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108														
910	1,4-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108														
918	3,3'-Dichlorobenzidine	50	ug/L	1.00	ug/L	20100108	C	Y			26	77	20	C	Y			10	90	20
971	2,4-Dichlorophenol	10	ug/L	1.00	ug/L	20100108	C	Y			46	103	20	C	Y			46	89	20
973	2,6-Dichlorophenol	10	ug/L	1.00	ug/L	20100112														
1082	Diethyl phthalate	10	ug/L	1.00	ug/L	20100108	C	Y			60	101	20	C	Y			54	96	20
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphorc	50	ug/L	1.00	ug/L	20100112														
1099	Dimethoate	20	ug/L	1.00	ug/L	20100112														
1110	p-Dimethylaminoazobenzene	20	ug/L	1.00	ug/L	20100112														
1116	N,N-Dimethylaniline	50	ug/L			0														
1120	7,12-Dimethylbenz(a)anthracene	20	ug/L	1.00	ug/L	20100112														
1124	3,3'-Dimethylbenzidine	50	ug/L	2.62	ug/L	20080515														
1128	Dimethylformamide	10	ug/L	1.00	ug/L	20051219														
1140	alpha,alpha-Dimethylphenethylamine	50	ug/L	22.1	ug/L	20080925														
1145	2,4-Dimethylphenol	10	ug/L	1.00	ug/L	20100108	C	Y			40	105	20	C	Y			47	87	20
1149	Dimethyl phthalate	10	ug/L	1.00	ug/L	20100108	C	Y			57	101	20	C	Y			53	93	20
1164	1,3-Dinitrobenzene	10	ug/L	1.00	ug/L	20100112														
2785	1,4-Dinitrobenzene	10	ug/L	1.00	ug/L	20100112														
1167	4,6-Dinitro-2-methylphenol	50	ug/L	1.00	ug/L	20100108	C	Y			61	120	20	C	Y			40	119	20
1187	2,4-Dinitrophenol	50	ug/L	2.00	ug/L	20100108	C	Y			42	146	20	C	Y			23	132	20
1191	2,4-Dinitrotoluene	10	ug/L	1.00	ug/L	20100108	C	Y			62	101	20	C	Y			43	103	20
1193	2,6-Dinitrotoluene	10	ug/L	2.16	ug/L	20100108	C	Y			62	103	20	C	Y			50	150	20
1196	2-sec-Butyl-4,6-dinitrophenol	20	ug/L	2.00	ug/L	20100112														
1195	Dinoseb	20	ug/L	2.00	ug/L	20100112														
1162	Di-n-octyl phthalate	10	ug/L	1.00	ug/L	20100108	C	Y			57	118	20	C	Y			21	140	20

Structured Analysis Code: I-0U-DP-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (B/N/A) - Base->Acid
Method: Base/Neutrals and Acids (625)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6159							Spike List 6160						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1199	1,4-Dioxane	10	ug/L	1.00	ug/L	20100108														
5685	Phenyl disulfide	10	ug/L	10	ug/L	20040521														
2944	1,2-Diphenylhydrazine (as Azobenzen	10	ug/L	1.00	ug/L	20100108														
1225	Disulfoton	50	ug/L	1.00	ug/L	20100112														
1360	Ethyl methacrylate	10	ug/L	1.00	ug/L	20100113														
1362	Ethyl methanesulfonate	10	ug/L	1.00	ug/L	20100112														
1372	Famphur	100	ug/L	1.70	ug/L	20080314														
1414	Fluoranthene	10	ug/L	1.00	ug/L	20100108	C	Y			55	114	20	C	Y			52	95	20
1417	Fluorene	10	ug/L	1.00	ug/L	20100108	C	Y			59	96	20	C	Y			52	91	20
1482	Hexachlorobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			56	110	20	C	Y			43	100	20
1489	Hexachlorobutadiene	10	ug/L	1.00	ug/L	20100108	C	Y			36	84	20	C	Y			45	72	20
1492	Hexachlorocyclopentadiene	50	ug/L	1.00	ug/L	20100108														
1491	Hexachloro-1,3-cyclopentadiene	50	ug/L	1.00	ug/L	20100108														
1497	Hexachloroethane	10	ug/L	1.00	ug/L	20100108	C	Y			40	77	20	C	Y			40	113	20
1501	Hexachlorophene	100	ug/L	10.0	ug/L	20051222														
1511	Hexachloropropene	100	ug/L	1.00	ug/L	20100112														
1535	Indeno(1,2,3-cd)pyrene	10	ug/L	1.00	ug/L	20100108	C	Y			55	124	20	C	Y			33	117	20
1559	Isodrin	10	ug/L	1.00	ug/L	20100112														
1566	Isophorone	10	ug/L	1.00	ug/L	20100108	C	Y			50	107	20	C	Y			45	92	20
1593	Isosafrole	20	ug/L	1.30	ug/L	20100112														
1596	Kepone	100	ug/L	20.0	ug/L	20090313														
1724	Methapyrilene	50	ug/L	1.26	ug/L	20100112														
1785	2-Methylbenzenamine	20	ug/L	1.00	ug/L	20100112														
1796	3-Methylcholanthrene	20	ug/L	1.00	ug/L	20100112														
1810	4,4'-Methylenebis(2-chloroaniline)	10	ug/L	1.00	ug/L	20100112														
1823	Methyl methacrylate	10	ug/L	1.00	ug/L	20100113														
1825	Methyl methanesulfonate	10	ug/L	1.00	ug/L	20100112														
1829	2-Methylnaphthalene	10	ug/L	1.00	ug/L	20100108														
1831	Methyl parathion	50	ug/L	1.00	ug/L	20100112														
1851	2-Methylphenol	10	ug/L	1.00	ug/L	20100108														
1857	4-Methylphenol	20	ug/L	1.51	ug/L	20011114														
2777	3-Methylphenol & 4-Methylphenol	10	ug/L	2.00	ug/L	20100108														
5683	N-(Hydroxymethyl)phthalimide	10	ug/L	10	ug/L	20040521														
1932	Naphthalene	10	ug/L	1.00	ug/L	20100108	C	Y			42	82	20	C	Y			34	84	20
1940	1,4-Naphthoquinone	50	ug/L	1.00	ug/L	20100112														
1944	1-Naphthylamine	10	ug/L	1.00	ug/L	20100112														
1949	2-Naphthylamine	10	ug/L	1.00	ug/L	20100112														
1960	2-Nitroaniline	50	ug/L	1.00	ug/L	20100108														
1964	3-Nitroaniline	50	ug/L	1.00	ug/L	20100108														

Structured Analysis Code: **I-0U-DP-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (B/N/A) - Base->Acid
Method: Base/Neutrals and Acids (625)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6159							Spike List 6160						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1968	4-Nitroaniline	50	ug/L	1.00	ug/L	20100108														
1972	Nitrobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			48	96	20	C	Y			36	97	20
1998	2-Nitrophenol	10	ug/L	1.00	ug/L	20100108	C	Y			51	98	20	C	Y			37	97	20
2001	4-Nitrophenol	50	ug/L	2.00	ug/L	20090316	C	Y			25	45	20	C	Y			16	73	20
2006	4-Nitroquinoline-1-oxide	100	ug/L	5.00	ug/L	20080515														
2009	N-Nitrosodi-n-butylamine	10	ug/L	1.00	ug/L	20100112														
2013	N-Nitrosodiethylamine	10	ug/L	1.00	ug/L	20100112														
2018	N-Nitrosodimethylamine	10	ug/L	2.00	ug/L	20090316														
2028	N-Nitrosodiphenylamine	10	ug/L	1.00	ug/L	20100108														
2024	N-Nitrosodi-n-propylamine	10	ug/L	1.00	ug/L	20100108	C	Y			57	113	20	C	Y			56	97	20
2031	N-Nitrosomethylethylamine	10	ug/L	1.00	ug/L	20100112														
2034	N-Nitrosomorpholine	10	ug/L	1.00	ug/L	20100112														
2036	N-Nitrosopiperidine	10	ug/L	1.00	ug/L	20100112														
2038	N-Nitrosopyrrolidine	10	ug/L	1.00	ug/L	20100112														
2042	N-Nitro-o-toluidine	20	ug/L	1.00	ug/L	20100112														
2046	5-Nitro-o-toluidine	20	ug/L	1.00	ug/L	20100112														
3597	2,2'-oxybis(1-Chloropropane)	10	ug/L	1.00	ug/L	20100108	C	Y			42	102	20	C	Y			36	150	20
2062	Parathion	50	ug/L	1.00	ug/L	20100112														
2104	Pentachlorobenzene	10	ug/L	1.00	ug/L	20100112														
2108	Pentachloroethane	50	ug/L	1.00	ug/L	20100112														
2112	Pentachloronitrobenzene	50	ug/L	1.00	ug/L	20100112														
2118	Pentachlorophenol	50	ug/L	1.27	ug/L	20100108	C	Y			56	126	20	C	Y			36	101	20
2146	Phenacetin	20	ug/L	1.00	ug/L	20100112														
2154	Phenanthrene	10	ug/L	1.00	ug/L	20100108	C	Y			54	110	20	C	Y			54	120	20
2155	Phenol	10	ug/L	2.00	ug/L	20100108	C	Y			27	43	20	C	Y			16	68	20
5686	Phenyl sulfide	10	ug/L	10	ug/L	20040521														
5687	Phenyl sulfone	10	ug/L	10	ug/L	20040521														
2164	p-Phenylene diamine	100	ug/L	1.00	ug/L	20030225														
2170	Phorate	50	ug/L	1.00	ug/L	20100112														
3171	Phthalic acid	10	ug/L			0														
2858	Phthalic anhydride	10	ug/L			0														
2206	2-Picoline	20	ug/L	2.00	ug/L	20100112														
2221	Pronamide	20	ug/L	1.00	ug/L	20100112														
2252	Pyrene	10	ug/L	1.00	ug/L	20100108	C	Y			53	117	20	C	Y			52	97	20
2256	Pyridine	20	ug/L	2.00	ug/L	20100108														
2275	Safrole	20	ug/L	1.00	ug/L	20100112														
2462	Sulfotepp	50	ug/L	1.00	ug/L	20100112														
2430	1,2,4,5-Tetrachlorobenzene	10	ug/L	1.00	ug/L	20100112														
2457	2,3,4,6-Tetrachlorophenol	50	ug/L	1.00	ug/L	20100112														

Structured Analysis Code: I-0U-DP-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (B/N/A) - Base->Acid
Method: Base/Neutrals and Acids (625)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6159							Spike List 6160						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2459	Tetraethyldithiopyrophosphate (Sulfot	50	ug/L	1.00	ug/L	20100112														
1086	Thionazin	50	ug/L	1.00	ug/L	20100112														
2745	Toluene diamine (2,4- + 2,6- isomers)	50	ug/L			0														
5391	Toluene Diamine, Total	50	ug/L			0														
1786	o-Toluidine	20	ug/L	1.00	ug/L	20100112														
2512	2,4,6-Tribromophenol	10	ug/L			0	X	Y			60	111	0	X	Y			41	109	0
2721	Tributyl phosphate	10	ug/L	1.00	ug/L	20100112														
2515	1,2,4-Trichlorobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			44	84	20	C	Y			44	142	20
2555	2,4,5-Trichlorophenol	10	ug/L	1.00	ug/L	20100108														
2559	2,4,6-Trichlorophenol	10	ug/L	1.00	ug/L	20100108	C	Y			54	105	20	C	Y			50	95	20
2569	O,O,O-Triethyl phosphorothioate	50	ug/L	1.00	ug/L	20100112														
2597	1,3,5-Trinitrobenzene	50	ug/L	1.00	ug/L	20100112														
5082	Tris(2-chloroethyl)phosphate	10	ug/L	1.00	ug/L	20100112														
5688	4-Chlorobenzenethiol	10	ug/L	10	ug/L	20040521														
5690	4-Chlorophenyl sulfone	10	ug/L	10	ug/L	20040521														
1425	2-Fluorobiphenyl						X	Y			50	91	0	X	Y			31	103	0
1426	2-Fluorophenol						X	Y			38	59	0	X	Y			23	82	0
2736	Nitrobenzene-d5						X	Y			49	99	0	X	Y			36	98	0
2737	Phenol-d5						X	Y			24	40	0	X	Y			14	68	0
2738	Terphenyl-d14						X	Y			58	128	0	X	Y			43	107	0

TAL Reference Data Summary

Structured Analysis Code: **I-KD-QL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	10	ug/L	1.00	ug/L	20100108														
5	Acenaphthylene	10	ug/L	1.00	ug/L	20100108														
24	Acetophenone	10	ug/L	1.00	ug/L	20100113														
30	2-Acetylaminofluorene	100	ug/L	1.00	ug/L	20100112														
93	4-Aminobiphenyl	50	ug/L	1.05	ug/L	20100112														
115	Aniline	10	ug/L	1.00	ug/L	20100108														
122	Anthracene	10	ug/L	1.00	ug/L	20100108														
132	Aramite (total)	20	ug/L	5.00	ug/L	20100108														
3303	Aramite 1	20	ug/L	1	ug/L	20080314														
3304	Aramite 2	20	ug/L	1	ug/L	20080314														
158	Atrazine	10	ug/L	1.00	ug/L	20100113														
3352	Azobenzene	10	ug/L	1.00	ug/L	20100108														
3398	Benzaldehyde	10	ug/L	1.00	ug/L	20100113														
2932	Benzenethiol	10	ug/L	1.96	ug/L	20051130														
199	Benzidine	100	ug/L	20.0	ug/L	20080925														
202	Benzo(a)anthracene	10	ug/L	1.00	ug/L	20100108														
205	Benzo(b)fluoranthene	10	ug/L	1.00	ug/L	20100108														
208	Benzo(k)fluoranthene	10	ug/L	1.00	ug/L	20100108														
209	Benzoic acid	50	ug/L	5.00	ug/L	20051220														
210	Benzo(ghi)perylene	10	ug/L	1.00	ug/L	20100108														
211	Benzo(a)pyrene	10	ug/L	1.00	ug/L	20100108														
3890	Benzothiazole	10	ug/L	1.00	ug/L	20100112														
215	Benzyl alcohol	10	ug/L	1.00	ug/L	20100108														
3474	1,1'-Biphenyl	10	ug/L	1.00	ug/L	20100113														
5682	Bis(p-chlorophenyl)-disulfide	10	ug/L	10	ug/L	20040521														
289	bis(2-Chloroethoxy)methane	10	ug/L	1.00	ug/L	20100108														
293	bis(2-Chloroethyl) ether	10	ug/L	1.00	ug/L	20100108														
298	bis(2-Chloroisopropyl) ether	10	ug/L	1.00	ug/L	20100108														
302	bis(2-Ethylhexyl) phthalate	10	ug/L	1.00	ug/L	20100108														
348	4-Bromophenyl phenyl ether	10	ug/L	1.00	ug/L	20100108														
5359	n-Butylbenzenesulfonamide	20	ug/L	2.74	ug/L	20011119														
403	Butyl benzyl phthalate	10	ug/L	1.00	ug/L	20100108														
5101	Caprolactam	10	ug/L	2.00	ug/L	20100113														
2751	Carbazole	10	ug/L	1.00	ug/L	20100108														
518	4-Chloroaniline	10	ug/L	1.00	ug/L	20100108														
2768	Chlorobenzilate	10	ug/L	1.00	ug/L	20100112														
525	p-Chlorobenzilate	10	ug/L	1.00	ug/L	20100112														

Structured Analysis Code: I-KD-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
578	4-Chloro-3-methylphenol	10	ug/L	1.00	ug/L	20100108														
589	2-Chloronaphthalene	10	ug/L	1.00	ug/L	20100108														
600	2-Chlorophenol	10	ug/L	1.00	ug/L	20100108														
602	4-Chlorophenyl phenyl ether	10	ug/L	1.00	ug/L	20100108														
633	Chrysene	10	ug/L	1.00	ug/L	20100108														
673	Cyclohexanol	10	ug/L	2.00	ug/L	20100108														
824	Diallate	20	ug/L	2.00	ug/L	20100112														
860	Dibenz(a,h)anthracene	10	ug/L	1.00	ug/L	20100108														
2669	Dibenzo(a,h)anthracene	10	ug/L	1.00	ug/L	20100108														
863	Dibenzofuran	10	ug/L	1.00	ug/L	20100108														
865	Dibenzo(a,e)pyrene	10	ug/L			0														
891	Di-n-butyl phthalate	10	ug/L	1.00	ug/L	20100108														
904	1,2-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108														
907	1,3-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108														
910	1,4-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			26	88	20	C	Y			34	79	20
918	3,3'-Dichlorobenzidine	50	ug/L	1.00	ug/L	20100108														
971	2,4-Dichlorophenol	10	ug/L	1.00	ug/L	20100108														
973	2,6-Dichlorophenol	10	ug/L	1.00	ug/L	20100112														
1082	Diethyl phthalate	10	ug/L	1.00	ug/L	20100108														
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphorc	50	ug/L	1.00	ug/L	20100112														
1099	Dimethoate	20	ug/L	1.00	ug/L	20100112														
1110	p-Dimethylaminoazobenzene	20	ug/L	1.00	ug/L	20100112														
1116	N,N-Dimethylaniline	50	ug/L	50	ug/L	20080307														
1120	7,12-Dimethylbenz(a)anthracene	20	ug/L	1.00	ug/L	20100112														
1124	3,3'-Dimethylbenzidine	50	ug/L	2.62	ug/L	20080515														
1128	Dimethylformamide	10	ug/L	1.00	ug/L	20051219														
1140	alpha,alpha-Dimethylphenethylamine	50	ug/L	22.1	ug/L	20080925														
1145	2,4-Dimethylphenol	10	ug/L	1.00	ug/L	20100108														
1149	Dimethyl phthalate	10	ug/L	1.00	ug/L	20100108														
1164	1,3-Dinitrobenzene	10	ug/L	1.00	ug/L	20100112														
2785	1,4-Dinitrobenzene	10	ug/L	1.00	ug/L	20100112														
1167	4,6-Dinitro-2-methylphenol	50	ug/L	1.00	ug/L	20100108														
1187	2,4-Dinitrophenol	50	ug/L	2.00	ug/L	20100108														
1191	2,4-Dinitrotoluene	10	ug/L	1.00	ug/L	20100108	C	Y			44	97	20	C	Y			37	93	20
1193	2,6-Dinitrotoluene	10	ug/L	2.16	ug/L	20100108														
1195	Dinoseb	20	ug/L	2.00	ug/L	20100112														
1196	2-sec-Butyl-4,6-dinitrophenol	20	ug/L	2.00	ug/L	20100112														
1162	Di-n-octyl phthalate	10	ug/L	1.00	ug/L	20100108														
1199	1,4-Dioxane	10	ug/L	1.00	ug/L	20100108														

Structured Analysis Code: I-KD-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5685	Phenyl disulfide	10	ug/L	1.00	ug/L	20080318														
2944	1,2-Diphenylhydrazine (as Azobenzen	10	ug/L	1.00	ug/L	20100108														
1225	Disulfoton	50	ug/L	1.00	ug/L	20100112														
1360	Ethyl methacrylate	10	ug/L	1.00	ug/L	20100113														
1362	Ethyl methanesulfonate	10	ug/L	1.00	ug/L	20100112														
1372	Famphur	100	ug/L	1.70	ug/L	20080314														
1414	Fluoranthene	10	ug/L	1.00	ug/L	20100108														
1417	Fluorene	10	ug/L	1.00	ug/L	20100108														
1482	Hexachlorobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			42	89	20	C	Y			35	102	20
1489	Hexachlorobutadiene	10	ug/L	1.00	ug/L	20100108	C	Y			31	91	20	C	Y			34	79	20
1492	Hexachlorocyclopentadiene	50	ug/L	1.00	ug/L	20100108														
1491	Hexachloro-1,3-cyclopentadiene	50	ug/L	1.00	ug/L	20100108														
1497	Hexachloroethane	10	ug/L	1.00	ug/L	20100108	C	Y			29	86	20	C	Y			31	80	20
1501	Hexachlorophene	100	ug/L	10.0	ug/L	20051222														
1511	Hexachloropropene	100	ug/L	1.00	ug/L	20100112														
1535	Indeno(1,2,3-cd)pyrene	10	ug/L	1.00	ug/L	20100108														
1559	Isodrin	10	ug/L	1.00	ug/L	20100112														
1566	Isophorone	10	ug/L	1.00	ug/L	20100108														
1593	Isosafrole	20	ug/L	1.30	ug/L	20100112														
1596	Kepone	100	ug/L	20.0	ug/L	20090313														
1724	Methapyrilene	50	ug/L	1.26	ug/L	20100112														
1785	2-Methylbenzenamine	20	ug/L	1.00	ug/L	20100112														
1796	3-Methylcholanthrene	20	ug/L	1.00	ug/L	20100112														
1810	4,4'-Methylenebis(2-chloroaniline)	10	ug/L	1.00	ug/L	20100112														
1823	Methyl methacrylate	10	ug/L	1.00	ug/L	20100113														
1825	Methyl methanesulfonate	10	ug/L	1.00	ug/L	20100112														
1829	2-Methylnaphthalene	10	ug/L	1.00	ug/L	20100108														
1831	Methyl parathion	50	ug/L	1.00	ug/L	20100112														
1851	2-Methylphenol	10	ug/L	1.00	ug/L	20100108	C	Y			37	88	20	C	Y			35	89	20
1857	4-Methylphenol	20	ug/L	1.51	ug/L	20011114														
2777	3-Methylphenol & 4-Methylphenol	10	ug/L	2.00	ug/L	20100108	C	Y			36	92	20	C	Y			29	96	20
5683	N-(Hydroxymethyl)phthalimide	10	ug/L	1.361	ug/L	20051130														
1932	Naphthalene	10	ug/L	1.00	ug/L	20100108														
1940	1,4-Naphthoquinone	50	ug/L	1.00	ug/L	20100112														
1944	1-Naphthylamine	10	ug/L	1.00	ug/L	20100112														
1949	2-Naphthylamine	10	ug/L	1.00	ug/L	20100112														
1960	2-Nitroaniline	50	ug/L	1.00	ug/L	20100108														
1964	3-Nitroaniline	50	ug/L	1.00	ug/L	20100108														
1968	4-Nitroaniline	50	ug/L	1.00	ug/L	20100108														

Structured Analysis Code: I-KD-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1972	Nitrobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			43	89	20	C	Y			38	85	20
1998	2-Nitrophenol	10	ug/L	1.00	ug/L	20100108														
2001	4-Nitrophenol	50	ug/L	2.00	ug/L	20090316														
2006	4-Nitroquinoline-1-oxide	100	ug/L	5.00	ug/L	20080515														
2009	N-Nitrosodi-n-butylamine	10	ug/L	1.00	ug/L	20100112														
2013	N-Nitrosodiethylamine	10	ug/L	1.00	ug/L	20100112														
2018	N-Nitrosodimethylamine	10	ug/L	2.00	ug/L	20090316														
2028	N-Nitrosodiphenylamine	10	ug/L	1.00	ug/L	20100108														
2024	N-Nitrosodi-n-propylamine	10	ug/L	1.00	ug/L	20100108														
2031	N-Nitrosomethylethylamine	10	ug/L	1.00	ug/L	20100112														
2034	N-Nitrosomorpholine	10	ug/L	1.00	ug/L	20100112														
2036	N-Nitrosopiperidine	10	ug/L	1.00	ug/L	20100112														
2038	N-Nitrosopyrrolidine	10	ug/L	1.00	ug/L	20100112														
2042	N-Nitro-o-toluidine	20	ug/L	1.00	ug/L	20100112														
2046	5-Nitro-o-toluidine	20	ug/L	1.00	ug/L	20100112														
3597	2,2'-oxybis(1-Chloropropane)	10	ug/L	1.00	ug/L	20100108														
2062	Parathion	50	ug/L	1.00	ug/L	20100112														
2104	Pentachlorobenzene	10	ug/L	1.00	ug/L	20100112														
2108	Pentachloroethane	50	ug/L	1.00	ug/L	20100112														
2112	Pentachloronitrobenzene	50	ug/L	1.00	ug/L	20100112														
2118	Pentachlorophenol	50	ug/L	1.27	ug/L	20100108	C	Y			30	84	20	C	Y			24	82	20
2146	Phenacetin	20	ug/L	1.00	ug/L	20100112														
2154	Phenanthrene	10	ug/L	1.00	ug/L	20100108														
2155	Phenol	10	ug/L	2.00	ug/L	20100108														
5686	Phenyl sulfide	10	ug/L	1.00	ug/L	20080318														
5687	Phenyl sulfone	10	ug/L	1.00	ug/L	20080318														
2164	p-Phenylene diamine	100	ug/L	1.00	ug/L	20030225														
2170	Phorate	50	ug/L	1.00	ug/L	20100112														
3171	Phthalic acid	10	ug/L	395.86	ug/L	20051115														
2858	Phthalic anhydride	10	ug/L	395.86	ug/L	20051115														
2206	2-Picoline	20	ug/L	2.00	ug/L	20100112														
2221	Pronamide	20	ug/L	1.00	ug/L	20100112														
2252	Pyrene	10	ug/L	1.00	ug/L	20100108														
2256	Pyridine	20	ug/L	2.00	ug/L	20100108	C	Y			10	75	20	C	Y			10	82	20
2275	Safrole	20	ug/L	1.00	ug/L	20100112														
2462	Sulfotepp	50	ug/L	1.00	ug/L	20100112														
2430	1,2,4,5-Tetrachlorobenzene	10	ug/L	1.00	ug/L	20100112														
2457	2,3,4,6-Tetrachlorophenol	50	ug/L	1.00	ug/L	20100112														
2459	Tetraethyldithiopyrophosphate (Sulfot	50	ug/L	1.00	ug/L	20100112														

Structured Analysis Code: I-KD-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1086	Thionazin	50	ug/L	1.00	ug/L	20100112														
2745	Toluene diamine (2,4- + 2,6- isomers)	50	ug/L			0														
5391	Toluene Diamine, Total	50	ug/L			0														
1786	o-Toluidine	20	ug/L	1.00	ug/L	20100112														
2512	2,4,6-Tribromophenol	10	ug/L			0	X	Y			38	100	0	X	Y			29	111	0
2721	Tributyl phosphate	10	ug/L	1.00	ug/L	20100112														
2515	1,2,4-Trichlorobenzene	10	ug/L	1.00	ug/L	20100108														
2555	2,4,5-Trichlorophenol	10	ug/L	1.00	ug/L	20100108	C	Y			42	88	20	C	Y			37	91	20
2559	2,4,6-Trichlorophenol	10	ug/L	1.00	ug/L	20100108	C	Y			43	89	20	C	Y			36	90	20
2569	O,O,O-Triethyl phosphorothioate	50	ug/L	1.00	ug/L	20100112														
2597	1,3,5-Trinitrobenzene	50	ug/L	1.00	ug/L	20100112														
5082	Tris(2-chloroethyl)phosphate	10	ug/L	1.00	ug/L	20100112														
5738	1-Methyl naphthalene	10	ug/L	1.00	ug/L	20100113														
5688	4-Chlorobenzenethiol	10	ug/L	2.626	ug/L	20051130														
5690	4-Chlorophenyl sulfone	10	ug/L	1.00	ug/L	20080303														
1425	2-Fluorobiphenyl						X	Y			31	92	0	X	Y			30	90	0
1426	2-Fluorophenol						X	Y			31	91	0	X	Y			25	92	0
2736	Nitrobenzene-d5						X	Y			41	89	0	X	Y			38	83	0
2737	Phenol-d5						X	Y			22	90	0	X	Y			18	94	0
2738	Terphenyl-d14						X	Y			39	110	0	X	Y			30	104	0

TAL Reference Data Summary

Structured Analysis Code: **I-14-QL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
5	Acenaphthylene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
24	Acetophenone	100000	ug/L	10000	ug/L	20100108														
30	2-Acetylaminofluorene	1000000	ug/L	10000	ug/L	20100108														
93	4-Aminobiphenyl	500000	ug/L	50000	ug/L	20100108														
115	Aniline	100000	ug/L	10000	ug/L	20100108	C	Y			12	150	20	C	Y			12	150	30
122	Anthracene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
132	Aramite (total)	200000	ug/L	20000	ug/L	20100108														
158	Atrazine	100000	ug/L	10000	ug/L	20100108														
3352	Azobenzene	100000	ug/L	10000	ug/L	20100108	C	Y			12	150	20	C	Y			12	150	30
3398	Benzaldehyde	100000	ug/L	10000	ug/L	20100108														
199	Benzidine	1000000	ug/L	20000	ug/L	20100108														
202	Benzo(a)anthracene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
205	Benzo(b)fluoranthene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
208	Benzo(k)fluoranthene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
209	Benzoic acid	500000	ug/L	50000	ug/L	20100108	C	Y			12	150	20	C	Y			12	150	30
210	Benzo(ghi)perylene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
211	Benzo(a)pyrene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
3890	Benzothiazole	100000	ug/L	10000	ug/L	20100108														
215	Benzyl alcohol	100000	ug/L	10000	ug/L	20100108	C	Y			12	150	20	C	Y			12	150	30
3474	1,1'-Biphenyl	100000	ug/L	10000	ug/L	20100108														
289	bis(2-Chloroethoxy)methane	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
293	bis(2-Chloroethyl) ether	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
298	bis(2-Chloroisopropyl) ether	100000	ug/L	10000	ug/L	20100108														
302	bis(2-Ethylhexyl) phthalate	100000	ug/L	20000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
348	4-Bromophenyl phenyl ether	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
5359	n-Butylbenzenesulfonamide	200000	ug/L	27400	ug/L	20100108														
403	Butyl benzyl phthalate	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
5101	Caprolactam	100000	ug/L	10000	ug/L	20100108														
2751	Carbazole	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
518	4-Chloroaniline	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2768	Chlorobenzilate	100000	ug/L	10000	ug/L	20100108														
525	p-Chlorobenzilate	100000	ug/L	10000	ug/L	20100108														
578	4-Chloro-3-methylphenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
589	2-Chloronaphthalene	100000	ug/L	10000	ug/L	20100108														
600	2-Chlorophenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
602	4-Chlorophenyl phenyl ether	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20

Structured Analysis Code: I-14-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
633	Chrysene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
673	Cyclohexanol	100000	ug/L	10000	ug/L	20100108														
824	Diallate	200000	ug/L	20000	ug/L	20100108														
860	Dibenz(a,h)anthracene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2669	Dibenzo(a,h)anthracene	100000	ug/L	10000	ug/L	20100108														
863	Dibenzofuran	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
865	Dibenzo(a,e)pyrene	100000	ug/L			0														
891	Di-n-butyl phthalate	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
904	1,2-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108														
907	1,3-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108														
910	1,4-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108														
918	3,3'-Dichlorobenzidine	500000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
971	2,4-Dichlorophenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
973	2,6-Dichlorophenol	100000	ug/L	10000	ug/L	20100108														
1082	Diethyl phthalate	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphor(	500000	ug/L	50000	ug/L	20100108														
1099	Dimethoate	200000	ug/L	20000	ug/L	20100108														
1110	p-Dimethylaminoazobenzene	100000	ug/L	10000	ug/L	20100108														
1116	N,N-Dimethylaniline	500000	ug/L			0														
1120	7,12-Dimethylbenz(a)anthracene	200000	ug/L	10000	ug/L	20100108														
1124	3,3'-Dimethylbenzidine	500000	ug/L	50000	ug/L	20100108														
1128	Dimethylformamide	100000	ug/L	10000	ug/L	20100108														
1140	alpha,alpha-Dimethylphenethylamine	500000	ug/L	50000	ug/L	20100108														
1145	2,4-Dimethylphenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1119	Dimethylphenylamine	500000	ug/L			0														
1149	Dimethyl phthalate	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1164	1,3-Dinitrobenzene	100000	ug/L	10000	ug/L	20100108														
2785	1,4-Dinitrobenzene	100000	ug/L	10000	ug/L	20100108														
1167	4,6-Dinitro-2-methylphenol	500000	ug/L	50000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1187	2,4-Dinitrophenol	500000	ug/L	50000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1191	2,4-Dinitrotoluene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1193	2,6-Dinitrotoluene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1195	Dinoseb	200000	ug/L	20000	ug/L	20100108														
1196	2-sec-Butyl-4,6-dinitrophenol	200000	ug/L	20000	ug/L	20100108														
1162	Di-n-octyl phthalate	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1199	1,4-Dioxane	100000	ug/L	10000	ug/L	20100108														
2944	1,2-Diphenylhydrazine (as Azobenzen	100000	ug/L	10000	ug/L	20100108														
1225	Disulfoton	500000	ug/L	50000	ug/L	20100108														
1362	Ethyl methanesulfonate	100000	ug/L	10000	ug/L	20100108														

Structured Analysis Code: I-14-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1372	Famphur	1000000	ug/L	10000	ug/L	20100108														
1414	Fluoranthene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1417	Fluorene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1482	Hexachlorobenzene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1489	Hexachlorobutadiene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1492	Hexachlorocyclopentadiene	500000	ug/L	50000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1491	Hexachloro-1,3-cyclopentadiene	500000	ug/L	50000	ug/L	20100108														
1497	Hexachloroethane	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1501	Hexachlorophene	1000000	ug/L	200000	ug/L	20100108														
1511	Hexachloropropene	100000	ug/L	10000	ug/L	20100108														
1535	Indeno(1,2,3-cd)pyrene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1559	Isodrin	100000	ug/L	10000	ug/L	20100108														
1566	Isophorone	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1593	Isosafrole	200000	ug/L	20000	ug/L	20100108														
1596	Kepone	1000000	ug/L	100000	ug/L	20100108														
1724	Methapyrilene	500000	ug/L	50000	ug/L	20100108														
1785	2-Methylbenzenamine	200000	ug/L	10000	ug/L	20100108														
1796	3-Methylcholanthrene	200000	ug/L	10000	ug/L	20100108														
1810	4,4'-Methylenebis(2-chloroaniline)	100000	ug/L	20000	ug/L	20100108														
1823	Methyl methacrylate	100000	ug/L	10000	ug/L	20100108														
1825	Methyl methanesulfonate	100000	ug/L	10000	ug/L	20100108														
1829	2-Methylnaphthalene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1831	Methyl parathion	500000	ug/L	50000	ug/L	20100108														
1851	2-Methylphenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2777	3-Methylphenol & 4-Methylphenol	100000	ug/L	20000	ug/L	20100108	C	Y	400000	ug/L	50	150	20	C	Y	40000	ug/L	50	150	20
1932	Naphthalene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1940	1,4-Naphthoquinone	500000	ug/L	50000	ug/L	20100108														
1944	1-Naphthylamine	100000	ug/L	10000	ug/L	20100108														
1949	2-Naphthylamine	100000	ug/L	20000	ug/L	20100108														
1960	2-Nitroaniline	500000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1964	3-Nitroaniline	500000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1968	4-Nitroaniline	500000	ug/L	50000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1972	Nitrobenzene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
1998	2-Nitrophenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2001	4-Nitrophenol	500000	ug/L	50000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2006	4-Nitroquinoline-1-oxide	1000000	ug/L	100000	ug/L	20100108														
2009	N-Nitrosodi-n-butylamine	100000	ug/L	10000	ug/L	20100108														
2013	N-Nitrosodiethylamine	100000	ug/L	10000	ug/L	20100108														
2018	N-Nitrosodimethylamine	100000	ug/L	10000	ug/L	20100108	C	Y			12	150	20	C	Y			12	150	30

Structured Analysis Code: I-14-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2028	N-Nitrosodiphenylamine	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2024	N-Nitrosodi-n-propylamine	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2031	N-Nitrosomethylethylamine	100000	ug/L	10000	ug/L	20100108														
2034	N-Nitrosomorpholine	100000	ug/L	10000	ug/L	20100108														
2036	N-Nitrosopiperidine	100000	ug/L	10000	ug/L	20100108														
2038	N-Nitrosopyrrolidine	100000	ug/L	10000	ug/L	20100108														
2042	N-Nitro-o-toluidine	200000	ug/L	10000	ug/L	20100108														
2046	5-Nitro-o-toluidine	200000	ug/L	10000	ug/L	20100108														
3597	2,2'-oxybis(1-Chloropropane)	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2062	Parathion	500000	ug/L	50000	ug/L	20100108														
2104	Pentachlorobenzene	100000	ug/L	10000	ug/L	20100108														
2108	Pentachloroethane	500000	ug/L	50000	ug/L	20100108														
2112	Pentachloronitrobenzene	500000	ug/L	50000	ug/L	20100108														
2118	Pentachlorophenol	500000	ug/L	50000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2146	Phenacetin	200000	ug/L	20000	ug/L	20100108														
2154	Phenanthrene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2155	Phenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2164	p-Phenylene diamine	1000000	ug/L	100000	ug/L	20100108														
2170	Phorate	500000	ug/L	50000	ug/L	20100108														
2206	2-Picoline	200000	ug/L	10000	ug/L	20100108														
2221	Pronamide	200000	ug/L	20000	ug/L	20100108														
2252	Pyrene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2256	Pyridine	200000	ug/L	20000	ug/L	20100108	C	Y			12	150	20	C	Y			12	150	30
2275	Safrole	200000	ug/L	20000	ug/L	20100108														
2462	Sulfotepp	500000	ug/L	50000	ug/L	20100108														
2430	1,2,4,5-Tetrachlorobenzene	100000	ug/L	10000	ug/L	20100108														
2457	2,3,4,6-Tetrachlorophenol	500000	ug/L	10000	ug/L	20100108														
2459	Tetraethyldithiopyrophosphate (Sulfot	500000	ug/L	50000	ug/L	20100108														
1086	Thionazin	500000	ug/L	50000	ug/L	20100108														
1786	o-Toluidine	200000	ug/L	10000	ug/L	20100108														
2721	Tributyl phosphate	100000	ug/L	10000	ug/L	20100108														
2515	1,2,4-Trichlorobenzene	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2555	2,4,5-Trichlorophenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2559	2,4,6-Trichlorophenol	100000	ug/L	10000	ug/L	20100108	C	Y	200000	ug/L	50	150	20	C	Y	20000	ug/L	50	150	20
2569	O,O,O-Triethyl phosphorothioate	100000	ug/L	10000	ug/L	20100108														
2597	1,3,5-Trinitrobenzene	500000	ug/L	50000	ug/L	20100108														
5082	Tris(2-chloroethyl)phosphate	100000	ug/L	10000	ug/L	20100108														
1425	2-Fluorobiphenyl						X	Y	200000	ug/L	10	150	0	X	Y	20000	ug/L	10	150	0
1426	2-Fluorophenol						X	Y	200000	ug/L	10	150	0	X	Y	20000	ug/L	10	150	0

Structured Analysis Code: I-14-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2512	2,4,6-Tribromophenol						X	Y	200000	ug/L	10	150	0	X	Y	20000	ug/L	10	150	0
2736	Nitrobenzene-d5						X	Y	200000	ug/L	10	150	0	X	Y	20000	ug/L	10	150	0
2737	Phenol-d5						X	Y	200000	ug/L	10	150	0	X	Y	20000	ug/L	10	150	0
2738	Terphenyl-d14						X	Y	200000	ug/L	10	150	0	X	Y	20000	ug/L	10	150	0

TAL Reference Data Summary

Structured Analysis Code: **I-3H-QL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	100000	ug/L	10000	ug/L	20100108														
5	Acenaphthylene	100000	ug/L	10000	ug/L	20100108														
24	Acetophenone	100000	ug/L	10000	ug/L	20100108														
30	2-Acetylaminofluorene	1000000	ug/L	10000	ug/L	20100108														
93	4-Aminobiphenyl	500000	ug/L	50000	ug/L	20100108														
115	Aniline	100000	ug/L	10000	ug/L	20100108														
122	Anthracene	100000	ug/L	10000	ug/L	20100108														
132	Aramite (total)	200000	ug/L	20000	ug/L	20100108														
158	Atrazine	100000	ug/L	10000	ug/L	20100108														
3352	Azobenzene	100000	ug/L	10000	ug/L	20100108														
3398	Benzaldehyde	100000	ug/L	10000	ug/L	20100108														
199	Benzidine	1000000	ug/L	20000	ug/L	20100108														
202	Benzo(a)anthracene	100000	ug/L	10000	ug/L	20100108														
205	Benzo(b)fluoranthene	100000	ug/L	10000	ug/L	20100108														
208	Benzo(k)fluoranthene	100000	ug/L	10000	ug/L	20100108														
209	Benzoic acid	500000	ug/L	50000	ug/L	20100108														
210	Benzo(ghi)perylene	100000	ug/L	10000	ug/L	20100108														
211	Benzo(a)pyrene	100000	ug/L	10000	ug/L	20100108														
3890	Benzothiazole	100000	ug/L	10000	ug/L	20100108														
215	Benzyl alcohol	100000	ug/L	10000	ug/L	20100108														
3474	1,1'-Biphenyl	100000	ug/L	10000	ug/L	20100108														
289	bis(2-Chloroethoxy)methane	100000	ug/L	10000	ug/L	20100108														
293	bis(2-Chloroethyl) ether	100000	ug/L	10000	ug/L	20100108														
298	bis(2-Chloroisopropyl) ether	100000	ug/L	10000	ug/L	20100108														
302	bis(2-Ethylhexyl) phthalate	100000	ug/L	20000	ug/L	20100108														
348	4-Bromophenyl phenyl ether	100000	ug/L	10000	ug/L	20100108														
5359	n-Butylbenzenesulfonamide	200000	ug/L	27400	ug/L	20100108														
403	Butyl benzyl phthalate	100000	ug/L	10000	ug/L	20100108														
5101	Caprolactam	100000	ug/L	10000	ug/L	20100108														
2751	Carbazole	100000	ug/L	10000	ug/L	20100108														
518	4-Chloroaniline	100000	ug/L	10000	ug/L	20100108														
2768	Chlorobenzilate	100000	ug/L	10000	ug/L	20100108														
525	p-Chlorobenzilate	100000	ug/L	10000	ug/L	20100108														
578	4-Chloro-3-methylphenol	100000	ug/L	10000	ug/L	20100108														
589	2-Chloronaphthalene	100000	ug/L	10000	ug/L	20100108														
600	2-Chlorophenol	100000	ug/L	10000	ug/L	20100108														
602	4-Chlorophenyl phenyl ether	100000	ug/L	10000	ug/L	20100108														

Structured Analysis Code: I-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
633	Chrysene	100000	ug/L	10000	ug/L	20100108														
673	Cyclohexanol	100000	ug/L	10000	ug/L	20100108														
824	Diallate	200000	ug/L	20000	ug/L	20100108														
860	Dibenz(a,h)anthracene	100000	ug/L	10000	ug/L	20100108														
2669	Dibenzo(a,h)anthracene	100000	ug/L	10000	ug/L	20100108														
863	Dibenzofuran	100000	ug/L	10000	ug/L	20100108														
865	Dibenzo(a,e)pyrene	100000	ug/L			0														
891	Di-n-butyl phthalate	100000	ug/L	10000	ug/L	20100108														
904	1,2-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108														
907	1,3-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108														
910	1,4-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108	C	Y			26	88	20	C	Y			34	79	20
918	3,3'-Dichlorobenzidine	500000	ug/L	10000	ug/L	20100108														
971	2,4-Dichlorophenol	100000	ug/L	10000	ug/L	20100108														
973	2,6-Dichlorophenol	100000	ug/L	10000	ug/L	20100108														
1082	Diethyl phthalate	100000	ug/L	10000	ug/L	20100108														
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphorc	500000	ug/L	50000	ug/L	20100108														
1099	Dimethoate	200000	ug/L	20000	ug/L	20100108														
1110	p-Dimethylaminoazobenzene	100000	ug/L	10000	ug/L	20100108														
1116	N,N-Dimethylaniline	500000	ug/L			0														
1120	7,12-Dimethylbenz(a)anthracene	200000	ug/L	10000	ug/L	20100108														
1124	3,3'-Dimethylbenzidine	500000	ug/L	50000	ug/L	20100108														
1128	Dimethylformamide	100000	ug/L	10000	ug/L	20100108														
1140	alpha,alpha-Dimethylphenethylamine	500000	ug/L	50000	ug/L	20100108														
1145	2,4-Dimethylphenol	100000	ug/L	10000	ug/L	20100108														
1119	Dimethylphenylamine	500000	ug/L			0														
1149	Dimethyl phthalate	100000	ug/L	10000	ug/L	20100108														
1164	1,3-Dinitrobenzene	100000	ug/L	10000	ug/L	20100108														
2785	1,4-Dinitrobenzene	100000	ug/L	10000	ug/L	20100108														
1167	4,6-Dinitro-2-methylphenol	500000	ug/L	50000	ug/L	20100108														
1187	2,4-Dinitrophenol	500000	ug/L	50000	ug/L	20100108														
1191	2,4-Dinitrotoluene	100000	ug/L	10000	ug/L	20100108	C	Y			44	97	20	C	Y			37	93	20
1193	2,6-Dinitrotoluene	100000	ug/L	10000	ug/L	20100108														
1195	Dinoseb	200000	ug/L	20000	ug/L	20100108														
1196	2-sec-Butyl-4,6-dinitrophenol	200000	ug/L	20000	ug/L	20100108														
1162	Di-n-octyl phthalate	100000	ug/L	10000	ug/L	20100108														
1199	1,4-Dioxane	100000	ug/L	10000	ug/L	20100108														
2944	1,2-Diphenylhydrazine (as Azobenzen	100000	ug/L	10000	ug/L	20100108														
1225	Disulfoton	500000	ug/L	50000	ug/L	20100108														
1362	Ethyl methanesulfonate	100000	ug/L	10000	ug/L	20100108														

Structured Analysis Code: I-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1372	Famphur	1000000	ug/L	10000	ug/L	20100108														
1414	Fluoranthene	100000	ug/L	10000	ug/L	20100108														
1417	Fluorene	100000	ug/L	10000	ug/L	20100108														
1482	Hexachlorobenzene	100000	ug/L	10000	ug/L	20100108	C	Y			42	89	20	C	Y			35	102	20
1489	Hexachlorobutadiene	100000	ug/L	10000	ug/L	20100108	C	Y			31	91	20	C	Y			34	79	20
1492	Hexachlorocyclopentadiene	500000	ug/L	50000	ug/L	20100108														
1491	Hexachloro-1,3-cyclopentadiene	500000	ug/L	50000	ug/L	20100108														
1497	Hexachloroethane	100000	ug/L	10000	ug/L	20100108	C	Y			29	86	20	C	Y			31	80	20
1501	Hexachlorophene	1000000	ug/L	200000	ug/L	20100108														
1511	Hexachloropropene	100000	ug/L	10000	ug/L	20100108														
1535	Indeno(1,2,3-cd)pyrene	100000	ug/L	10000	ug/L	20100108														
1559	Isodrin	100000	ug/L	10000	ug/L	20100108														
1566	Isophorone	100000	ug/L	10000	ug/L	20100108														
1593	Isosafrole	200000	ug/L	20000	ug/L	20100108														
1596	Kepone	1000000	ug/L	100000	ug/L	20100108														
1724	Methapyrilene	500000	ug/L	50000	ug/L	20100108														
1785	2-Methylbenzenamine	200000	ug/L	10000	ug/L	20100108														
1796	3-Methylcholanthrene	200000	ug/L	10000	ug/L	20100108														
1810	4,4'-Methylenebis(2-chloroaniline)	100000	ug/L	20000	ug/L	20100108														
1825	Methyl methanesulfonate	100000	ug/L	10000	ug/L	20100108														
1829	2-Methylnaphthalene	100000	ug/L	10000	ug/L	20100108														
1831	Methyl parathion	500000	ug/L	50000	ug/L	20100108														
1851	2-Methylphenol	100000	ug/L	10000	ug/L	20100108	C	Y			37	88	20	C	Y			35	89	20
2777	3-Methylphenol & 4-Methylphenol	100000	ug/L	20000	ug/L	20100108	C	Y			36	92	20	C	Y			29	96	20
1932	Naphthalene	100000	ug/L	10000	ug/L	20100108														
1940	1,4-Naphthoquinone	500000	ug/L	50000	ug/L	20100108														
1944	1-Naphthylamine	100000	ug/L	10000	ug/L	20100108														
1949	2-Naphthylamine	100000	ug/L	20000	ug/L	20100108														
1960	2-Nitroaniline	500000	ug/L	10000	ug/L	20100108														
1964	3-Nitroaniline	500000	ug/L	10000	ug/L	20100108														
1968	4-Nitroaniline	500000	ug/L	50000	ug/L	20100108														
1972	Nitrobenzene	100000	ug/L	10000	ug/L	20100108	C	Y			43	89	20	C	Y			38	85	20
1998	2-Nitrophenol	100000	ug/L	10000	ug/L	20100108														
2001	4-Nitrophenol	500000	ug/L	50000	ug/L	20100108														
2006	4-Nitroquinoline-1-oxide	1000000	ug/L	100000	ug/L	20100108														
2009	N-Nitrosodi-n-butylamine	100000	ug/L	10000	ug/L	20100108														
2013	N-Nitrosodiethylamine	100000	ug/L	10000	ug/L	20100108														
2018	N-Nitrosodimethylamine	100000	ug/L	10000	ug/L	20100108														
2028	N-Nitrosodiphenylamine	100000	ug/L	10000	ug/L	20100108														

Structured Analysis Code: I-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2024	N-Nitrosodi-n-propylamine	100000	ug/L	10000	ug/L	20100108														
2031	N-Nitrosomethylethylamine	100000	ug/L	10000	ug/L	20100108														
2034	N-Nitrosomorpholine	100000	ug/L	10000	ug/L	20100108														
2036	N-Nitrosopiperidine	100000	ug/L	10000	ug/L	20100108														
2038	N-Nitrosopyrrolidine	100000	ug/L	10000	ug/L	20100108														
2042	N-Nitro-o-toluidine	200000	ug/L	10000	ug/L	20100108														
3597	2,2'-oxybis(1-Chloropropane)	100000	ug/L	10000	ug/L	20100108														
2062	Parathion	500000	ug/L	50000	ug/L	20100108														
2104	Pentachlorobenzene	100000	ug/L	10000	ug/L	20100108														
2108	Pentachloroethane	500000	ug/L	50000	ug/L	20100108														
2112	Pentachloronitrobenzene	500000	ug/L	50000	ug/L	20100108														
2118	Pentachlorophenol	500000	ug/L	50000	ug/L	20100108	C	Y			30	84	20	C	Y			24	82	20
2146	Phenacetin	200000	ug/L	20000	ug/L	20100108														
2154	Phenanthrene	100000	ug/L	10000	ug/L	20100108														
2155	Phenol	100000	ug/L	10000	ug/L	20100108														
2164	p-Phenylene diamine	1000000	ug/L	100000	ug/L	20100108														
2170	Phorate	500000	ug/L	50000	ug/L	20100108														
2206	2-Picoline	200000	ug/L	10000	ug/L	20100108														
2221	Pronamide	200000	ug/L	20000	ug/L	20100108														
2252	Pyrene	100000	ug/L	10000	ug/L	20100108														
2256	Pyridine	200000	ug/L	20000	ug/L	20100108	C	Y			10	75	20	C	Y			10	82	20
2275	Safrole	200000	ug/L	20000	ug/L	20100108														
2462	Sulfotepp	500000	ug/L	50000	ug/L	20100108														
2430	1,2,4,5-Tetrachlorobenzene	100000	ug/L	10000	ug/L	20100108														
2457	2,3,4,6-Tetrachlorophenol	500000	ug/L	10000	ug/L	20100108														
2459	Tetraethyldithiopyrophosphate (Sulfot	500000	ug/L	50000	ug/L	20100108														
1086	Thionazin	500000	ug/L	50000	ug/L	20100108														
1786	o-Toluidine	200000	ug/L	10000	ug/L	20100108														
2721	Tributyl phosphate	100000	ug/L	10000	ug/L	20100108														
2515	1,2,4-Trichlorobenzene	100000	ug/L	10000	ug/L	20100108														
2555	2,4,5-Trichlorophenol	100000	ug/L	10000	ug/L	20100108	C	Y			42	88	20	C	Y			37	91	20
2559	2,4,6-Trichlorophenol	100000	ug/L	10000	ug/L	20100108	C	Y			43	89	20	C	Y			36	90	20
2569	O,O,O-Triethyl phosphorothioate	100000	ug/L	10000	ug/L	20100108														
2597	1,3,5-Trinitrobenzene	500000	ug/L	50000	ug/L	20100108														
5082	Tris(2-chloroethyl)phosphate	100000	ug/L	10000	ug/L	20100108														
1425	2-Fluorobiphenyl						X	Y			31	92	0	X	Y			30	90	0
1426	2-Fluorophenol						X	Y			31	91	0	X	Y			25	92	0
2512	2,4,6-Tribromophenol						X	Y			38	100	0	X	Y			29	111	0
2736	Nitrobenzene-d5						X	Y			41	89	0	X	Y			38	83	0

Structured Analysis Code: I-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2737	Phenol-d5						X	Y			22	90	0	X	Y			18	94	0
2738	Terphenyl-d14						X	Y			39	110	0	X	Y			30	104	0

TAL Reference Data Summary

Structured Analysis Code: **I-39-QL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-W(1312) -> LIQ/LIQ, SEP FUNNEL - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
403	Butyl benzyl phthalate	50	ug/L	5.00	ug/L	20100108														
910	1,4-Dichlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			26	88	20	C	Y			34	79	20
1191	2,4-Dinitrotoluene	50	ug/L	5.00	ug/L	20100108	C	Y			44	97	20	C	Y			37	93	20
1482	Hexachlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			42	89	20	C	Y			35	102	20
1489	Hexachlorobutadiene	50	ug/L	5.00	ug/L	20100108	C	Y			31	91	20	C	Y			34	79	20
1497	Hexachloroethane	50	ug/L	5.00	ug/L	20100108	C	Y			29	86	20	C	Y			31	80	20
1535	Indeno(1,2,3-cd)pyrene	50	ug/L	5.0	ug/L	20100108														
1851	2-Methylphenol	50	ug/L	10.0	ug/L	20100108	C	Y			37	88	20	C	Y			35	89	20
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	5.00	ug/L	20100108	C	Y			36	92	20	C	Y			29	96	20
1972	Nitrobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			43	89	20	C	Y			38	85	20
2118	Pentachlorophenol	250	ug/L	10.00	ug/L	20100108	C	Y			30	84	20	C	Y			24	82	20
2155	Phenol	50	ug/L	20.0	ug/L	20100108														
2256	Pyridine	100	ug/L	25.0	ug/L	20100108	C	Y			10	75	20	C	Y			10	82	20
2555	2,4,5-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			42	88	20	C	Y			37	91	20
2559	2,4,6-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			43	89	20	C	Y			36	90	20
1425	2-Fluorobiphenyl						X	Y			31	92	0	X	Y			30	90	0
1426	2-Fluorophenol						X	Y			31	91	0	X	Y			25	92	0
2512	2,4,6-Tribromophenol						X	Y			38	100	0	X	Y			29	111	0
2736	Nitrobenzene-d5						X	Y			41	89	0	X	Y			38	83	0
2737	Phenol-d5						X	Y			22	90	0	X	Y			18	94	0
2738	Terphenyl-d14						X	Y			39	110	0	X	Y			30	104	0

TAL Reference Data Summary

Structured Analysis Code: **I-5C-QL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LEACHATE,Citrate Buffer, CA Title 22 WET -> SOLVENT E
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
910	1,4-Dichlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			26	88	20	C	Y			34	79	20
1191	2,4-Dinitrotoluene	50	ug/L	5.00	ug/L	20100108	C	Y			44	97	20	C	Y			37	93	20
1482	Hexachlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			42	89	20	C	Y			35	102	20
1489	Hexachlorobutadiene	50	ug/L	5.00	ug/L	20100108	C	Y			31	91	20	C	Y			34	79	20
1497	Hexachloroethane	50	ug/L	5.00	ug/L	20100108	C	Y			29	86	20	C	Y			31	80	20
1596	Kepone	500	ug/L	100	ug/L	20090316														
1851	2-Methylphenol	50	ug/L	10.0	ug/L	20100108	C	Y			37	88	20	C	Y			35	89	20
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	5.00	ug/L	20100108	C	Y			36	92	20	C	Y			29	96	20
1972	Nitrobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			43	89	20	C	Y			38	85	20
2118	Pentachlorophenol	250	ug/L	10.00	ug/L	20100108	C	Y			30	84	20	C	Y			24	82	20
2155	Phenol	50	ug/L	20.0	ug/L	20100108														
2256	Pyridine	100	ug/L	25.0	ug/L	20100108	C	Y			10	75	20	C	Y			10	82	20
2555	2,4,5-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			42	88	20	C	Y			37	91	20
2559	2,4,6-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			43	89	20	C	Y			36	90	20
1425	2-Fluorobiphenyl						X	Y			31	92	0	X	Y			30	90	0
1426	2-Fluorophenol						X	Y			31	91	0	X	Y			25	92	0
2512	2,4,6-Tribromophenol						X	Y			38	100	0	X	Y			29	111	0
2736	Nitrobenzene-d5						X	Y			41	89	0	X	Y			38	83	0
2737	Phenol-d5						X	Y			22	90	0	X	Y			18	94	0
2738	Terphenyl-d14						X	Y			39	110	0	X	Y			30	104	0

TAL Reference Data Summary

Structured Analysis Code: **I-52-QL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6155							Spike List 6156						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	10	ug/L	1.00	ug/L	20110408	C	Y			47	94	20	C	Y			51	96	20
5	Acenaphthylene	10	ug/L	1.00	ug/L	20110408	C	Y			46	99	20	C	Y			45	106	20
24	Acetophenone	10	ug/L	1.12	ug/L	20110408														
30	2-Acetylaminofluorene	100	ug/L	1.00	ug/L	20110408														
93	4-Aminobiphenyl	50	ug/L	1.05	ug/L	20110408														
115	Aniline	10	ug/L	1.27	ug/L	20110408														
122	Anthracene	10	ug/L	1.00	ug/L	20110408	C	Y			59	103	20	C	Y			53	109	20
132	Aramite (total)	20	ug/L	5.00	ug/L	20110408														
158	Atrazine	10	ug/L	1.00	ug/L	20110408														
3352	Azobenzene	10	ug/L	1.00	ug/L	20110408														
3398	Benzaldehyde	10	ug/L	1.00	ug/L	20110408														
199	Benzidine	100	ug/L	20.0	ug/L	20110408														
202	Benzo(a)anthracene	10	ug/L	1.00	ug/L	20110408	C	Y			62	109	20	C	Y			60	112	20
205	Benzo(b)fluoranthene	10	ug/L	1.00	ug/L	20110408	C	Y			60	108	20	C	Y			54	113	20
208	Benzo(k)fluoranthene	10	ug/L	1.00	ug/L	20110408	C	Y			60	107	20	C	Y			54	111	20
209	Benzoic acid	50	ug/L	5.00	ug/L	20110408														
210	Benzo(ghi)perylene	10	ug/L	1.00	ug/L	20110408	C	Y			57	123	20	C	Y			54	118	20
211	Benzo(a)pyrene	10	ug/L	1.00	ug/L	20110408	C	Y			59	104	20	C	Y			54	108	20
3890	Benzothiazole	10	ug/L	1.00	ug/L	20110408														
215	Benzyl alcohol	10	ug/L	1.00	ug/L	20110408														
3474	1,1'-Biphenyl	10	ug/L	1.00	ug/L	20110408														
289	bis(2-Chloroethoxy)methane	10	ug/L	1.00	ug/L	20110408	C	Y			53	99	20	C	Y			48	100	20
293	bis(2-Chloroethyl) ether	10	ug/L	1.00	ug/L	20110408	C	Y			56	92	20	C	Y			52	94	20
298	bis(2-Chloroisopropyl) ether	10	ug/L	1.00	ug/L	20110408														
302	bis(2-Ethylhexyl) phthalate	10	ug/L	1.00	ug/L	20110408	C	Y			56	109	20	C	Y			53	110	20
348	4-Bromophenyl phenyl ether	10	ug/L	1.00	ug/L	20110408	C	Y			57	105	20	C	Y			55	108	20
403	Butyl benzyl phthalate	10	ug/L	1.00	ug/L	20110408	C	Y			58	115	20	C	Y			55	116	20
5101	Caprolactam	10	ug/L	2.00	ug/L	20110408														
2751	Carbazole	10	ug/L	1.00	ug/L	20110408	C	Y			58	102	20	C	Y			54	107	20
518	4-Chloroaniline	10	ug/L	2.20	ug/L	20110408	C	Y			13	73	20	C	Y			10	74	20
2768	Chlorobenzilate	10	ug/L	1.00	ug/L	20110408														
525	p-Chlorobenzilate	10	ug/L	1.00	ug/L	20110408														
578	4-Chloro-3-methylphenol	10	ug/L	1.00	ug/L	20110408	C	Y			49	99	20	C	Y			44	104	20
589	2-Chloronaphthalene	10	ug/L	1.00	ug/L	20110408	C	Y			45	98	20	C	Y			51	98	20
600	2-Chlorophenol	10	ug/L	1.00	ug/L	20110408	C	Y			54	91	20	C	Y			48	99	20
602	4-Chlorophenyl phenyl ether	10	ug/L	1.00	ug/L	20110408	C	Y			54	99	20	C	Y			53	102	20
633	Chrysene	10	ug/L	1.00	ug/L	20110408	C	Y			61	108	20	C	Y			57	111	20

Structured Analysis Code: I-52-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6155							Spike List 6156						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2758	Cresols (total)	20	ug/L	3.00	ug/L	20110408														
673	Cyclohexanol	10	ug/L	2.00	ug/L	20110408														
824	Diallate	20	ug/L	2.00	ug/L	20110408														
860	Dibenz(a,h)anthracene	10	ug/L	1.00	ug/L	20110408	C	Y			57	122	20	C	Y			53	117	20
2669	Dibenzo(a,h)anthracene	10	ug/L	1.00	ug/L	20110408														
863	Dibenzofuran	10	ug/L	1.00	ug/L	20110408	C	Y			52	96	20	C	Y			53	98	20
891	Di-n-butyl phthalate	10	ug/L	1.00	ug/L	20110408	C	Y			58	103	20	C	Y			54	107	20
904	1,2-Dichlorobenzene	10	ug/L	1.00	ug/L	20110408	C	Y			36	85	20	C	Y			40	88	20
907	1,3-Dichlorobenzene	10	ug/L	1.00	ug/L	20110408	C	Y			34	83	20	C	Y			37	86	20
910	1,4-Dichlorobenzene	10	ug/L	1.00	ug/L	20110408	C	Y			36	83	20	C	Y			38	87	20
918	3,3'-Dichlorobenzidine	50	ug/L	1.29	ug/L	20110408	C	Y			24	80	20	C	Y			11	89	20
971	2,4-Dichlorophenol	10	ug/L	1.08	ug/L	20110408	C	Y			50	99	20	C	Y			46	98	20
973	2,6-Dichlorophenol	10	ug/L	1.00	ug/L	20110408														
1082	Diethyl phthalate	10	ug/L	1.00	ug/L	20110408	C	Y			58	100	20	C	Y			57	104	20
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphorc	50	ug/L	1.00	ug/L	20110408														
1099	Dimethoate	20	ug/L	1.00	ug/L	20110408														
1110	p-Dimethylaminoazobenzene	20	ug/L	1.00	ug/L	20110408														
1120	7,12-Dimethylbenz(a)anthracene	20	ug/L	1.00	ug/L	20110408														
1124	3,3'-Dimethylbenzidine	50	ug/L	2.62	ug/L	20110408														
1128	Dimethylformamide	10	ug/L	1.00	ug/L	20110408														
1140	alpha,alpha-Dimethylphenethylamine	50	ug/L	22.1	ug/L	20110408														
1145	2,4-Dimethylphenol	10	ug/L	1.00	ug/L	20110408	C	Y			45	96	20	C	Y			47	101	20
1149	Dimethyl phthalate	10	ug/L	1.00	ug/L	20110408	C	Y			59	99	20	C	Y			55	103	20
1164	1,3-Dinitrobenzene	10	ug/L	1.00	ug/L	20110408														
2785	1,4-Dinitrobenzene	10	ug/L	1.00	ug/L	20110408														
1167	4,6-Dinitro-2-methylphenol	10	ug/L	1.00	ug/L	20110408	C	Y			57	120	20	C	Y			48	129	20
1187	2,4-Dinitrophenol	50	ug/L	2.00	ug/L	20110408	C	Y			29	140	20	C	Y			31	150	20
1191	2,4-Dinitrotoluene	10	ug/L	1.00	ug/L	20110408	C	Y			59	102	20	C	Y			56	106	20
1193	2,6-Dinitrotoluene	10	ug/L	2.16	ug/L	20110408	C	Y			61	104	20	C	Y			58	108	20
1195	Dinoseb	20	ug/L	2.00	ug/L	20110408														
1196	2-sec-Butyl-4,6-dinitrophenol	20	ug/L	2.00	ug/L	20110408														
1162	Di-n-octyl phthalate	10	ug/L	1.00	ug/L	20110408	C	Y			58	114	20	C	Y			54	116	20
1199	1,4-Dioxane	10	ug/L	1.00	ug/L	20110408														
2944	1,2-Diphenylhydrazine (as Azobenzen	10	ug/L	1.00	ug/L	20110408														
1225	Disulfoton	50	ug/L	1.00	ug/L	20110408														
1360	Ethyl methacrylate	10	ug/L	1.00	ug/L	20110408														
1362	Ethyl methanesulfonate	10	ug/L	1.00	ug/L	20110408														
1372	Famphur	100	ug/L	1.70	ug/L	20110408														
1414	Fluoranthene	10	ug/L	1.00	ug/L	20110408	C	Y			60	106	20	C	Y			56	110	20

Structured Analysis Code: I-52-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6155							Spike List 6156						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1417	Fluorene	10	ug/L	1.00	ug/L	20110408	C	Y			55	99	20	C	Y			57	101	20
1482	Hexachlorobenzene	10	ug/L	1.00	ug/L	20110408	C	Y			59	106	20	C	Y			56	109	20
1489	Hexachlorobutadiene	10	ug/L	1.00	ug/L	20110408	C	Y			29	94	20	C	Y			30	99	20
1492	Hexachlorocyclopentadiene	10	ug/L	1.00	ug/L	20110408	C	Y			10	99	20	C	Y			10	111	20
1491	Hexachloro-1,3-cyclopentadiene	10	ug/L	1.00	ug/L	20110408														
1497	Hexachloroethane	10	ug/L	1.00	ug/L	20110408	C	Y			33	84	20	C	Y			36	88	20
1501	Hexachlorophene	100	ug/L	10.0	ug/L	20110408														
1511	Hexachloropropene	100	ug/L	1.00	ug/L	20110408														
1535	Indeno(1,2,3-cd)pyrene	10	ug/L	1.00	ug/L	20110408	C	Y			50	134	20	C	Y			52	120	20
1559	Isodrin	10	ug/L	1.00	ug/L	20110408														
1566	Isophorone	10	ug/L	1.00	ug/L	20110408	C	Y			51	108	20	C	Y			46	108	20
1593	Isosafrole	20	ug/L	1.30	ug/L	20110408														
1596	Kepone	100	ug/L	20.0	ug/L	20110408														
1724	Methapyrilene	50	ug/L	1.26	ug/L	20110408														
1785	2-Methylbenzenamine	20	ug/L	1.00	ug/L	20110408														
1796	3-Methylcholanthrene	20	ug/L	1.00	ug/L	20110408														
1810	4,4'-Methylenebis(2-chloroaniline)	10	ug/L	1.00	ug/L	20110408														
1823	Methyl methacrylate	10	ug/L	1.00	ug/L	20110408														
1825	Methyl methanesulfonate	10	ug/L	1.00	ug/L	20110408														
1829	2-Methylnaphthalene	10	ug/L	1.00	ug/L	20110408	C	Y			37	90	20	C	Y			38	93	20
1831	Methyl parathion	10	ug/L	1.00	ug/L	20110408														
1851	2-Methylphenol	10	ug/L	1.00	ug/L	20110408	C	Y			46	84	20	C	Y			42	98	20
2777	3-Methylphenol & 4-Methylphenol	10	ug/L	2.00	ug/L	20110408	C	Y			41	77	20	C	Y			37	97	20
2759	2-Methylphenol, 3-methylphenol and 4	20	ug/L	3.00	ug/L	20110408														
2756	Methylphenols (total)	20	ug/L	3.00	ug/L	20110408														
1932	Naphthalene	10	ug/L	1.00	ug/L	20110408	C	Y			38	87	20	C	Y			36	90	20
1940	1,4-Naphthoquinone	50	ug/L	2.32	ug/L	20110408														
1944	1-Naphthylamine	10	ug/L	1.21	ug/L	20110408														
1949	2-Naphthylamine	10	ug/L	1.00	ug/L	20110408														
1960	2-Nitroaniline	10	ug/L	1.00	ug/L	20110408	C	Y			56	102	20	C	Y			45	111	20
1964	3-Nitroaniline	10	ug/L	1.00	ug/L	20110408	C	Y			23	76	20	C	Y			21	76	20
1968	4-Nitroaniline	10	ug/L	1.00	ug/L	20110408	C	Y			52	97	20	C	Y			35	111	20
1972	Nitrobenzene	10	ug/L	1.09	ug/L	20110408	C	Y			48	96	20	C	Y			44	98	20
1998	2-Nitrophenol	10	ug/L	1.00	ug/L	20110408	C	Y			50	100	20	C	Y			47	99	20
2001	4-Nitrophenol	10	ug/L	2.00	ug/L	20110408	C	Y			18	49	20	C	Y			14	81	20
2006	4-Nitroquinoline-1-oxide	100	ug/L	5.00	ug/L	20110408														
2009	N-Nitrosodi-n-butylamine	10	ug/L	1.00	ug/L	20110408														
2013	N-Nitrosodiethylamine	10	ug/L	1.08	ug/L	20110408														
2018	N-Nitrosodimethylamine	10	ug/L	2.00	ug/L	20110408														

Structured Analysis Code: I-52-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6155							Spike List 6156						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2028	N-Nitrosodiphenylamine	10	ug/L	1.00	ug/L	20110408	C	Y			60	134	20	C	Y			62	135	20
2024	N-Nitrosodi-n-propylamine	10	ug/L	1.00	ug/L	20110408	C	Y			61	108	20	C	Y			55	113	20
2031	N-Nitrosomethylethylamine	10	ug/L	1.00	ug/L	20110408														
2034	N-Nitrosomorpholine	10	ug/L	1.16	ug/L	20110408														
2036	N-Nitrosopiperidine	10	ug/L	1.05	ug/L	20110408														
2038	N-Nitrosopyrrolidine	10	ug/L	1.00	ug/L	20110408														
2046	5-Nitro-o-toluidine	20	ug/L	1.00	ug/L	20110408														
3597	2,2'-oxybis(1-Chloropropane)	10	ug/L	1.00	ug/L	20110408	C	Y			48	95	20	C	Y			49	97	20
2062	Parathion	50	ug/L	1.00	ug/L	20110408														
2104	Pentachlorobenzene	10	ug/L	1.00	ug/L	20110408														
2108	Pentachloroethane	50	ug/L	1.28	ug/L	20110408														
2112	Pentachloronitrobenzene	50	ug/L	1.00	ug/L	20110408														
2118	Pentachlorophenol	10	ug/L	1.27	ug/L	20110408	C	Y			54	123	20	C	Y			53	124	20
2146	Phenacetin	20	ug/L	1.00	ug/L	20110408														
2154	Phenanthrene	10	ug/L	1.00	ug/L	20110408	C	Y			59	102	20	C	Y			55	105	20
2155	Phenol	10	ug/L	2.00	ug/L	20110408	C	Y			21	49	20	C	Y			17	75	20
2164	p-Phenylene diamine	100	ug/L	1.00	ug/L	20110408														
2170	Phorate	50	ug/L	1.00	ug/L	20110408														
2206	2-Picoline	20	ug/L	2.00	ug/L	20110408														
2221	Pronamide	20	ug/L	1.00	ug/L	20110408														
2252	Pyrene	10	ug/L	1.00	ug/L	20110408	C	Y			58	109	20	C	Y			53	111	20
2256	Pyridine	20	ug/L	2.00	ug/L	20110408														
2275	Safrole	20	ug/L	1.00	ug/L	20110408														
2462	Sulfotepp	50	ug/L	1.00	ug/L	20110408														
2430	1,2,4,5-Tetrachlorobenzene	10	ug/L	1.00	ug/L	20110408														
2457	2,3,4,6-Tetrachlorophenol	50	ug/L	1.17	ug/L	20110408														
2459	Tetraethyldithiopyrophosphate (Sulfot	50	ug/L	1.00	ug/L	20110408														
1086	Thionazin	50	ug/L	1.00	ug/L	20110408														
1786	o-Toluidine	20	ug/L	1.00	ug/L	20110408														
2721	Tributyl phosphate	10	ug/L	1.00	ug/L	20110408														
2515	1,2,4-Trichlorobenzene	10	ug/L	1.00	ug/L	20110408	C	Y			34	90	20	C	Y			34	95	20
2555	2,4,5-Trichlorophenol	10	ug/L	1.00	ug/L	20110408	C	Y			60	100	20	C	Y			55	105	20
2559	2,4,6-Trichlorophenol	10	ug/L	1.00	ug/L	20110408	C	Y			59	99	20	C	Y			53	103	20
2569	O,O,O-Triethyl phosphorothioate	50	ug/L	1.14	ug/L	20110408														
2597	1,3,5-Trinitrobenzene	50	ug/L	1.20	ug/L	20110408														
5082	Tris(2-chloroethyl)phosphate	10	ug/L	1.00	ug/L	20110408														
5738	1-Methyl naphthalene	10	ug/L	1.00	ug/L	20110408														
1425	2-Fluorobiphenyl						X	Y			47	99	0	X	Y			50	100	0
1426	2-Fluorophenol						X	Y			32	66	0	X	Y			27	88	0

Structured Analysis Code: I-52-QL-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (A/B/N) - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6155							Spike List 6156						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2512	2,4,6-Tribromophenol						X	Y			60	110	0	X	Y			53	115	0
2736	Nitrobenzene-d5						X	Y			49	99	0	X	Y			45	100	0
2737	Phenol-d5						X	Y			21	43	0	X	Y			16	72	0
2738	Terphenyl-d14						X	Y			64	119	0	X	Y			56	122	0

TAL Reference Data Summary

Structured Analysis Code: **I-62-QL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> LIQ/LIQ, SEP FUNNEL - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
910	1,4-Dichlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			26	88	20	C	Y			34	79	20
1191	2,4-Dinitrotoluene	50	ug/L	5.00	ug/L	20100108	C	Y			44	97	20	C	Y			37	93	20
1482	Hexachlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			42	89	20	C	Y			35	102	20
1489	Hexachlorobutadiene	50	ug/L	5.00	ug/L	20100108	C	Y			31	91	20	C	Y			34	79	20
1497	Hexachloroethane	50	ug/L	5.00	ug/L	20100108	C	Y			29	86	20	C	Y			31	80	20
1851	2-Methylphenol	50	ug/L	10.0	ug/L	20100108	C	Y			37	88	20	C	Y			35	89	20
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	5.00	ug/L	20100108	C	Y			36	92	20	C	Y			29	96	20
1972	Nitrobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			43	89	20	C	Y			38	85	20
2118	Pentachlorophenol	250	ug/L	10.00	ug/L	20100108	C	Y			30	84	20	C	Y			24	82	20
2155	Phenol	50	ug/L	20.0	ug/L	20100108														
2256	Pyridine	100	ug/L	25.0	ug/L	20100108	C	Y			10	75	20	C	Y			10	82	20
2555	2,4,5-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			42	88	20	C	Y			37	91	20
2559	2,4,6-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			43	89	20	C	Y			36	90	20
1425	2-Fluorobiphenyl						X	Y			31	92	0	X	Y			30	90	0
1426	2-Fluorophenol						X	Y			31	91	0	X	Y			25	92	0
2512	2,4,6-Tribromophenol						X	Y			38	100	0	X	Y			29	111	0
2736	Nitrobenzene-d5						X	Y			41	89	0	X	Y			38	83	0
2737	Phenol-d5						X	Y			22	90	0	X	Y			18	94	0
2738	Terphenyl-d14						X	Y			39	110	0	X	Y			30	104	0

TAL Reference Data Summary

Structured Analysis Code: **A-KC-QL-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311)-> Low Level Liq/Liq CONT., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 0							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
910	1,4-Dichlorobenzene	20	ug/L	0.82	ug/L	20030122														
1191	2,4-Dinitrotoluene	20	ug/L	1.24	ug/L	20030122														
1482	Hexachlorobenzene	20	ug/L	0.94	ug/L	20030122														
1489	Hexachlorobutadiene	20	ug/L	0.82	ug/L	20030122														
1497	Hexachloroethane	20	ug/L	0.48	ug/L	20030122														
1851	2-Methylphenol	20	ug/L	0.48	ug/L	20030220														
1857	4-Methylphenol	20	ug/L	14.28	ug/L	20011115														
2777	3-Methylphenol & 4-Methylphenol	20	ug/L	0.62	ug/L	20030220														
1972	Nitrobenzene	20	ug/L	0.68	ug/L	20030122														
2118	Pentachlorophenol	100	ug/L	1.16	ug/L	20030220														
2155	Phenol	20	ug/L	0.52	ug/L	20030220														
2256	Pyridine	40	ug/L	3.66	ug/L	20030122														
2555	2,4,5-Trichlorophenol	20	ug/L	1.28	ug/L	20030220														
2559	2,4,6-Trichlorophenol	20	ug/L	0.88	ug/L	20030220														

TAL Reference Data Summary

Structured Analysis Code: **A-KD-QL-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	10	ug/L	1.00	ug/L	20100108														
5	Acenaphthylene	10	ug/L	1.00	ug/L	20100108														
24	Acetophenone	10	ug/L	1.00	ug/L	20100113														
30	2-Acetylaminofluorene	100	ug/L	1.00	ug/L	20100112														
93	4-Aminobiphenyl	50	ug/L	1.05	ug/L	20100112														
115	Aniline	10	ug/L	1.00	ug/L	20100108														
122	Anthracene	10	ug/L	1.00	ug/L	20100108														
132	Aramite (total)	20	ug/L	5.00	ug/L	20100108														
3303	Aramite 1	20	ug/L	1	ug/L	20080314														
3304	Aramite 2	20	ug/L	1	ug/L	20080314														
158	Atrazine	10	ug/L	1.00	ug/L	20100113														
3352	Azobenzene	10	ug/L	1.00	ug/L	20100108														
3398	Benzaldehyde	10	ug/L	1.00	ug/L	20100113														
2932	Benzenethiol	10	ug/L	1.96	ug/L	20051130														
199	Benzidine	100	ug/L	20.0	ug/L	20080925														
202	Benzo(a)anthracene	10	ug/L	1.00	ug/L	20100108														
205	Benzo(b)fluoranthene	10	ug/L	1.00	ug/L	20100108														
208	Benzo(k)fluoranthene	10	ug/L	1.00	ug/L	20100108														
209	Benzoic acid	50	ug/L	5.00	ug/L	20051220														
210	Benzo(ghi)perylene	10	ug/L	1.00	ug/L	20100108														
211	Benzo(a)pyrene	10	ug/L	1.00	ug/L	20100108														
3890	Benzothiazole	10	ug/L	1.00	ug/L	20100112														
215	Benzyl alcohol	10	ug/L	1.00	ug/L	20100108														
3474	1,1'-Biphenyl	10	ug/L	1.00	ug/L	20100113														
5682	Bis(p-chlorophenyl)-disulfide	10	ug/L	10	ug/L	20040521														
289	bis(2-Chloroethoxy)methane	10	ug/L	1.00	ug/L	20100108														
293	bis(2-Chloroethyl) ether	10	ug/L	1.00	ug/L	20100108														
298	bis(2-Chloroisopropyl) ether	10	ug/L	1.00	ug/L	20100108														
302	bis(2-Ethylhexyl) phthalate	10	ug/L	1.00	ug/L	20100108														
348	4-Bromophenyl phenyl ether	10	ug/L	1.00	ug/L	20100108														
5359	n-Butylbenzenesulfonamide	20	ug/L	2.74	ug/L	20011119														
403	Butyl benzyl phthalate	10	ug/L	1.00	ug/L	20100108														
5101	Caprolactam	10	ug/L	2.00	ug/L	20100113														
2751	Carbazole	10	ug/L	1.00	ug/L	20100108														
518	4-Chloroaniline	10	ug/L	1.00	ug/L	20100108														
2768	Chlorobenzilate	10	ug/L	1.00	ug/L	20100112														
525	p-Chlorobenzilate	10	ug/L	1.00	ug/L	20100112														

Structured Analysis Code: A-KD-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
578	4-Chloro-3-methylphenol	10	ug/L	1.00	ug/L	20100108														
589	2-Chloronaphthalene	10	ug/L	1.00	ug/L	20100108														
600	2-Chlorophenol	10	ug/L	1.00	ug/L	20100108														
602	4-Chlorophenyl phenyl ether	10	ug/L	1.00	ug/L	20100108														
633	Chrysene	10	ug/L	1.00	ug/L	20100108														
673	Cyclohexanol	10	ug/L	2.00	ug/L	20100108														
824	Diallate	20	ug/L	2.00	ug/L	20100112														
860	Dibenz(a,h)anthracene	10	ug/L	1.00	ug/L	20100108														
2669	Dibenzo(a,h)anthracene	10	ug/L	1.00	ug/L	20100108														
863	Dibenzofuran	10	ug/L	1.00	ug/L	20100108														
865	Dibenzo(a,e)pyrene	10	ug/L			0														
891	Di-n-butyl phthalate	10	ug/L	1.00	ug/L	20100108														
904	1,2-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108														
907	1,3-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108														
910	1,4-Dichlorobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			40	93	20	C	Y			35	93	20
918	3,3'-Dichlorobenzidine	50	ug/L	1.00	ug/L	20100108														
971	2,4-Dichlorophenol	10	ug/L	1.00	ug/L	20100108														
973	2,6-Dichlorophenol	10	ug/L	1.00	ug/L	20100112														
1082	Diethyl phthalate	10	ug/L	1.00	ug/L	20100108														
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphorc	50	ug/L	1.00	ug/L	20100112														
1099	Dimethoate	20	ug/L	1.00	ug/L	20100112														
1110	p-Dimethylaminoazobenzene	20	ug/L	1.00	ug/L	20100112														
1116	N,N-Dimethylaniline	50	ug/L	50	ug/L	20080307														
1120	7,12-Dimethylbenz(a)anthracene	20	ug/L	1.00	ug/L	20100112														
1124	3,3'-Dimethylbenzidine	50	ug/L	2.62	ug/L	20080515														
1128	Dimethylformamide	10	ug/L	1.00	ug/L	20051219														
1140	alpha,alpha-Dimethylphenethylamine	50	ug/L	22.1	ug/L	20080925														
1145	2,4-Dimethylphenol	10	ug/L	1.00	ug/L	20100108														
1149	Dimethyl phthalate	10	ug/L	1.00	ug/L	20100108														
1164	1,3-Dinitrobenzene	10	ug/L	1.00	ug/L	20100112														
2785	1,4-Dinitrobenzene	10	ug/L	1.00	ug/L	20100112														
1167	4,6-Dinitro-2-methylphenol	50	ug/L	1.00	ug/L	20100108														
1187	2,4-Dinitrophenol	50	ug/L	2.00	ug/L	20100108														
1191	2,4-Dinitrotoluene	10	ug/L	1.00	ug/L	20100108	C	Y			49	95	20	C	Y			52	100	20
1193	2,6-Dinitrotoluene	10	ug/L	2.16	ug/L	20100108														
1195	Dinoseb	20	ug/L	2.00	ug/L	20100112														
1196	2-sec-Butyl-4,6-dinitrophenol	20	ug/L	2.00	ug/L	20100112														
1162	Di-n-octyl phthalate	10	ug/L	1.00	ug/L	20100108														
1199	1,4-Dioxane	10	ug/L	1.00	ug/L	20100108														

Structured Analysis Code: A-KD-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5685	Phenyl disulfide	10	ug/L	1.00	ug/L	20080318														
2944	1,2-Diphenylhydrazine (as Azobenzen	10	ug/L	1.00	ug/L	20100108														
1225	Disulfoton	50	ug/L	1.00	ug/L	20100112														
1360	Ethyl methacrylate	10	ug/L	1.00	ug/L	20100113														
1362	Ethyl methanesulfonate	10	ug/L	1.00	ug/L	20100112														
1372	Famphur	100	ug/L	1.70	ug/L	20080314														
1414	Fluoranthene	10	ug/L	1.00	ug/L	20100108														
1417	Fluorene	10	ug/L	1.00	ug/L	20100108														
1482	Hexachlorobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			46	87	20	C	Y			46	90	20
1489	Hexachlorobutadiene	10	ug/L	1.00	ug/L	20100108	C	Y			30	95	20	C	Y			29	96	20
1492	Hexachlorocyclopentadiene	50	ug/L	1.00	ug/L	20100108														
1491	Hexachloro-1,3-cyclopentadiene	50	ug/L	1.00	ug/L	20100108														
1497	Hexachloroethane	10	ug/L	1.00	ug/L	20100108	C	Y			25	97	20	C	Y			23	104	20
1501	Hexachlorophene	100	ug/L	10.0	ug/L	20051222														
1511	Hexachloropropene	100	ug/L	1.00	ug/L	20100112														
1535	Indeno(1,2,3-cd)pyrene	10	ug/L	1.00	ug/L	20100108														
1559	Isodrin	10	ug/L	1.00	ug/L	20100112														
1566	Isophorone	10	ug/L	1.00	ug/L	20100108														
1593	Isosafrole	20	ug/L	1.30	ug/L	20100112														
1596	Kepone	100	ug/L	20.0	ug/L	20090313														
1724	Methapyrilene	50	ug/L	1.26	ug/L	20100112														
1785	2-Methylbenzenamine	20	ug/L	1.00	ug/L	20100112														
1796	3-Methylcholanthrene	20	ug/L	1.00	ug/L	20100112														
1810	4,4'-Methylenebis(2-chloroaniline)	10	ug/L	1.00	ug/L	20100112														
1823	Methyl methacrylate	10	ug/L	1.00	ug/L	20100113														
1825	Methyl methanesulfonate	10	ug/L	1.00	ug/L	20100112														
1829	2-Methylnaphthalene	10	ug/L	1.00	ug/L	20100108														
1831	Methyl parathion	50	ug/L	1.00	ug/L	20100112														
1851	2-Methylphenol	10	ug/L	1.00	ug/L	20100108	C	Y			51	99	20	C	Y			44	106	20
1857	4-Methylphenol	20	ug/L	1.51	ug/L	20011114														
2777	3-Methylphenol & 4-Methylphenol	10	ug/L	2.00	ug/L	20100108	C	Y			53	96	20	C	Y			49	100	20
5683	N-(Hydroxymethyl)phthalimide	10	ug/L	1.361	ug/L	20051130														
1932	Naphthalene	10	ug/L	1.00	ug/L	20100108														
1940	1,4-Naphthoquinone	50	ug/L	1.00	ug/L	20100112														
1944	1-Naphthylamine	10	ug/L	1.00	ug/L	20100112														
1949	2-Naphthylamine	10	ug/L	1.00	ug/L	20100112														
1960	2-Nitroaniline	50	ug/L	1.00	ug/L	20100108														
1964	3-Nitroaniline	50	ug/L	1.00	ug/L	20100108														
1968	4-Nitroaniline	50	ug/L	1.00	ug/L	20100108														

Structured Analysis Code: A-KD-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1972	Nitrobenzene	10	ug/L	1.00	ug/L	20100108	C	Y			45	95	20	C	Y			44	102	20
1998	2-Nitrophenol	10	ug/L	1.00	ug/L	20100108														
2001	4-Nitrophenol	50	ug/L	2.00	ug/L	20090316														
2006	4-Nitroquinoline-1-oxide	100	ug/L	5.00	ug/L	20080515														
2009	N-Nitrosodi-n-butylamine	10	ug/L	1.00	ug/L	20100112														
2013	N-Nitrosodiethylamine	10	ug/L	1.00	ug/L	20100112														
2018	N-Nitrosodimethylamine	10	ug/L	2.00	ug/L	20090316														
2028	N-Nitrosodiphenylamine	10	ug/L	1.00	ug/L	20100108														
2024	N-Nitrosodi-n-propylamine	10	ug/L	1.00	ug/L	20100108														
2031	N-Nitrosomethylethylamine	10	ug/L	1.00	ug/L	20100112														
2034	N-Nitrosomorpholine	10	ug/L	1.00	ug/L	20100112														
2036	N-Nitrosopiperidine	10	ug/L	1.00	ug/L	20100112														
2038	N-Nitrosopyrrolidine	10	ug/L	1.00	ug/L	20100112														
2042	N-Nitro-o-toluidine	20	ug/L	1.00	ug/L	20100112														
2046	5-Nitro-o-toluidine	20	ug/L	1.00	ug/L	20100112														
3597	2,2'-oxybis(1-Chloropropane)	10	ug/L	1.00	ug/L	20100108														
2062	Parathion	50	ug/L	1.00	ug/L	20100112														
2104	Pentachlorobenzene	10	ug/L	1.00	ug/L	20100112														
2108	Pentachloroethane	50	ug/L	1.00	ug/L	20100112														
2112	Pentachloronitrobenzene	50	ug/L	1.00	ug/L	20100112														
2118	Pentachlorophenol	50	ug/L	1.27	ug/L	20100108	C	Y			35	98	20	C	Y			35	108	20
2146	Phenacetin	20	ug/L	1.00	ug/L	20100112														
2154	Phenanthrene	10	ug/L	1.00	ug/L	20100108														
2155	Phenol	10	ug/L	2.00	ug/L	20100108														
5686	Phenyl sulfide	10	ug/L	1.00	ug/L	20080318														
5687	Phenyl sulfone	10	ug/L	1.00	ug/L	20080318														
2164	p-Phenylene diamine	100	ug/L	1.00	ug/L	20030225														
2170	Phorate	50	ug/L	1.00	ug/L	20100112														
3171	Phthalic acid	10	ug/L	395.86	ug/L	20051115														
2858	Phthalic anhydride	10	ug/L	395.86	ug/L	20051115														
2206	2-Picoline	20	ug/L	2.00	ug/L	20100112														
2221	Pronamide	20	ug/L	1.00	ug/L	20100112														
2252	Pyrene	10	ug/L	1.00	ug/L	20100108														
2256	Pyridine	20	ug/L	2.00	ug/L	20100108	C	Y			10	72	20	C	Y			10	80	20
2275	Safrole	20	ug/L	1.00	ug/L	20100112														
2462	Sulfotepp	50	ug/L	1.00	ug/L	20100112														
2430	1,2,4,5-Tetrachlorobenzene	10	ug/L	1.00	ug/L	20100112														
2457	2,3,4,6-Tetrachlorophenol	50	ug/L	1.00	ug/L	20100112														
2459	Tetraethyldithiopyrophosphate (Sulfot	50	ug/L	1.00	ug/L	20100112														

Structured Analysis Code: A-KD-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311)-> Low Level Liq/Liq SEPF., Acid -> Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1086	Thionazin	50	ug/L	1.00	ug/L	20100112														
2745	Toluene diamine (2,4- + 2,6- isomers)	50	ug/L			0														
5391	Toluene Diamine, Total	50	ug/L			0														
1786	o-Toluidine	20	ug/L	1.00	ug/L	20100112														
2512	2,4,6-Tribromophenol	10	ug/L			0	X	Y			48	95	0	X	Y			50	101	0
2721	Tributyl phosphate	10	ug/L	1.00	ug/L	20100112														
2515	1,2,4-Trichlorobenzene	10	ug/L	1.00	ug/L	20100108														
2555	2,4,5-Trichlorophenol	10	ug/L	1.00	ug/L	20100108	C	Y			47	92	20	C	Y			47	96	20
2559	2,4,6-Trichlorophenol	10	ug/L	1.00	ug/L	20100108	C	Y			47	88	20	C	Y			48	96	20
2569	O,O,O-Triethyl phosphorothioate	50	ug/L	1.00	ug/L	20100112														
2597	1,3,5-Trinitrobenzene	50	ug/L	1.00	ug/L	20100112														
5082	Tris(2-chloroethyl)phosphate	10	ug/L	1.00	ug/L	20100112														
5738	1-Methyl naphthalene	10	ug/L	1.00	ug/L	20100113														
5688	4-Chlorobenzenethiol	10	ug/L	2.626	ug/L	20051130														
5690	4-Chlorophenyl sulfone	10	ug/L	1.00	ug/L	20080303														
1425	2-Fluorobiphenyl						X	Y			42	94	0	X	Y			42	95	0
1426	2-Fluorophenol						X	Y			42	93	0	X	Y			38	98	0
2736	Nitrobenzene-d5						X	Y			48	97	0	X	Y			45	102	0
2737	Phenol-d5						X	Y			44	92	0	X	Y			40	95	0
2738	Terphenyl-d14						X	Y			57	118	0	X	Y			56	118	0

TAL Reference Data Summary

Structured Analysis Code: A-MU-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; Sonication
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	95	20	C	Y			45	100	30
5	Acenaphthylene	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	104	20	C	Y			48	105	30
24	Acetophenone	330	ug/kg	33.3	ug/kg	20110405														
30	2-Acetylaminofluorene	3300	ug/kg	33.3	ug/kg	20110405														
93	4-Aminobiphenyl	1600	ug/kg	330	ug/kg	20110405														
115	Aniline	330	ug/kg	33.3	ug/kg	20110405	C	Y			40	87	20	C	Y			19	87	30
122	Anthracene	330	ug/kg	33.3	ug/kg	20110405	C	Y			58	107	20	C	Y			48	109	30
132	Aramite (total)	660	ug/kg	330	ug/kg	20110405														
158	Atrazine	330	ug/kg	33.3	ug/kg	20110405														
3352	Azobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			51	114	20	C	Y			48	110	30
3398	Benzaldehyde	330	ug/kg	33.3	ug/kg	20110405														
199	Benzidine	330	ug/kg	33.3	ug/kg	20110405														
202	Benzo(a)anthracene	330	ug/kg	33.3	ug/kg	20110405	C	Y			62	111	20	C	Y			50	114	30
205	Benzo(b)fluoranthene	330	ug/kg	33.3	ug/kg	20110405	C	Y			60	112	20	C	Y			42	122	30
208	Benzo(k)fluoranthene	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	109	20	C	Y			41	118	30
209	Benzoic acid	1600	ug/kg	330	ug/kg	20110405	C	Y			10	80	20	C	Y			10	87	30
210	Benzo(ghi)perylene	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	122	20	C	Y			20	137	30
211	Benzo(a)pyrene	330	ug/kg	33.3	ug/kg	20110405	C	Y			60	109	20	C	Y			47	112	30
215	Benzyl alcohol	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	109	20	C	Y			47	114	30
3474	1,1'-Biphenyl	330	ug/kg	33.3	ug/kg	20110405														
289	bis(2-Chloroethoxy)methane	330	ug/kg	33.3	ug/kg	20110405	C	Y			50	100	20	C	Y			44	101	30
293	bis(2-Chloroethyl) ether	330	ug/kg	33.4	ug/kg	20110405	C	Y			52	93	20	C	Y			46	91	30
298	bis(2-Chloroisopropyl) ether	330	ug/kg	33.3	ug/kg	20110405														
302	bis(2-Ethylhexyl) phthalate	330	ug/kg	45.3	ug/kg	20110405	C	Y			54	111	20	C	Y			43	114	30
348	4-Bromophenyl phenyl ether	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	108	20	C	Y			54	109	30
403	Butyl benzyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	115	20	C	Y			47	114	30
5101	Caprolactam	330	ug/kg	33.3	ug/kg	20110405														
2751	Carbazole	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	102	20	C	Y			46	107	30
518	4-Chloroaniline	330	ug/kg	33.3	ug/kg	20110405	C	Y			23	80	20	C	Y			11	93	30
2768	Chlorobenzilate	330	ug/kg	33.3	ug/kg	20110405														
525	p-Chlorobenzilate	330	ug/kg	33.3	ug/kg	20110405														
578	4-Chloro-3-methylphenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			48	105	20	C	Y			42	110	30
589	2-Chloronaphthalene	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	102	30	C	Y			51	100	30
600	2-Chlorophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	97	20	C	Y			33	107	30
602	4-Chlorophenyl phenyl ether	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	103	20	C	Y			53	105	30
633	Chrysene	330	ug/kg	33.3	ug/kg	20110405	C	Y			60	109	20	C	Y			49	111	30
673	Cyclohexanol	330	ug/kg	33.3	ug/kg	20110405														

Structured Analysis Code: A-MU-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; Sonication
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
824	Diallate	660	ug/kg	66.6	ug/kg	20110405														
860	Dibenz(a,h)anthracene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	121	20	C	Y			31	129	30
2669	Dibenzo(a,h)anthracene	330	ug/kg	33.3	ug/kg	20110405														
863	Dibenzofuran	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	100	20	C	Y			51	101	30
891	Di-n-butyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			55	104	20	C	Y			48	108	30
904	1,2-Dichlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			52	92	30	C	Y			45	88	30
907	1,3-Dichlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			52	90	30	C	Y			42	87	30
910	1,4-Dichlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			51	92	30	C	Y			45	87	30
918	3,3'-Dichlorobenzidine	1600	ug/kg	33.3	ug/kg	20110405	C	Y			30	77	20	C	Y			10	107	30
971	2,4-Dichlorophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	105	20	C	Y			30	113	30
973	2,6-Dichlorophenol	330	ug/kg	33.3	ug/kg	20110405														
1082	Diethyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	100	20	C	Y			50	105	30
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphorc	1600	ug/kg	330	ug/kg	20110405														
1099	Dimethoate	660	ug/kg	33.3	ug/kg	20110405														
1110	p-Dimethylaminoazobenzene	660	ug/kg	33.3	ug/kg	20110405														
1120	7,12-Dimethylbenz(a)anthracene	660	ug/kg	33.3	ug/kg	20110405														
1124	3,3'-Dimethylbenzidine	1600	ug/kg	330	ug/kg	20110405														
1128	Dimethylformamide	330	ug/kg	68.4	ug/kg	20110405														
1140	alpha,alpha-Dimethylphenethylamine	1600	ug/kg	76.7	ug/kg	20110405														
1145	2,4-Dimethylphenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			48	105	20	C	Y			41	108	30
1149	Dimethyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	100	20	C	Y			50	104	30
1164	1,3-Dinitrobenzene	330	ug/kg	33.3	ug/kg	20110405														
2785	1,4-Dinitrobenzene	330	ug/kg	33.3	ug/kg	20110405														
1167	4,6-Dinitro-2-methylphenol	1600	ug/kg	330	ug/kg	20110405	C	Y			19	114	20	C	Y			10	132	30
1187	2,4-Dinitrophenol	1600	ug/kg	330	ug/kg	20110405	C	Y			10	108	20	C	Y			10	133	30
1191	2,4-Dinitrotoluene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	103	20	C	Y			52	106	30
1193	2,6-Dinitrotoluene	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	104	20	C	Y			54	109	30
1195	Dinoseb	660	ug/kg	330	ug/kg	20110405														
1196	2-sec-Butyl-4,6-dinitrophenol	660	ug/kg	330	ug/kg	20110405														
1162	Di-n-octyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	104	20	C	Y			48	118	30
1199	1,4-Dioxane	330	ug/kg	33.3	ug/kg	20110405														
1212	Diphenylamine	330	ug/kg	33.3	ug/kg	20110405														
2944	1,2-Diphenylhydrazine (as Azobenzen	330	ug/kg	33.3	ug/kg	20110405														
1225	Disulfoton	1600	ug/kg	33.3	ug/kg	20110405														
1360	Ethyl methacrylate	330	ug/kg	33.3	ug/kg	20110405														
1362	Ethyl methanesulfonate	330	ug/kg	33.3	ug/kg	20110405														
1372	Famphur	3300	ug/kg	33.3	ug/kg	20110405														
1414	Fluoranthene	330	ug/kg	33.3	ug/kg	20110405	C	Y			58	109	20	C	Y			39	119	30
1417	Fluorene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	101	20	C	Y			48	106	30

Structured Analysis Code: A-MU-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; Sonication
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1482	Hexachlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	109	20	C	Y			54	110	30
1489	Hexachlorobutadiene	330	ug/kg	33.3	ug/kg	20110405	C	Y			45	113	20	C	Y			44	106	30
1492	Hexachlorocyclopentadiene	1600	ug/kg	330	ug/kg	20110405	C	Y			35	125	20	C	Y			10	128	30
1491	Hexachloro-1,3-cyclopentadiene	1600	ug/kg	330	ug/kg	20110405														
1497	Hexachloroethane	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	94	20	C	Y			44	88	30
1501	Hexachlorophene	3300	ug/kg	236.23	ug/kg	20110405														
1511	Hexachloropropene	3300	ug/kg	33.3	ug/kg	20110405														
1535	Indeno(1,2,3-cd)pyrene	330	ug/kg	33.3	ug/kg	20110405	C	Y			51	136	20	C	Y			28	138	30
1559	Isodrin	330	ug/kg	33.3	ug/kg	20110405														
1566	Isophorone	330	ug/kg	33.3	ug/kg	20110405	C	Y			51	101	20	C	Y			43	105	30
1593	Isosafrole	660	ug/kg	66.6	ug/kg	20110405														
1596	Kepone	3300	ug/kg	330	ug/kg	20110405														
1724	Methapyrilene	1600	ug/kg	51.6	ug/kg	20110405														
1785	2-Methylbenzenamine	330	ug/kg	33.3	ug/kg	20110405														
1796	3-Methylcholanthrene	660	ug/kg	33.3	ug/kg	20110405														
1810	4,4'-Methylenebis(2-chloroaniline)	330	ug/kg	66.6	ug/kg	20110405														
1823	Methyl methacrylate	330	ug/kg	33.3	ug/kg	20110405														
1825	Methyl methanesulfonate	330	ug/kg	33.3	ug/kg	20110405														
1829	2-Methylnaphthalene	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	98	20	C	Y			41	100	30
1831	Methyl parathion	1600	ug/kg	33.3	ug/kg	20110405														
1851	2-Methylphenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	98	20	C	Y			49	99	30
2777	3-Methylphenol & 4-Methylphenol	660	ug/kg	66.6	ug/kg	20110405	C	Y			55	97	20	C	Y			46	102	32
1932	Naphthalene	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	94	20	C	Y			43	90	30
1940	1,4-Naphthoquinone	1600	ug/kg	71.6	ug/kg	20110405														
1944	1-Naphthylamine	330	ug/kg	35.7	ug/kg	20110405														
1949	2-Naphthylamine	330	ug/kg	38.8	ug/kg	20110405														
1960	2-Nitroaniline	1600	ug/kg	33.3	ug/kg	20110405	C	Y			54	104	20	C	Y			50	109	30
1964	3-Nitroaniline	1600	ug/kg	33.3	ug/kg	20110405	C	Y			30	81	20	C	Y			26	100	30
1968	4-Nitroaniline	1600	ug/kg	330	ug/kg	20110405	C	Y			53	93	20	C	Y			31	110	30
1972	Nitrobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	97	20	C	Y			43	95	30
1998	2-Nitrophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	104	20	C	Y			30	109	30
2001	4-Nitrophenol	1600	ug/kg	330	ug/kg	20110405	C	Y			51	109	20	C	Y			34	123	30
2006	4-Nitroquinoline-1-oxide	3300	ug/kg	330	ug/kg	20110405														
2009	N-Nitrosodi-n-butylamine	330	ug/kg	33.3	ug/kg	20110405														
2013	N-Nitrosodiethylamine	330	ug/kg	33.3	ug/kg	20110405														
2018	N-Nitrosodimethylamine	330	ug/kg	33.3	ug/kg	20110405	C	Y			48	101	20	C	Y			45	93	30
2028	N-Nitrosodiphenylamine	330	ug/kg	33.3	ug/kg	20110405	C	Y			67	139	20	C	Y			59	136	30
2024	N-Nitrosodi-n-propylamine	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	111	20	C	Y			50	109	30
2031	N-Nitrosomethylethylamine	330	ug/kg	33.3	ug/kg	20110405														

Structured Analysis Code: A-MU-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; Sonication
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2034	N-Nitrosomorpholine	330	ug/kg	33.3	ug/kg	20110405														
2036	N-Nitrosopiperidine	330	ug/kg	33.3	ug/kg	20110405														
2038	N-Nitrosopyrrolidine	330	ug/kg	33.3	ug/kg	20110405														
2046	5-Nitro-o-toluidine	660	ug/kg	33.3	ug/kg	20110405														
3597	2,2'-oxybis(1-Chloropropane)	330	ug/kg	33.3	ug/kg	20110405	C	Y			47	98	20	C	Y			43	91	30
2062	Parathion	1600	ug/kg	33.3	ug/kg	20110405														
2104	Pentachlorobenzene	330	ug/kg	33.3	ug/kg	20110405														
2108	Pentachloroethane	1600	ug/kg	33.3	ug/kg	20110405														
2112	Pentachloronitrobenzene	1600	ug/kg	33.3	ug/kg	20110405														
2118	Pentachlorophenol	1600	ug/kg	330	ug/kg	20110405	C	Y			49	122	20	C	Y			29	124	30
2146	Phenacetin	660	ug/kg	33.3	ug/kg	20110405														
2154	Phenanthrene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	105	20	C	Y			40	112	30
2155	Phenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	102	20	C	Y			49	100	30
2170	Phorate	1600	ug/kg	33.3	ug/kg	20110405														
2206	2-Picoline	660	ug/kg	33.3	ug/kg	20110405														
2221	Pronamide	660	ug/kg	33.3	ug/kg	20110405														
2252	Pyrene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	109	20	C	Y			40	112	30
2256	Pyridine	660	ug/kg	66.6	ug/kg	20110405	C	Y			33	76	20	C	Y			19	76	30
2275	Safrole	660	ug/kg	33.3	ug/kg	20110405														
2462	Sulfotepp	1600	ug/kg	33.3	ug/kg	20110405														
2430	1,2,4,5-Tetrachlorobenzene	330	ug/kg	33.3	ug/kg	20110405														
2457	2,3,4,6-Tetrachlorophenol	1600	ug/kg	33.3	ug/kg	20110405														
2459	Tetraethyldithiopyrophosphate (Sulfot	1600	ug/kg	33.3	ug/kg	20110405														
1086	Thionazin	1600	ug/kg	330	ug/kg	20110405														
1786	o-Toluidine	330	ug/kg	33.3	ug/kg	20110405														
2721	Tributyl phosphate	330	ug/kg	45.9	ug/kg	20110405														
2515	1,2,4-Trichlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	104	20	C	Y			44	98	30
2555	2,4,5-Trichlorophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			58	104	20	C	Y			39	114	30
2559	2,4,6-Trichlorophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	103	20	C	Y			39	110	30
2569	O,O,O-Triethyl phosphorothioate	1600	ug/kg	33.3	ug/kg	20110405														
2597	1,3,5-Trinitrobenzene	1600	ug/kg	42.1	ug/kg	20110405														
5082	Tris(2-chloroethyl)phosphate	330	ug/kg	33.3	ug/kg	20110405														
5738	1-Methyl naphthalene	330	ug/kg	33.3	ug/kg	20110405														
5688	4-Chlorobenzenethiol	330	ug/kg	330	ug/kg	20110405														
5690	4-Chlorophenyl sulfone	330	ug/kg	330	ug/kg	20110405														
1425	2-Fluorobiphenyl						X	Y			57	103	0	X	Y			55	102	0
1426	2-Fluorophenol						X	Y			55	98	0	X	Y			42	98	0
2512	2,4,6-Tribromophenol						X	Y			57	116	0	X	Y			48	121	0
2736	Nitrobenzene-d5						X	Y			46	101	0	X	Y			46	98	0

Structured Analysis Code: A-MU-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; Sonication
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2737	Phenol-d5						X	Y			57	100	0	X	Y			52	97	0
2738	Terphenyl-d14						X	Y			64	119	0	X	Y			59	114	0

TAL Reference Data Summary

Structured **Analysis Code:** **A-13-QL-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	95	20	C	Y			45	100	30
5	Acenaphthylene	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	104	20	C	Y			48	105	30
24	Acetophenone	330	ug/kg	33.3	ug/kg	20110405														
30	2-Acetylaminofluorene	3300	ug/kg	33.3	ug/kg	20110405														
93	4-Aminobiphenyl	1600	ug/kg	330	ug/kg	20110405														
115	Aniline	330	ug/kg	33.3	ug/kg	20110405	C	Y			40	87	20	C	Y			19	87	30
122	Anthracene	330	ug/kg	33.3	ug/kg	20110405	C	Y			58	107	20	C	Y			48	109	30
132	Aramite (total)	660	ug/kg	330	ug/kg	20110405														
158	Atrazine	330	ug/kg	33.3	ug/kg	20110405														
3352	Azobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			51	114	20	C	Y			48	110	30
3398	Benzaldehyde	330	ug/kg	33.3	ug/kg	20110405														
199	Benzidine	330	ug/kg	33.3	ug/kg	20110405														
202	Benzo(a)anthracene	330	ug/kg	33.3	ug/kg	20110405	C	Y			62	111	20	C	Y			50	114	30
205	Benzo(b)fluoranthene	330	ug/kg	33.3	ug/kg	20110405	C	Y			60	112	20	C	Y			42	122	30
208	Benzo(k)fluoranthene	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	109	20	C	Y			41	118	30
209	Benzoic acid	1600	ug/kg	330	ug/kg	20110405	C	Y			10	80	20	C	Y			10	87	30
210	Benzo(ghi)perylene	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	122	20	C	Y			20	137	30
211	Benzo(a)pyrene	330	ug/kg	33.3	ug/kg	20110405	C	Y			60	109	20	C	Y			47	112	30
215	Benzyl alcohol	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	109	20	C	Y			47	114	30
3474	1,1'-Biphenyl	330	ug/kg	33.3	ug/kg	20110405														
289	bis(2-Chloroethoxy)methane	330	ug/kg	33.3	ug/kg	20110405	C	Y			50	100	20	C	Y			44	101	30
293	bis(2-Chloroethyl) ether	330	ug/kg	33.4	ug/kg	20110405	C	Y			52	93	20	C	Y			46	91	30
298	bis(2-Chloroisopropyl) ether	330	ug/kg	33.3	ug/kg	20110405														
302	bis(2-Ethylhexyl) phthalate	330	ug/kg	45.3	ug/kg	20110405	C	Y			54	111	20	C	Y			43	114	30
348	4-Bromophenyl phenyl ether	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	108	20	C	Y			54	109	30
403	Butyl benzyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	115	20	C	Y			47	114	30
5101	Caprolactam	330	ug/kg	33.3	ug/kg	20110405														
2751	Carbazole	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	102	20	C	Y			46	107	30
518	4-Chloroaniline	330	ug/kg	33.3	ug/kg	20110405	C	Y			23	80	20	C	Y			11	93	30
2768	Chlorobenzilate	330	ug/kg	33.3	ug/kg	20110405														
525	p-Chlorobenzilate	330	ug/kg	33.3	ug/kg	20110405														
578	4-Chloro-3-methylphenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			48	105	20	C	Y			42	110	30
589	2-Chloronaphthalene	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	102	30	C	Y			51	100	30
600	2-Chlorophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	97	20	C	Y			33	107	30
602	4-Chlorophenyl phenyl ether	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	103	20	C	Y			53	105	30
633	Chrysene	330	ug/kg	33.3	ug/kg	20110405	C	Y			60	109	20	C	Y			49	111	30
2758	Cresols (total)	330	ug/kg	33.3	ug/kg	20110405														

Structured Analysis Code: A-13-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
673	Cyclohexanol	330	ug/kg	33.3	ug/kg	20110405														
824	Diallate	660	ug/kg	66.6	ug/kg	20110405														
860	Dibenz(a,h)anthracene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	121	20	C	Y			31	129	30
2669	Dibenzo(a,h)anthracene	330	ug/kg	33.3	ug/kg	20110405														
863	Dibenzofuran	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	100	20	C	Y			51	101	30
891	Di-n-butyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			55	104	20	C	Y			48	108	30
904	1,2-Dichlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			52	92	30	C	Y			45	88	30
907	1,3-Dichlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			52	90	30	C	Y			42	87	30
910	1,4-Dichlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			51	92	30	C	Y			45	87	30
918	3,3'-Dichlorobenzidine	1600	ug/kg	33.3	ug/kg	20110405	C	Y			30	77	20	C	Y			10	107	30
971	2,4-Dichlorophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	105	20	C	Y			30	113	30
973	2,6-Dichlorophenol	330	ug/kg	33.3	ug/kg	20110405														
1082	Diethyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	100	20	C	Y			50	105	30
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphorc	1600	ug/kg	330	ug/kg	20110405														
1099	Dimethoate	660	ug/kg	33.3	ug/kg	20110405														
1110	p-Dimethylaminoazobenzene	660	ug/kg	33.3	ug/kg	20110405														
1120	7,12-Dimethylbenz(a)anthracene	660	ug/kg	33.3	ug/kg	20110405														
1124	3,3'-Dimethylbenzidine	1600	ug/kg	330	ug/kg	20110405														
1128	Dimethylformamide	330	ug/kg	68.4	ug/kg	20110405														
1140	alpha,alpha-Dimethylphenethylamine	1600	ug/kg	76.7	ug/kg	20110405														
1145	2,4-Dimethylphenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			48	105	20	C	Y			41	108	30
1149	Dimethyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	100	20	C	Y			50	104	30
1164	1,3-Dinitrobenzene	330	ug/kg	33.3	ug/kg	20110405														
2785	1,4-Dinitrobenzene	330	ug/kg	33.3	ug/kg	20110405														
1167	4,6-Dinitro-2-methylphenol	1600	ug/kg	330	ug/kg	20110405	C	Y			19	114	20	C	Y			10	132	30
1187	2,4-Dinitrophenol	1600	ug/kg	330	ug/kg	20110405	C	Y			10	108	20	C	Y			10	133	30
1191	2,4-Dinitrotoluene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	103	20	C	Y			52	106	30
1193	2,6-Dinitrotoluene	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	104	20	C	Y			54	109	30
1196	2-sec-Butyl-4,6-dinitrophenol	660	ug/kg	330	ug/kg	20110405														
1195	Dinoseb	660	ug/kg	330	ug/kg	20110405														
1162	Di-n-octyl phthalate	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	104	20	C	Y			48	118	30
1199	1,4-Dioxane	330	ug/kg	33.3	ug/kg	20110405														
1212	Diphenylamine	330	ug/kg	33.3	ug/kg	20110405														
2944	1,2-Diphenylhydrazine (as Azobenzen	330	ug/kg	33.3	ug/kg	20110405														
1225	Disulfoton	1600	ug/kg	33.3	ug/kg	20110405														
1360	Ethyl methacrylate	330	ug/kg	33.3	ug/kg	20110405														
1362	Ethyl methanesulfonate	330	ug/kg	33.3	ug/kg	20110405														
1372	Famphur	3300	ug/kg	33.3	ug/kg	20110405														
1414	Fluoranthene	330	ug/kg	33.3	ug/kg	20110405	C	Y			58	109	20	C	Y			39	119	30

Structured Analysis Code: A-13-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1417	Fluorene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	101	20	C	Y			48	106	30
1482	Hexachlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			59	109	20	C	Y			54	110	30
1489	Hexachlorobutadiene	330	ug/kg	33.3	ug/kg	20110405	C	Y			45	113	20	C	Y			44	106	30
1492	Hexachlorocyclopentadiene	1600	ug/kg	330	ug/kg	20110405	C	Y			35	125	20	C	Y			10	128	30
1491	Hexachloro-1,3-cyclopentadiene	1600	ug/kg	330	ug/kg	20110405														
1497	Hexachloroethane	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	94	20	C	Y			44	88	30
1501	Hexachlorophene	3300	ug/kg	236.23	ug/kg	20110405														
1511	Hexachloropropene	3300	ug/kg	33.3	ug/kg	20110405														
1535	Indeno(1,2,3-cd)pyrene	330	ug/kg	33.3	ug/kg	20110405	C	Y			51	136	20	C	Y			28	138	30
1559	Isodrin	330	ug/kg	33.3	ug/kg	20110405														
1566	Isophorone	330	ug/kg	33.3	ug/kg	20110405	C	Y			51	101	20	C	Y			43	105	30
1593	Isosafrole	660	ug/kg	66.6	ug/kg	20110405														
1596	Kepone	3300	ug/kg	330	ug/kg	20110405														
1724	Methapyrilene	1600	ug/kg	51.6	ug/kg	20110405														
1785	2-Methylbenzenamine	330	ug/kg	33.3	ug/kg	20110405														
1796	3-Methylcholanthrene	660	ug/kg	33.3	ug/kg	20110405														
1810	4,4'-Methylenebis(2-chloroaniline)	330	ug/kg	66.6	ug/kg	20110405														
1823	Methyl methacrylate	330	ug/kg	33.3	ug/kg	20110405														
1825	Methyl methanesulfonate	330	ug/kg	33.3	ug/kg	20110405														
1829	2-Methylnaphthalene	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	98	20	C	Y			41	100	30
1831	Methyl parathion	1600	ug/kg	33.3	ug/kg	20110405														
1851	2-Methylphenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	98	20	C	Y			49	99	30
2777	3-Methylphenol & 4-Methylphenol	660	ug/kg	66.6	ug/kg	20110405	C	Y			55	97	20	C	Y			46	102	32
1932	Naphthalene	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	94	20	C	Y			43	90	30
1940	1,4-Naphthoquinone	1600	ug/kg	71.6	ug/kg	20110405														
1944	1-Naphthylamine	330	ug/kg	35.7	ug/kg	20110405														
1949	2-Naphthylamine	330	ug/kg	38.8	ug/kg	20110405														
1960	2-Nitroaniline	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	104	20	C	Y			50	109	30
1964	3-Nitroaniline	330	ug/kg	33.3	ug/kg	20110405	C	Y			30	81	20	C	Y			26	100	30
1968	4-Nitroaniline	1600	ug/kg	330	ug/kg	20110405	C	Y			53	93	20	C	Y			31	110	30
1972	Nitrobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	97	20	C	Y			43	95	30
1998	2-Nitrophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	104	20	C	Y			30	109	30
2001	4-Nitrophenol	1600	ug/kg	330	ug/kg	20110405	C	Y			51	109	20	C	Y			34	123	30
2006	4-Nitroquinoline-1-oxide	3300	ug/kg	330	ug/kg	20110405														
2009	N-Nitrosodi-n-butylamine	330	ug/kg	33.3	ug/kg	20110405														
2013	N-Nitrosodiethylamine	330	ug/kg	33.3	ug/kg	20110405														
2018	N-Nitrosodimethylamine	330	ug/kg	33.3	ug/kg	20110405	C	Y			48	101	20	C	Y			45	93	30
2028	N-Nitrosodiphenylamine	330	ug/kg	33.3	ug/kg	20110405	C	Y			67	139	20	C	Y			59	136	30
2024	N-Nitrosodi-n-propylamine	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	111	20	C	Y			50	109	30

Structured Analysis Code: A-13-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2031	N-Nitrosomethylethylamine	330	ug/kg	33.3	ug/kg	20110405														
2034	N-Nitrosomorpholine	330	ug/kg	33.3	ug/kg	20110405														
2036	N-Nitrosopiperidine	330	ug/kg	33.3	ug/kg	20110405														
2038	N-Nitrosopyrrolidine	330	ug/kg	33.3	ug/kg	20110405														
2046	5-Nitro-o-toluidine	660	ug/kg	33.3	ug/kg	20110405														
3597	2,2'-oxybis(1-Chloropropane)	330	ug/kg	33.3	ug/kg	20110405	C	Y			47	98	20	C	Y			43	91	30
2062	Parathion	1600	ug/kg	33.3	ug/kg	20110405														
2104	Pentachlorobenzene	330	ug/kg	33.3	ug/kg	20110405														
2108	Pentachloroethane	1600	ug/kg	33.3	ug/kg	20110405														
2112	Pentachloronitrobenzene	1600	ug/kg	33.3	ug/kg	20110405														
2118	Pentachlorophenol	660	ug/kg	330	ug/kg	20110405	C	Y			49	122	20	C	Y			29	124	30
2146	Phenacetin	660	ug/kg	33.3	ug/kg	20110405														
2154	Phenanthrene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	105	20	C	Y			40	112	30
2155	Phenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			54	102	20	C	Y			49	100	30
2170	Phorate	1600	ug/kg	33.3	ug/kg	20110405														
3171	Phthalic acid	1600	ug/kg	250	ug/kg	20110405														
2206	2-Picoline	660	ug/kg	33.3	ug/kg	20110405														
2221	Pronamide	660	ug/kg	33.3	ug/kg	20110405														
2252	Pyrene	330	ug/kg	33.3	ug/kg	20110405	C	Y			57	109	20	C	Y			40	112	30
2256	Pyridine	660	ug/kg	66.6	ug/kg	20110405	C	Y			33	76	20	C	Y			19	76	30
2275	Safrole	660	ug/kg	33.3	ug/kg	20110405														
2462	Sulfotepp	1600	ug/kg	33.3	ug/kg	20110405														
2430	1,2,4,5-Tetrachlorobenzene	330	ug/kg	33.3	ug/kg	20110405														
2457	2,3,4,6-Tetrachlorophenol	1600	ug/kg	33.3	ug/kg	20110405														
2459	Tetraethyldithiopyrophosphate (Sulfot	1600	ug/kg	33.3	ug/kg	20110405														
1086	Thionazin	1600	ug/kg	330	ug/kg	20110405														
1786	o-Toluidine	330	ug/kg	33.3	ug/kg	20110405														
2721	Tributyl phosphate	330	ug/kg	45.9	ug/kg	20110405														
2515	1,2,4-Trichlorobenzene	330	ug/kg	33.3	ug/kg	20110405	C	Y			46	104	20	C	Y			44	98	30
2555	2,4,5-Trichlorophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			58	104	20	C	Y			39	114	30
2559	2,4,6-Trichlorophenol	330	ug/kg	33.3	ug/kg	20110405	C	Y			56	103	20	C	Y			39	110	30
2569	O,O,O-Triethyl phosphorothioate	1600	ug/kg	33.3	ug/kg	20110405														
2597	1,3,5-Trinitrobenzene	1600	ug/kg	42.1	ug/kg	20110405														
5082	Tris(2-chloroethyl)phosphate	330	ug/kg	33.3	ug/kg	20110405														
5738	1-Methyl naphthalene	330	ug/kg	33.3	ug/kg	20110405														
5688	4-Chlorobenzenethiol	330	ug/kg	330	ug/kg	20110405														
5690	4-Chlorophenyl sulfone	330	ug/kg	330	ug/kg	20110405														
1425	2-Fluorobiphenyl						X	Y			57	103	0	X	Y			55	102	0
1426	2-Fluorophenol						X	Y			55	98	0	X	Y			42	98	0

Structured Analysis Code: A-13-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6151							Spike List 6152						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2512	2,4,6-Tribromophenol						X	Y			57	116	0	X	Y			48	121	0
2736	Nitrobenzene-d5						X	Y			46	101	0	X	Y			46	98	0
2737	Phenol-d5						X	Y			57	100	0	X	Y			52	97	0
2738	Terphenyl-d14						X	Y			64	119	0	X	Y			59	114	0

TAL Reference Data Summary

Structured Analysis Code: A-14-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
5	Acenaphthylene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
24	Acetophenone	100000	ug/kg	10000	ug/kg	20100108														
30	2-Acetylaminofluorene	1000000	ug/kg	10000	ug/kg	20100108														
93	4-Aminobiphenyl	500000	ug/kg	50000	ug/kg	20100108														
115	Aniline	100000	ug/kg	10000	ug/kg	20100108	C	Y			12	150	20	C	Y			12	150	30
122	Anthracene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
132	Aramite (total)	200000	ug/kg	20000	ug/kg	20100108														
158	Atrazine	100000	ug/kg	10000	ug/kg	20100108														
3352	Azobenzene	100000	ug/kg	10000	ug/kg	20100108	C	Y			12	150	20	C	Y			12	150	30
3363	Benzal chloride	100000	ug/kg			0														
3398	Benzaldehyde	100000	ug/kg	10000	ug/kg	20100108														
199	Benzidine	1000000	ug/kg	20000	ug/kg	20100108														
202	Benzo(a)anthracene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
205	Benzo(b)fluoranthene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
208	Benzo(k)fluoranthene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
209	Benzoic acid	500000	ug/kg	50000	ug/kg	20100108	C	Y			12	150	20	C	Y			12	150	30
210	Benzo(ghi)perylene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
211	Benzo(a)pyrene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
3890	Benzothiazole	100000	ug/kg	10000	ug/kg	20100108														
215	Benzyl alcohol	100000	ug/kg	10000	ug/kg	20100108	C	Y			12	150	20	C	Y			12	150	30
3474	1,1'-Biphenyl	100000	ug/kg	10000	ug/kg	20100108														
289	bis(2-Chloroethoxy)methane	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
293	bis(2-Chloroethyl) ether	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
298	bis(2-Chloroisopropyl) ether	100000	ug/kg	10000	ug/kg	20100108														
302	bis(2-Ethylhexyl) phthalate	100000	ug/kg	20000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
348	4-Bromophenyl phenyl ether	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
5359	n-Butylbenzenesulfonamide	200000	ug/kg	27400	ug/kg	20100108														
403	Butyl benzyl phthalate	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
5101	Caprolactam	100000	ug/kg	10000	ug/kg	20100108														
2751	Carbazole	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
518	4-Chloroaniline	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2768	Chlorobenzilate	100000	ug/kg	10000	ug/kg	20100108														
525	p-Chlorobenzilate	100000	ug/kg	10000	ug/kg	20100108														
578	4-Chloro-3-methylphenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
589	2-Chloronaphthalene	100000	ug/kg	10000	ug/kg	20100108														
600	2-Chlorophenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30

Structured Analysis Code: A-14-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
602	4-Chlorophenyl phenyl ether	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
633	Chrysene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
673	Cyclohexanol	100000	ug/kg	10000	ug/kg	20100108														
824	Diallate	200000	ug/kg	20000	ug/kg	20100108														
860	Dibenz(a,h)anthracene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2669	Dibenzo(a,h)anthracene	100000	ug/kg	10000	ug/kg	20100108														
863	Dibenzofuran	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
865	Dibenzo(a,e)pyrene	100000	ug/kg			0														
891	Di-n-butyl phthalate	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
904	1,2-Dichlorobenzene	100000	ug/kg	10000	ug/kg	20100108														
907	1,3-Dichlorobenzene	100000	ug/kg	10000	ug/kg	20100108														
910	1,4-Dichlorobenzene	100000	ug/kg	10000	ug/kg	20100108														
918	3,3'-Dichlorobenzidine	500000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
971	2,4-Dichlorophenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
973	2,6-Dichlorophenol	100000	ug/kg	10000	ug/kg	20100108														
1082	Diethyl phthalate	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphor(	500000	ug/kg	50000	ug/kg	20100108														
1099	Dimethoate	200000	ug/kg	20000	ug/kg	20100108														
1110	p-Dimethylaminoazobenzene	100000	ug/kg	10000	ug/kg	20100108														
1116	N,N-Dimethylaniline	500000	ug/kg			0														
1120	7,12-Dimethylbenz(a)anthracene	200000	ug/kg	10000	ug/kg	20100108														
1124	3,3'-Dimethylbenzidine	500000	ug/kg	50000	ug/kg	20100108														
1128	Dimethylformamide	100000	ug/kg	10000	ug/kg	20100108														
1140	alpha,alpha-Dimethylphenethylamine	500000	ug/kg	50000	ug/kg	20100108														
1145	2,4-Dimethylphenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1119	Dimethylphenylamine	500000	ug/kg			0														
1149	Dimethyl phthalate	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1164	1,3-Dinitrobenzene	100000	ug/kg	10000	ug/kg	20100108														
2785	1,4-Dinitrobenzene	100000	ug/kg	10000	ug/kg	20100108														
1167	4,6-Dinitro-2-methylphenol	500000	ug/kg	50000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1187	2,4-Dinitrophenol	500000	ug/kg	50000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1191	2,4-Dinitrotoluene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1193	2,6-Dinitrotoluene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1196	2-sec-Butyl-4,6-dinitrophenol	200000	ug/kg	20000	ug/kg	20100108														
1195	Dinoseb	200000	ug/kg	20000	ug/kg	20100108														
1162	Di-n-octyl phthalate	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1199	1,4-Dioxane	100000	ug/kg	10000	ug/kg	20100108														
1212	Diphenylamine	100000	ug/kg	10000	ug/kg	20100108														
2944	1,2-Diphenylhydrazine (as Azobenzen	100000	ug/kg	10000	ug/kg	20100108														

Structured Analysis Code: A-14-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1225	Disulfoton	500000	ug/kg	50000	ug/kg	20100108														
1362	Ethyl methanesulfonate	100000	ug/kg	10000	ug/kg	20100108														
1372	Famphur	1000000	ug/kg	10000	ug/kg	20100108														
1414	Fluoranthene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1417	Fluorene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1482	Hexachlorobenzene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1489	Hexachlorobutadiene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1492	Hexachlorocyclopentadiene	500000	ug/kg	50000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1491	Hexachloro-1,3-cyclopentadiene	500000	ug/kg	50000	ug/kg	20100108														
1497	Hexachloroethane	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1501	Hexachlorophene	1000000	ug/kg	200000	ug/kg	20100108														
1511	Hexachloropropene	100000	ug/kg	10000	ug/kg	20100108														
1535	Indeno(1,2,3-cd)pyrene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1559	Isodrin	100000	ug/kg	10000	ug/kg	20100108														
1566	Isophorone	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1593	Isosafrole	200000	ug/kg	20000	ug/kg	20100108														
1596	Kepone	1000000	ug/kg	100000	ug/kg	20100108														
1724	Methapyrilene	500000	ug/kg	50000	ug/kg	20100108														
1785	2-Methylbenzenamine	200000	ug/kg	10000	ug/kg	20100108														
1796	3-Methylcholanthrene	200000	ug/kg	10000	ug/kg	20100108														
1810	4,4'-Methylenebis(2-chloroaniline)	100000	ug/kg	20000	ug/kg	20100108														
1823	Methyl methacrylate	100000	ug/kg	10000	ug/kg	20100108														
1825	Methyl methanesulfonate	100000	ug/kg	10000	ug/kg	20100108														
1829	2-Methylnaphthalene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1831	Methyl parathion	500000	ug/kg	50000	ug/kg	20100108														
1851	2-Methylphenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2777	3-Methylphenol & 4-Methylphenol	100000	ug/kg	20000	ug/kg	20100108	C	Y	400000	ug/kg	50	150	20	C	Y	40000	ug/kg	50	150	30
1932	Naphthalene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1940	1,4-Naphthoquinone	500000	ug/kg	50000	ug/kg	20100108														
1944	1-Naphthylamine	100000	ug/kg	10000	ug/kg	20100108														
1949	2-Naphthylamine	100000	ug/kg	20000	ug/kg	20100108														
1960	2-Nitroaniline	500000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1964	3-Nitroaniline	500000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1968	4-Nitroaniline	500000	ug/kg	50000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1972	Nitrobenzene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
1998	2-Nitrophenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2001	4-Nitrophenol	500000	ug/kg	50000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2006	4-Nitroquinoline-1-oxide	1000000	ug/kg	100000	ug/kg	20100108														
2009	N-Nitrosodi-n-butylamine	100000	ug/kg	10000	ug/kg	20100108														

Structured Analysis Code: A-14-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2013	N-Nitrosodiethylamine	100000	ug/kg	10000	ug/kg	20100108														
2018	N-Nitrosodimethylamine	100000	ug/kg	10000	ug/kg	20100108	C	Y			12	150	20	C	Y			12	150	30
2028	N-Nitrosodiphenylamine	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2024	N-Nitrosodi-n-propylamine	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2031	N-Nitrosomethylethylamine	100000	ug/kg	10000	ug/kg	20100108														
2034	N-Nitrosomorpholine	100000	ug/kg	10000	ug/kg	20100108														
2036	N-Nitrosopiperidine	100000	ug/kg	10000	ug/kg	20100108														
2038	N-Nitrosopyrrolidine	100000	ug/kg	10000	ug/kg	20100108														
2042	N-Nitro-o-toluidine	200000	ug/kg	10000	ug/kg	20100108														
3597	2,2'-oxybis(1-Chloropropane)	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2062	Parathion	500000	ug/kg	50000	ug/kg	20100108														
2104	Pentachlorobenzene	100000	ug/kg	10000	ug/kg	20100108														
2108	Pentachloroethane	500000	ug/kg	50000	ug/kg	20100108														
2112	Pentachloronitrobenzene	500000	ug/kg	50000	ug/kg	20100108														
2118	Pentachlorophenol	500000	ug/kg	50000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2146	Phenacetin	200000	ug/kg	20000	ug/kg	20100108														
2154	Phenanthrene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2155	Phenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2164	p-Phenylene diamine	1000000	ug/kg	100000	ug/kg	20100108														
2170	Phorate	500000	ug/kg	50000	ug/kg	20100108														
3171	Phthalic acid	100000	ug/kg	10000	ug/kg	20100108														
2858	Phthalic anhydride	100000	ug/kg			0														
2206	2-Picoline	200000	ug/kg	10000	ug/kg	20100108														
2221	Pronamide	200000	ug/kg	20000	ug/kg	20100108														
2252	Pyrene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2256	Pyridine	200000	ug/kg	20000	ug/kg	20100108	C	Y			12	150	20	C	Y			12	150	30
2275	Safrole	200000	ug/kg	20000	ug/kg	20100108														
2462	Sulfotepp	500000	ug/kg	50000	ug/kg	20100108														
2430	1,2,4,5-Tetrachlorobenzene	100000	ug/kg	10000	ug/kg	20100108														
2457	2,3,4,6-Tetrachlorophenol	500000	ug/kg	10000	ug/kg	20100108														
2459	Tetraethyldithiopyrophosphate (Sulfot	500000	ug/kg	50000	ug/kg	20100108														
1086	Thionazin	500000	ug/kg	50000	ug/kg	20100108														
2745	Toluene diamine (2,4- + 2,6- isomers)	500000	ug/kg			0														
5391	Toluene Diamine, Total	500000	ug/kg			0														
1786	o-Toluidine	200000	ug/kg	10000	ug/kg	20100108														
2721	Tributyl phosphate	100000	ug/kg	10000	ug/kg	20100108														
2515	1,2,4-Trichlorobenzene	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2555	2,4,5-Trichlorophenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30
2559	2,4,6-Trichlorophenol	100000	ug/kg	10000	ug/kg	20100108	C	Y	200000	ug/kg	50	150	20	C	Y	20000	ug/kg	50	150	30

Structured Analysis Code: A-14-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6244							Spike List 6245						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2567	Triethyl amine	100000	ug/kg			0														
2569	O,O,O-Triethyl phosphorothioate	100000	ug/kg	10000	ug/kg	20100108														
2597	1,3,5-Trinitrobenzene	500000	ug/kg	50000	ug/kg	20100108														
5082	Tris(2-chloroethyl)phosphate	100000	ug/kg	10000	ug/kg	20100108														
1425	2-Fluorobiphenyl						X	Y	200000	ug/kg	10	150	0	X	Y	20000	ug/kg	10	150	0
1426	2-Fluorophenol						X	Y	200000	ug/kg	10	150	0	X	Y	20000	ug/kg	10	150	0
2512	2,4,6-Tribromophenol						X	Y	200000	ug/kg	10	150	0	X	Y	20000	ug/kg	10	150	0
2736	Nitrobenzene-d5						X	Y	200000	ug/kg	10	150	0	X	Y	20000	ug/kg	10	150	0
2737	Phenol-d5						X	Y	200000	ug/kg	10	150	0	X	Y	20000	ug/kg	10	150	0
2738	Terphenyl-d14						X	Y	200000	ug/kg	10	150	0	X	Y	20000	ug/kg	10	150	0

TAL Reference Data Summary

Structured Analysis Code: A-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	100000	ug/L	10000	ug/L	20100108														
5	Acenaphthylene	100000	ug/L	10000	ug/L	20100108														
24	Acetophenone	100000	ug/L	10000	ug/L	20100108														
30	2-Acetylaminofluorene	1000000	ug/L	10000	ug/L	20100108														
93	4-Aminobiphenyl	500000	ug/L	50000	ug/L	20100108														
115	Aniline	100000	ug/L	10000	ug/L	20100108														
122	Anthracene	100000	ug/L	10000	ug/L	20100108														
132	Aramite (total)	200000	ug/L	20000	ug/L	20100108														
158	Atrazine	100000	ug/L	10000	ug/L	20100108														
3352	Azobenzene	100000	ug/L	10000	ug/L	20100108														
3398	Benzaldehyde	100000	ug/L	10000	ug/L	20100108														
199	Benzidine	1000000	ug/L	20000	ug/L	20100108														
202	Benzo(a)anthracene	100000	ug/L	10000	ug/L	20100108														
205	Benzo(b)fluoranthene	100000	ug/L	10000	ug/L	20100108														
208	Benzo(k)fluoranthene	100000	ug/L	10000	ug/L	20100108														
209	Benzoic acid	500000	ug/L	50000	ug/L	20100108														
210	Benzo(ghi)perylene	100000	ug/L	10000	ug/L	20100108														
211	Benzo(a)pyrene	100000	ug/L	10000	ug/L	20100108														
3890	Benzothiazole	100000	ug/L	10000	ug/L	20100108														
215	Benzyl alcohol	100000	ug/L	10000	ug/L	20100108														
3474	1,1'-Biphenyl	100000	ug/L	10000	ug/L	20100108														
289	bis(2-Chloroethoxy)methane	100000	ug/L	10000	ug/L	20100108														
293	bis(2-Chloroethyl) ether	100000	ug/L	10000	ug/L	20100108														
298	bis(2-Chloroisopropyl) ether	100000	ug/L	10000	ug/L	20100108														
302	bis(2-Ethylhexyl) phthalate	100000	ug/L	20000	ug/L	20100108														
348	4-Bromophenyl phenyl ether	100000	ug/L	10000	ug/L	20100108														
5359	n-Butylbenzenesulfonamide	200000	ug/L	27400	ug/L	20100108														
403	Butyl benzyl phthalate	100000	ug/L	10000	ug/L	20100108														
5101	Caprolactam	100000	ug/L	10000	ug/L	20100108														
2751	Carbazole	100000	ug/L	10000	ug/L	20100108														
518	4-Chloroaniline	100000	ug/L	10000	ug/L	20100108														
2768	Chlorobenzilate	100000	ug/L	10000	ug/L	20100108														
525	p-Chlorobenzilate	100000	ug/L	10000	ug/L	20100108														
578	4-Chloro-3-methylphenol	100000	ug/L	10000	ug/L	20100108														
589	2-Chloronaphthalene	100000	ug/L	10000	ug/L	20100108														
600	2-Chlorophenol	100000	ug/L	10000	ug/L	20100108														
602	4-Chlorophenyl phenyl ether	100000	ug/L	10000	ug/L	20100108														

Structured Analysis Code: A-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
633	Chrysene	100000	ug/L	10000	ug/L	20100108														
673	Cyclohexanol	100000	ug/L	10000	ug/L	20100108														
824	Diallate	200000	ug/L	20000	ug/L	20100108														
860	Dibenz(a,h)anthracene	100000	ug/L	10000	ug/L	20100108														
2669	Dibenzo(a,h)anthracene	100000	ug/L	10000	ug/L	20100108														
863	Dibenzofuran	100000	ug/L	10000	ug/L	20100108														
865	Dibenzo(a,e)pyrene	100000	ug/L			0														
891	Di-n-butyl phthalate	100000	ug/L	10000	ug/L	20100108														
904	1,2-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108														
907	1,3-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108														
910	1,4-Dichlorobenzene	100000	ug/L	10000	ug/L	20100108	C	Y			40	93	20	C	Y			35	93	20
918	3,3'-Dichlorobenzidine	500000	ug/L	10000	ug/L	20100108														
971	2,4-Dichlorophenol	100000	ug/L	10000	ug/L	20100108														
973	2,6-Dichlorophenol	100000	ug/L	10000	ug/L	20100108														
1082	Diethyl phthalate	100000	ug/L	10000	ug/L	20100108														
1085	O,O-Diethyl-O-(2-pyrazinyl) phosphorc	500000	ug/L	50000	ug/L	20100108														
1099	Dimethoate	200000	ug/L	20000	ug/L	20100108														
1110	p-Dimethylaminoazobenzene	100000	ug/L	10000	ug/L	20100108														
1116	N,N-Dimethylaniline	500000	ug/L			0														
1120	7,12-Dimethylbenz(a)anthracene	200000	ug/L	10000	ug/L	20100108														
1124	3,3'-Dimethylbenzidine	500000	ug/L	50000	ug/L	20100108														
1128	Dimethylformamide	100000	ug/L	10000	ug/L	20100108														
1140	alpha,alpha-Dimethylphenethylamine	500000	ug/L	50000	ug/L	20100108														
1145	2,4-Dimethylphenol	100000	ug/L	10000	ug/L	20100108														
1119	Dimethylphenylamine	500000	ug/L			0														
1149	Dimethyl phthalate	100000	ug/L	10000	ug/L	20100108														
1164	1,3-Dinitrobenzene	100000	ug/L	10000	ug/L	20100108														
2785	1,4-Dinitrobenzene	100000	ug/L	10000	ug/L	20100108														
1167	4,6-Dinitro-2-methylphenol	500000	ug/L	50000	ug/L	20100108														
1187	2,4-Dinitrophenol	500000	ug/L	50000	ug/L	20100108														
1191	2,4-Dinitrotoluene	100000	ug/L	10000	ug/L	20100108	C	Y			49	95	20	C	Y			52	100	20
1193	2,6-Dinitrotoluene	100000	ug/L	10000	ug/L	20100108														
1195	Dinoseb	200000	ug/L	20000	ug/L	20100108														
1196	2-sec-Butyl-4,6-dinitrophenol	200000	ug/L	20000	ug/L	20100108														
1162	Di-n-octyl phthalate	100000	ug/L	10000	ug/L	20100108														
1199	1,4-Dioxane	100000	ug/L	10000	ug/L	20100108														
2944	1,2-Diphenylhydrazine (as Azobenzen	100000	ug/L	10000	ug/L	20100108														
1225	Disulfoton	500000	ug/L	50000	ug/L	20100108														
1362	Ethyl methanesulfonate	100000	ug/L	10000	ug/L	20100108														

Structured Analysis Code: A-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1372	Famphur	1000000	ug/L	10000	ug/L	20100108														
1414	Fluoranthene	100000	ug/L	10000	ug/L	20100108														
1417	Fluorene	100000	ug/L	10000	ug/L	20100108														
1482	Hexachlorobenzene	100000	ug/L	10000	ug/L	20100108	C	Y			46	87	20	C	Y			46	90	20
1489	Hexachlorobutadiene	100000	ug/L	10000	ug/L	20100108	C	Y			30	95	20	C	Y			29	96	20
1492	Hexachlorocyclopentadiene	500000	ug/L	50000	ug/L	20100108														
1491	Hexachloro-1,3-cyclopentadiene	500000	ug/L	50000	ug/L	20100108														
1497	Hexachloroethane	100000	ug/L	10000	ug/L	20100108	C	Y			25	97	20	C	Y			23	104	20
1501	Hexachlorophene	1000000	ug/L	200000	ug/L	20100108														
1511	Hexachloropropene	100000	ug/L	10000	ug/L	20100108														
1535	Indeno(1,2,3-cd)pyrene	100000	ug/L	10000	ug/L	20100108														
1559	Isodrin	100000	ug/L	10000	ug/L	20100108														
1566	Isophorone	100000	ug/L	10000	ug/L	20100108														
1593	Isosafrole	200000	ug/L	20000	ug/L	20100108														
1596	Kepone	1000000	ug/L	100000	ug/L	20100108														
1724	Methapyrilene	500000	ug/L	50000	ug/L	20100108														
1785	2-Methylbenzenamine	200000	ug/L	10000	ug/L	20100108														
1796	3-Methylcholanthrene	200000	ug/L	10000	ug/L	20100108														
1810	4,4'-Methylenebis(2-chloroaniline)	100000	ug/L	20000	ug/L	20100108														
1825	Methyl methanesulfonate	100000	ug/L	10000	ug/L	20100108														
1829	2-Methylnaphthalene	100000	ug/L	10000	ug/L	20100108														
1831	Methyl parathion	500000	ug/L	50000	ug/L	20100108														
1851	2-Methylphenol	100000	ug/L	10000	ug/L	20100108	C	Y			51	99	20	C	Y			44	106	20
2777	3-Methylphenol & 4-Methylphenol	100000	ug/L	20000	ug/L	20100108	C	Y			53	96	20	C	Y			49	100	20
1932	Naphthalene	100000	ug/L	10000	ug/L	20100108														
1940	1,4-Naphthoquinone	500000	ug/L	50000	ug/L	20100108														
1944	1-Naphthylamine	100000	ug/L	10000	ug/L	20100108														
1949	2-Naphthylamine	100000	ug/L	20000	ug/L	20100108														
1960	2-Nitroaniline	500000	ug/L	10000	ug/L	20100108														
1964	3-Nitroaniline	500000	ug/L	10000	ug/L	20100108														
1968	4-Nitroaniline	500000	ug/L	50000	ug/L	20100108														
1972	Nitrobenzene	100000	ug/L	10000	ug/L	20100108	C	Y			45	95	20	C	Y			44	102	20
1998	2-Nitrophenol	100000	ug/L	10000	ug/L	20100108														
2001	4-Nitrophenol	500000	ug/L	50000	ug/L	20100108														
2006	4-Nitroquinoline-1-oxide	1000000	ug/L	100000	ug/L	20100108														
2009	N-Nitrosodi-n-butylamine	100000	ug/L	10000	ug/L	20100108														
2013	N-Nitrosodiethylamine	100000	ug/L	10000	ug/L	20100108														
2018	N-Nitrosodimethylamine	100000	ug/L	10000	ug/L	20100108														
2028	N-Nitrosodiphenylamine	100000	ug/L	10000	ug/L	20100108														

Structured Analysis Code: A-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2024	N-Nitrosodi-n-propylamine	100000	ug/L	10000	ug/L	20100108														
2031	N-Nitrosomethylethylamine	100000	ug/L	10000	ug/L	20100108														
2034	N-Nitrosomorpholine	100000	ug/L	10000	ug/L	20100108														
2036	N-Nitrosopiperidine	100000	ug/L	10000	ug/L	20100108														
2038	N-Nitrosopyrrolidine	100000	ug/L	10000	ug/L	20100108														
2042	N-Nitro-o-toluidine	200000	ug/L	10000	ug/L	20100108														
3597	2,2'-oxybis(1-Chloropropane)	100000	ug/L	10000	ug/L	20100108														
2062	Parathion	500000	ug/L	50000	ug/L	20100108														
2104	Pentachlorobenzene	100000	ug/L	10000	ug/L	20100108														
2108	Pentachloroethane	500000	ug/L	50000	ug/L	20100108														
2112	Pentachloronitrobenzene	500000	ug/L	50000	ug/L	20100108														
2118	Pentachlorophenol	500000	ug/L	50000	ug/L	20100108	C	Y			35	98	20	C	Y			35	108	20
2146	Phenacetin	200000	ug/L	20000	ug/L	20100108														
2154	Phenanthrene	100000	ug/L	10000	ug/L	20100108														
2155	Phenol	100000	ug/L	10000	ug/L	20100108														
2164	p-Phenylene diamine	1000000	ug/L	100000	ug/L	20100108														
2170	Phorate	500000	ug/L	50000	ug/L	20100108														
2206	2-Picoline	200000	ug/L	10000	ug/L	20100108														
2221	Pronamide	200000	ug/L	20000	ug/L	20100108														
2252	Pyrene	100000	ug/L	10000	ug/L	20100108														
2256	Pyridine	200000	ug/L	20000	ug/L	20100108	C	Y			10	72	20	C	Y			10	80	20
2275	Safrole	200000	ug/L	20000	ug/L	20100108														
2462	Sulfotepp	500000	ug/L	50000	ug/L	20100108														
2430	1,2,4,5-Tetrachlorobenzene	100000	ug/L	10000	ug/L	20100108														
2457	2,3,4,6-Tetrachlorophenol	500000	ug/L	10000	ug/L	20100108														
2459	Tetraethyldithiopyrophosphate (Sulfot	500000	ug/L	50000	ug/L	20100108														
1086	Thionazin	500000	ug/L	50000	ug/L	20100108														
1786	o-Toluidine	200000	ug/L	10000	ug/L	20100108														
2721	Tributyl phosphate	100000	ug/L	10000	ug/L	20100108														
2515	1,2,4-Trichlorobenzene	100000	ug/L	10000	ug/L	20100108														
2555	2,4,5-Trichlorophenol	100000	ug/L	10000	ug/L	20100108	C	Y			47	92	20	C	Y			47	96	20
2559	2,4,6-Trichlorophenol	100000	ug/L	10000	ug/L	20100108	C	Y			47	88	20	C	Y			48	96	20
2569	O,O,O-Triethyl phosphorothioate	100000	ug/L	10000	ug/L	20100108														
2597	1,3,5-Trinitrobenzene	500000	ug/L	50000	ug/L	20100108														
5082	Tris(2-chloroethyl)phosphate	100000	ug/L	10000	ug/L	20100108														
1425	2-Fluorobiphenyl						X	Y			42	94	0	X	Y			42	95	0
1426	2-Fluorophenol						X	Y			42	93	0	X	Y			38	98	0
2512	2,4,6-Tribromophenol						X	Y			48	95	0	X	Y			50	101	0
2736	Nitrobenzene-d5						X	Y			48	97	0	X	Y			45	102	0

Structural Analysis Code: A-3H-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Waste Dilution
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2737	Phenol-d5						X	Y			44	92	0	X	Y			40	95	0
2738	Terphenyl-d14						X	Y			57	118	0	X	Y			56	118	0

TAL Reference Data Summary

Structured Analysis Code: A-39-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-W(1312) -> LIQ/LIQ, SEP FUNNEL - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
302	bis(2-Ethylhexyl) phthalate	50	ug/L	5.00	ug/L	20100108														
403	Butyl benzyl phthalate	50	ug/L	5.00	ug/L	20100108														
633	Chrysene	50	ug/L	5.0	ug/L	20100108														
2669	Dibenzo(a,h)anthracene	50	ug/L	5.0	ug/L	20100108														
863	Dibenzofuran	50	ug/L	5.00	ug/L	20100108														
910	1,4-Dichlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			40	93	20	C	Y			35	93	20
1191	2,4-Dinitrotoluene	50	ug/L	5.00	ug/L	20100108	C	Y			49	95	20	C	Y			52	100	20
1482	Hexachlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			46	87	20	C	Y			46	90	20
1489	Hexachlorobutadiene	50	ug/L	5.00	ug/L	20100108	C	Y			30	95	20	C	Y			29	96	20
1497	Hexachloroethane	50	ug/L	5.00	ug/L	20100108	C	Y			25	97	20	C	Y			23	104	20
1535	Indeno(1,2,3-cd)pyrene	50	ug/L	5.0	ug/L	20100108														
1851	2-Methylphenol	50	ug/L	10.0	ug/L	20100108	C	Y			51	99	20	C	Y			44	106	20
2777	3-Methylphenol & 4-Methylphenol	100	ug/L	5.00	ug/L	20100108	C	Y			53	96	20	C	Y			49	100	20
1972	Nitrobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			45	95	20	C	Y			44	102	20
2118	Pentachlorophenol	250	ug/L	10.00	ug/L	20100108	C	Y			35	98	20	C	Y			35	108	20
2154	Phenanthrene	50	ug/L	5.0	ug/L	20100108														
2252	Pyrene	50	ug/L	5.00	ug/L	20100108														
2256	Pyridine	100	ug/L	25.0	ug/L	20100108	C	Y			10	72	20	C	Y			10	80	20
2555	2,4,5-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			47	92	20	C	Y			47	96	20
2559	2,4,6-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			47	88	20	C	Y			48	96	20
1425	2-Fluorobiphenyl						X	Y			42	94	0	X	Y			42	95	0
1426	2-Fluorophenol						X	Y			42	93	0	X	Y			38	98	0
2512	2,4,6-Tribromophenol						X	Y			48	95	0	X	Y			50	101	0
2736	Nitrobenzene-d5						X	Y			48	97	0	X	Y			45	102	0
2737	Phenol-d5						X	Y			44	92	0	X	Y			40	95	0
2738	Terphenyl-d14						X	Y			57	118	0	X	Y			56	118	0

TAL Reference Data Summary

Structured Analysis Code: A-42-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-W(1312) -> LIQ/LIQ, CONT - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 0							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
202	Benzo(a)anthracene	50	ug/L	2.35	ug/L	20030122														
205	Benzo(b)fluoranthene	50	ug/L	4.15	ug/L	20030122														
208	Benzo(k)fluoranthene	50	ug/L	7.35	ug/L	20030122														
211	Benzo(a)pyrene	50	ug/L	5.5	ug/L	20030122														
302	bis(2-Ethylhexyl) phthalate	50	ug/L	19.4	ug/L	20030122														
403	Butyl benzyl phthalate	50	ug/L	13.35	ug/L	20030122														
2751	Carbazole	50	ug/L	2.1	ug/L	20030122														
633	Chrysene	50	ug/L	3.0	ug/L	20030122														
2669	Dibenzo(a,h)anthracene	50	ug/L	6.75	ug/L	20030122														
863	Dibenzofuran	50	ug/L	1.80	ug/L	20030122														
910	1,4-Dichlorobenzene	50	ug/L	2.05	ug/L	20030122														
918	3,3'-Dichlorobenzidine	250	ug/L	6.65	ug/L	20030122														
1191	2,4-Dinitrotoluene	50	ug/L	3.1	ug/L	20030122														
1193	2,6-Dinitrotoluene	50	ug/L	3.4	ug/L	20030122														
1482	Hexachlorobenzene	50	ug/L	2.35	ug/L	20030122														
1489	Hexachlorobutadiene	50	ug/L	2.05	ug/L	20030122														
1497	Hexachloroethane	50	ug/L	1.2	ug/L	20030122														
1535	Indeno(1,2,3-cd)pyrene	50	ug/L	6.2	ug/L	20030122														
1851	2-Methylphenol	50	ug/L	1.2	ug/L	20030220														
1857	4-Methylphenol	50	ug/L	35.7	ug/L	20011115														
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	1.55	ug/L	20030220														
1972	Nitrobenzene	50	ug/L	1.7	ug/L	20030122														
2024	N-Nitrosodi-n-propylamine	50	ug/L	4.45	ug/L	20030122														
2118	Pentachlorophenol	250	ug/L	2.9	ug/L	20030220														
2154	Phenanthrene	50	ug/L	2.00	ug/L	20030122														
2252	Pyrene	50	ug/L	2.3	ug/L	20030122														
2256	Pyridine	100	ug/L	9.15	ug/L	20030122														
2555	2,4,5-Trichlorophenol	50	ug/L	3.2	ug/L	20030220														
2559	2,4,6-Trichlorophenol	50	ug/L	2.2	ug/L	20030220														
2563	1,2,3-Trichloropropane	50	ug/L	13.10	ug/L	20011115														

TAL Reference Data Summary

Structured Analysis Code: A-45-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312) -> LIQ/LIQ, CONT - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 0							Spike List 0					
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
910	1,4-Dichlorobenzene	50	ug/L	2.05	ug/L	20030122														
1191	2,4-Dinitrotoluene	50	ug/L	3.1	ug/L	20030122														
1482	Hexachlorobenzene	50	ug/L	2.35	ug/L	20030122														
1489	Hexachlorobutadiene	50	ug/L	2.05	ug/L	20030122														
1497	Hexachloroethane	50	ug/L	1.2	ug/L	20030122														
1851	2-Methylphenol	50	ug/L	1.2	ug/L	20030220														
1857	4-Methylphenol	50	ug/L	35.7	ug/L	20011115														
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	1.55	ug/L	20030220														
1972	Nitrobenzene	50	ug/L	1.7	ug/L	20030122														
2118	Pentachlorophenol	250	ug/L	2.9	ug/L	20030220														
2256	Pyridine	100	ug/L	9.15	ug/L	20030122														
2555	2,4,5-Trichlorophenol	50	ug/L	3.2	ug/L	20030220														
2559	2,4,6-Trichlorophenol	50	ug/L	2.2	ug/L	20030220														

TAL Reference Data Summary

Structured Analysis Code: A-SS-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE,Citrate Buffer, CA Title 22 WET -> SOLVENT E
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
910	1,4-Dichlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			40	93	20	C	Y			35	93	20
1191	2,4-Dinitrotoluene	50	ug/L	5.00	ug/L	20100108	C	Y			49	95	20	C	Y			52	100	20
1482	Hexachlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			46	87	20	C	Y			46	90	20
1489	Hexachlorobutadiene	50	ug/L	5.00	ug/L	20100108	C	Y			30	95	20	C	Y			29	96	20
1497	Hexachloroethane	50	ug/L	5.00	ug/L	20100108	C	Y			25	97	20	C	Y			23	104	20
1596	Kepone	500	ug/L	100	ug/L	20090313														
1851	2-Methylphenol	50	ug/L	10.0	ug/L	20100108	C	Y			51	99	20	C	Y			44	106	20
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	10.00	ug/L	20100108	C	Y			53	96	20	C	Y			49	100	20
1972	Nitrobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			45	95	20	C	Y			44	102	20
2118	Pentachlorophenol	250	ug/L	10.00	ug/L	20100108	C	Y			35	98	20	C	Y			35	108	20
2256	Pyridine	100	ug/L	25.0	ug/L	20100108	C	Y			10	72	20	C	Y			10	80	20
2555	2,4,5-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			47	92	20	C	Y			47	96	20
2559	2,4,6-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			47	88	20	C	Y			48	96	20
1425	2-Fluorobiphenyl						X	Y			42	94	0	X	Y			42	95	0
1426	2-Fluorophenol						X	Y			42	93	0	X	Y			38	98	0
2512	2,4,6-Tribromophenol						X	Y			48	95	0	X	Y			50	101	0
2736	Nitrobenzene-d5						X	Y			48	97	0	X	Y			45	102	0
2737	Phenol-d5						X	Y			44	92	0	X	Y			40	95	0
2738	Terphenyl-d14						X	Y			57	118	0	X	Y			56	118	0

TAL Reference Data Summary

Structured Analysis Code: A-SJ-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> LIQ/LIQ, CONT - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 0							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
910	1,4-Dichlorobenzene	50	ug/L	2.05	ug/L	20030122														
1191	2,4-Dinitrotoluene	50	ug/L	3.1	ug/L	20030122														
1482	Hexachlorobenzene	50	ug/L	2.35	ug/L	20030122														
1489	Hexachlorobutadiene	50	ug/L	2.05	ug/L	20030122														
1497	Hexachloroethane	50	ug/L	1.2	ug/L	20030122														
1851	2-Methylphenol	50	ug/L	1.2	ug/L	20030220														
1857	4-Methylphenol	50	ug/L	35.7	ug/L	20011115														
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	1.55	ug/L	20030220														
1972	Nitrobenzene	50	ug/L	1.7	ug/L	20030122														
2118	Pentachlorophenol	250	ug/L	2.9	ug/L	20030220														
2155	Phenol	50	ug/L	1.3	ug/L	20030220														
2256	Pyridine	100	ug/L	9.15	ug/L	20030122														
2555	2,4,5-Trichlorophenol	50	ug/L	3.2	ug/L	20030220														
2559	2,4,6-Trichlorophenol	50	ug/L	2.2	ug/L	20030220														

TAL Reference Data Summary

Structured Analysis Code: A-62-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> LIQ/LIQ, SEP FUNNEL - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6162						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	50	ug/L	5.0	ug/L	20100108														
5	Acenaphthylene	50	ug/L	5.0	ug/L	20100108														
122	Anthracene	50	ug/L	5.0	ug/L	20100108														
202	Benzo(a)anthracene	50	ug/L	5.0	ug/L	20100108														
205	Benzo(b)fluoranthene	50	ug/L	5.0	ug/L	20100108														
208	Benzo(k)fluoranthene	50	ug/L	5.0	ug/L	20100108														
210	Benzo(ghi)perylene	50	ug/L	5.0	ug/L	20100108														
211	Benzo(a)pyrene	50	ug/L	5.0	ug/L	20100108														
633	Chrysene	50	ug/L	5.0	ug/L	20100108														
2758	Cresols (total)	50	ug/L			0														
860	Dibenz(a,h)anthracene	50	ug/L	5.0	ug/L	20100108														
910	1,4-Dichlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			40	93	20	C	Y			35	93	20
1191	2,4-Dinitrotoluene	50	ug/L	5.00	ug/L	20100108	C	Y			49	95	20	C	Y			52	100	20
1414	Fluoranthene	50	ug/L	5.0	ug/L	20100108														
1417	Fluorene	50	ug/L	5.0	ug/L	20100108														
1482	Hexachlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			46	87	20	C	Y			46	90	20
1489	Hexachlorobutadiene	50	ug/L	5.00	ug/L	20100108	C	Y			30	95	20	C	Y			29	96	20
1497	Hexachloroethane	50	ug/L	5.00	ug/L	20100108	C	Y			25	97	20	C	Y			23	104	20
1535	Indeno(1,2,3-cd)pyrene	50	ug/L	5.0	ug/L	20100108														
1851	2-Methylphenol	50	ug/L	10.0	ug/L	20100108	C	Y			51	99	20	C	Y			44	106	20
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	5.00	ug/L	20100108	C	Y			53	96	20	C	Y			49	100	20
1932	Naphthalene	50	ug/L	5.0	ug/L	20100108														
1972	Nitrobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			45	95	20	C	Y			44	102	20
2118	Pentachlorophenol	250	ug/L	10.00	ug/L	20100108	C	Y			35	98	20	C	Y			35	108	20
2154	Phenanthrene	50	ug/L	5.0	ug/L	20100108														
2155	Phenol	50	ug/L	20.0	ug/L	20100108														
2252	Pyrene	50	ug/L	0.304	ug/L	20100108														
2256	Pyridine	100	ug/L	25.0	ug/L	20100108	C	Y			10	72	20	C	Y			10	80	20
2555	2,4,5-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			47	92	20	C	Y			47	96	20
2559	2,4,6-Trichlorophenol	50	ug/L	10.00	ug/L	20100108	C	Y			47	88	20	C	Y			48	96	20
1425	2-Fluorobiphenyl						X	Y			42	94	0	X	Y			42	95	0
1426	2-Fluorophenol						X	Y			42	93	0	X	Y			38	98	0
2512	2,4,6-Tribromophenol						X	Y			48	95	0	X	Y			50	101	0
2736	Nitrobenzene-d5						X	Y			48	97	0	X	Y			45	102	0
2737	Phenol-d5						X	Y			44	92	0	X	Y			40	95	0
2738	Terphenyl-d14						X	Y			57	118	0	X	Y			56	118	0

TAL Reference Data Summary

Structured Analysis Code: A-66-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312) -> LIQ/LIQ, SEP FUNNEL - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6161						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1	Acenaphthene	50	ug/L	5.0	ug/L	20100108														
5	Acenaphthylene	50	ug/L	5.00	ug/L	20100108														
115	Aniline	50	ug/L	5.00	ug/L	20100108														
122	Anthracene	500	ug/L	100	ug/L	20100108														
199	Benzidine	500	ug/L	100	ug/L	20100108														
202	Benzo(a)anthracene	50	ug/L	5.0	ug/L	20100108														
205	Benzo(b)fluoranthene	50	ug/L	5.0	ug/L	20100108														
208	Benzo(k)fluoranthene	250	ug/L	25.0	ug/L	20100108														
209	Benzoic acid	250	ug/L	25.0	ug/L	20100108														
210	Benzo(ghi)perylene	50	ug/L	5.0	ug/L	20100108														
211	Benzo(a)pyrene	50	ug/L	5.0	ug/L	20100108														
293	bis(2-Chloroethyl) ether	50	ug/L	5.00	ug/L	20100108														
298	bis(2-Chloroisopropyl) ether	50	ug/L	5.00	ug/L	20100108														
302	bis(2-Ethylhexyl) phthalate	50	ug/L	5.00	ug/L	20100108														
348	4-Bromophenyl phenyl ether	50	ug/L	5.00	ug/L	20100108														
403	Butyl benzyl phthalate	50	ug/L	5.00	ug/L	20100108														
2751	Carbazole	50	ug/L	5.00	ug/L	20100108														
518	4-Chloroaniline	50	ug/L	5.00	ug/L	20100108														
589	2-Chloronaphthalene	50	ug/L	5.00	ug/L	20100108														
600	2-Chlorophenol	50	ug/L	5.00	ug/L	20100108														
602	4-Chlorophenyl phenyl ether	50	ug/L	5.00	ug/L	20100108														
633	Chrysene	50	ug/L	5.0	ug/L	20100108														
860	Dibenz(a,h)anthracene	50	ug/L	5.00	ug/L	20100108														
863	Dibenzofuran	50	ug/L	5.00	ug/L	20100108														
891	Di-n-butyl phthalate	50	ug/L	5.00	ug/L	20100108														
910	1,4-Dichlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			40	93	20	C	Y			40	93	20
918	3,3'-Dichlorobenzidine	250	ug/L	25.0	ug/L	20100108														
971	2,4-Dichlorophenol	50	ug/L	5.00	ug/L	20100108														
1082	Diethyl phthalate	50	ug/L	5.00	ug/L	20100108														
1145	2,4-Dimethylphenol	50	ug/L	5.00	ug/L	20100108														
1149	Dimethyl phthalate	50	ug/L	5.00	ug/L	20100108														
1187	2,4-Dinitrophenol	250	ug/L	10	ug/L	20100108														
1191	2,4-Dinitrotoluene	50	ug/L	15	ug/L	20100108	C	Y			49	95	20	C	Y			49	95	20
1193	2,6-Dinitrotoluene	50	ug/L	15	ug/L	20100108														
1162	Di-n-octyl phthalate	50	ug/L	5.00	ug/L	20100108														
1414	Fluoranthene	50	ug/L	5.0	ug/L	20100108														
1417	Fluorene	50	ug/L	5.0	ug/L	20100108														

Structured Analysis Code: A-66-QL-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312) -> LIQ/LIQ, SEP FUNNEL - Acid->Base
Method: Base/Neutrals and Acids (8270C)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6161							Spike List 6161						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1482	Hexachlorobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			46	87	20	C	Y			46	87	20
1489	Hexachlorobutadiene	50	ug/L	5.00	ug/L	20100108	C	Y			30	95	20	C	Y			30	95	20
1491	Hexachloro-1,3-cyclopentadiene	50	ug/L	5.00	ug/L	20100108														
1497	Hexachloroethane	50	ug/L	5.00	ug/L	20100108	C	Y			25	97	20	C	Y			25	97	20
1535	Indeno(1,2,3-cd)pyrene	50	ug/L	5.0	ug/L	20100108														
1566	Isophorone	50	ug/L	5.00	ug/L	20100108														
1829	2-Methylnaphthalene	50	ug/L	5.00	ug/L	20100108														
1851	2-Methylphenol	50	ug/L	5.00	ug/L	20100108	C	Y			51	99	20	C	Y			51	99	20
2777	3-Methylphenol & 4-Methylphenol	50	ug/L	5.00	ug/L	20100108	C	Y			53	96	20	C	Y			53	96	20
1932	Naphthalene	50	ug/L	5.0	ug/L	20100108														
1960	2-Nitroaniline	50	ug/L	5.00	ug/L	20100108														
1964	3-Nitroaniline	50	ug/L	5.00	ug/L	20100108														
1968	4-Nitroaniline	50	ug/L	5.00	ug/L	20100108														
1972	Nitrobenzene	50	ug/L	5.00	ug/L	20100108	C	Y			45	95	20	C	Y			45	95	20
1998	2-Nitrophenol	50	ug/L	5.00	ug/L	20100108														
2028	N-Nitrosodiphenylamine	50	ug/L	5.00	ug/L	20100108														
2024	N-Nitrosodi-n-propylamine	50	ug/L	5.00	ug/L	20100108														
2112	Pentachloronitrobenzene	250	ug/L	10.0	ug/L	20100108														
2118	Pentachlorophenol	250	ug/L	10.0	ug/L	20100108	C	Y			35	98	20	C	Y			35	98	20
2154	Phenanthrene	50	ug/L	5.0	ug/L	20100108														
2155	Phenol	50	ug/L	10.0	ug/L	20100108														
2252	Pyrene	50	ug/L	5.00	ug/L	20100108														
2256	Pyridine	100	ug/L	25.0	ug/L	20100108	C	Y			10	72	20	C	Y			10	72	20
2430	1,2,4,5-Tetrachlorobenzene	50	ug/L	5.00	ug/L	20100108														
2515	1,2,4-Trichlorobenzene	50	ug/L	5.00	ug/L	20100108														
2555	2,4,5-Trichlorophenol	50	ug/L	10	ug/L	20100108	C	Y			47	92	20	C	Y			47	92	20
2559	2,4,6-Trichlorophenol	50	ug/L	5.00	ug/L	20100108	C	Y			47	88	20	C	Y			47	88	20
1425	2-Fluorobiphenyl						X	Y			42	94	0	X	Y			42	94	0
1426	2-Fluorophenol						X	Y			42	93	0	X	Y			42	93	0
2512	2,4,6-Tribromophenol						X	Y			48	95	0	X	Y			48	95	0
2736	Nitrobenzene-d5						X	Y			48	97	0	X	Y			48	97	0
2737	Phenol-d5						X	Y			44	92	0	X	Y			44	92	0
2738	Terphenyl-d14						X	Y			57	118	0	X	Y			57	118	0

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 941 to 955

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

TAL Reference Data Summary

Structured Analysis Code: **I-10-DM-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (PAH,P/P,TPH) - Nominal
Method: Pesticides/PCB (608)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	69	140	20	C	Y	0.50	ug/L	57	150	20
226	alpha-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	71	140	20	C	Y	0.50	ug/L	61	150	20
228	beta-BHC	0.05	ug/L	0.013	ug/L	20100601	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	38	150	20
230	delta-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	54	140	20	C	Y	0.50	ug/L	54	150	20
232	gamma-BHC (Lindane)	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	150	20
497	alpha-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	138	20	C	Y	0.50	ug/L	54	150	20
499	gamma-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	150	20
476	Chlordane (technical)	0.5	ug/L	0.231	ug/L	20100601	C	Y			70	130	20	C	Y			50	150	20
770	4,4'-DDD	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	64	150	20
2779	2,4'-DDD	0.05	ug/L	0.01	ug/L	20100601														
777	4,4'-DDE	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	139	20
2781	2,4'-DDE	0.05	ug/L	0.01	ug/L	20100601														
780	4,4'-DDT	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	66	150	20
2783	2,4'-DDT	0.05	ug/L	0.02	ug/L	20100601													-	
1052	Dieldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	68	140	20	C	Y	0.50	ug/L	66	149	20
1236	Endosulfan I	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	138	20	C	Y	0.50	ug/L	64	143	20
1239	Endosulfan II	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	71	133	20	C	Y	0.50	ug/L	64	146	20
1241	Endosulfan sulfate	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	135	20	C	Y	0.50	ug/L	64	147	20
1270	Endrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	70	150	20
1277	Endrin aldehyde	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	57	140	20	C	Y	0.50	ug/L	47	150	20
1279	Endrin ketone	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	144	20
1470	Heptachlor	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	52	150	20
1479	Heptachlor epoxide	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	64	140	20	C	Y	0.50	ug/L	54	150	20
1741	Methoxychlor	0.1	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	60	140	20	C	Y	0.50	ug/L	58	150	20
2499	Toxaphene	2.0	ug/L	0.66	ug/L	20100601	C	Y			50	150	30							
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	76	120	0	X	Y	0.2	ug/L	74	127	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	66	127	0	X	Y	0.2	ug/L	56	136	0

TAL Reference Data Summary

Structured Analysis Code: **I-KF-QJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Low Level, Liq/Liq, CONT (P/P)
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.025	ug/L	0.0052	ug/L	20051007	C	Y	0.50	ug/L	69	140	20	C	Y	0.50	ug/L	57	150	20
226	alpha-BHC	0.025	ug/L	0.0041	ug/L	20051007	C	Y	0.50	ug/L	71	140	20	C	Y	0.50	ug/L	61	150	20
228	beta-BHC	0.025	ug/L	0.0051	ug/L	20051007	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	38	150	20
230	delta-BHC	0.025	ug/L	0.0124	ug/L	20051007	C	Y	0.50	ug/L	54	140	20	C	Y	0.50	ug/L	54	150	20
232	gamma-BHC (Lindane)	0.025	ug/L	0.0046	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	150	20
497	alpha-Chlordane	0.025	ug/L	0.0060	ug/L	20051007	C	Y	0.50	ug/L	70	138	20	C	Y	0.50	ug/L	54	150	20
499	gamma-Chlordane	0.025	ug/L	0.0056	ug/L	20051007	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	150	20
476	Chlordane (technical)	0.250	ug/L	0.0542	ug/L	20050923	C	Y			70	130	20	C	Y			50	150	20
770	4,4'-DDD	0.025	ug/L	0.0075	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	64	150	20
777	4,4'-DDE	0.025	ug/L	0.0065	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	139	20
780	4,4'-DDT	0.025	ug/L	0.0085	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	66	150	20
1052	Dieldrin	0.025	ug/L	0.0065	ug/L	20051007	C	Y	0.50	ug/L	68	140	20	C	Y	0.50	ug/L	66	149	20
1236	Endosulfan I	0.025	ug/L	0.0052	ug/L	20051007	C	Y	0.50	ug/L	66	138	20	C	Y	0.50	ug/L	64	143	20
1239	Endosulfan II	0.025	ug/L	0.0065	ug/L	20051007	C	Y	0.50	ug/L	71	133	20	C	Y	0.50	ug/L	64	146	20
1241	Endosulfan sulfate	0.025	ug/L	0.0074	ug/L	20051007	C	Y	0.50	ug/L	70	135	20	C	Y	0.50	ug/L	64	147	20
1270	Endrin	0.025	ug/L	0.0070	ug/L	20051007	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	70	150	20
1277	Endrin aldehyde	0.025	ug/L	0.0071	ug/L	20051007	C	Y	0.50	ug/L	57	140	20	C	Y	0.50	ug/L	47	150	20
1279	Endrin ketone	0.025	ug/L	0.0082	ug/L	20051007	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	144	20
1470	Heptachlor	0.025	ug/L	0.0107	ug/L	20051007	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	52	150	20
1479	Heptachlor epoxide	0.025	ug/L	0.0056	ug/L	20051007	C	Y	0.50	ug/L	64	140	20	C	Y	0.50	ug/L	54	150	20
1741	Methoxychlor	0.025	ug/L	0.0187	ug/L	20051007	C	Y	0.50	ug/L	60	140	20	C	Y	0.50	ug/L	58	150	20
2499	Toxaphene	1	ug/L	0.2959	ug/L	20051007	C	Y			50	150	30							
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	76	120	0	X	Y	0.2	ug/L	74	127	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	66	127	0	X	Y	0.2	ug/L	56	136	0

TAL Reference Data Summary

Structured Analysis Code: **I-KH-QJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Low Level Liq/Liq, CONT (P/P)
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20030214														
226	alpha-BHC	0.1	ug/L	0.0058	ug/L	20050923														
228	beta-BHC	0.1	ug/L	0.034	ug/L	20030214														
230	delta-BHC	0.1	ug/L	0.02	ug/L	20030214														
232	gamma-BHC (Lindane)	0.1	ug/L	0.0053	ug/L	20050923	C	Y	5	ug/L	78	117	20	C	Y	5	ug/L	68	131	20
476	Chlordane (technical)	0.250	ug/L	0.0542	ug/L	20050923	C	Y			70	130	20							
770	4,4'-DDD	0.025	ug/L	0.0056	ug/L	20050923														
777	4,4'-DDE	0.05	ug/L	0.006	ug/L	20030214														
780	4,4'-DDT	0.05	ug/L	0.014	ug/L	20030214														
1052	Dieldrin	0.1	ug/L	0.0053	ug/L	20050923														
1236	Endosulfan I	0.1	ug/L	0.0045	ug/L	20050923														
1239	Endosulfan II	0.1	ug/L	0.0066	ug/L	20050923														
1241	Endosulfan sulfate	0.1	ug/L	0.0076	ug/L	20050923														
1270	Endrin	0.1	ug/L	0.0174	ug/L	20030214	C	Y	5	ug/L	75	125	20	C	Y	5	ug/L	78	129	20
1277	Endrin aldehyde	0.1	ug/L	0.0087	ug/L	20050923														
1470	Heptachlor	0.1	ug/L	0.013	ug/L	20030214	C	Y	5	ug/L	75	131	20	C	Y	5	ug/L	56	193	20
1479	Heptachlor epoxide	0.1	ug/L	0.0057	ug/L	20050923	C	Y	5	ug/L	80	118	20	C	Y	5	ug/L	54	144	20
1741	Methoxychlor	0.2	ug/L	0.026	ug/L	20030214	C	Y	10	ug/L	70	123	20	C	Y	10	ug/L	65	138	20
2499	Toxaphene	4.0	ug/L	0.054	ug/L	20030213	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	77	129	0	X	Y	50	ug/L	68	146	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	71	132	0	X	Y	50	ug/L	66	148	0

TAL Reference Data Summary

Structured Analysis Code: **I-10-QJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (PAH,P/P,TPH) - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	69	140	20	C	Y	0.50	ug/L	57	150	20
226	alpha-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	71	140	20	C	Y	0.50	ug/L	61	150	20
228	beta-BHC	0.05	ug/L	0.013	ug/L	20100601	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	38	150	20
230	delta-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	54	140	20	C	Y	0.50	ug/L	54	150	20
232	gamma-BHC (Lindane)	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	150	20
497	alpha-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	138	20	C	Y	0.50	ug/L	54	150	20
499	gamma-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	150	20
476	Chlordane (technical)	0.5	ug/L	0.231	ug/L	20100601	C	Y			70	130	20	C	Y			50	150	20
770	4,4'-DDD	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	64	150	20
2779	2,4'-DDD	0.05	ug/L	0.016	ug/L	20110624														
777	4,4'-DDE	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	67	139	20
2781	2,4'-DDE	0.05	ug/L	0.01	ug/L	20100601														
780	4,4'-DDT	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	66	150	20
2783	2,4'-DDT	0.05	ug/L	0.02	ug/L	20100601														
1052	Dieldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	68	140	20	C	Y	0.50	ug/L	66	149	20
1236	Endosulfan I	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	138	20	C	Y	0.50	ug/L	64	143	20
1239	Endosulfan II	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	71	133	20	C	Y	0.50	ug/L	64	146	20
1241	Endosulfan sulfate	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	135	20	C	Y	0.50	ug/L	64	147	20
1270	Endrin	0.05	ug/L	0.017	ug/L	20110624	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	70	150	20
1277	Endrin aldehyde	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	57	140	20	C	Y	0.50	ug/L	47	150	20
1279	Endrin ketone	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	66	140	20	C	Y	0.50	ug/L	64	144	20
1470	Heptachlor	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	52	140	20	C	Y	0.50	ug/L	52	150	20
1479	Heptachlor epoxide	0.05	ug/L	0.017	ug/L	20110624	C	Y	0.50	ug/L	64	140	20	C	Y	0.50	ug/L	54	150	20
1482	Hexachlorobenzene	0.05	ug/L	0.015	ug/L	20110624														
1741	Methoxychlor	0.50	ug/L	0.01	ug/L	20110624	C	Y	0.50	ug/L	60	140	20	C	Y	0.50	ug/L	58	150	20
2499	Toxaphene	2.0	ug/L	0.66	ug/L	20100601	C	Y			50	150	30							
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	76	120	0	X	Y	0.2	ug/L	74	127	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	66	127	0	X	Y	0.2	ug/L	56	136	0

TAL Reference Data Summary

Structured Analysis Code: **I-14-QJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6374							Spike List 6375						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	50	ug/L	4.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
226	alpha-BHC	50	ug/L	2.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
228	beta-BHC	50	ug/L	12.7	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
230	delta-BHC	50	ug/L	6.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
232	gamma-BHC (Lindane)	50	ug/L	2.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
497	alpha-Chlordane	50	ug/L	3.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
499	gamma-Chlordane	50	ug/L	2.7	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
476	Chlordane (technical)	500	ug/L	18.0	ug/L	20080402	C	Y			70	130	20	C	Y			70	130	20
770	4,4'-DDD	50	ug/L	3.8	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
777	4,4'-DDE	50	ug/L	2.7	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
780	4,4'-DDT	50	ug/L	5.6	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1052	Dieldrin	50	ug/L	2.3	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1236	Endosulfan I	50	ug/L	2.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1239	Endosulfan II	50	ug/L	10.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1241	Endosulfan sulfate	50	ug/L	17.3	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1270	Endrin	50	ug/L	2.8	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1277	Endrin aldehyde	50	ug/L	3.2	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1279	Endrin ketone	50	ug/L	16.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1470	Heptachlor	50	ug/L	2.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1479	Heptachlor epoxide	50	ug/L	3.2	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1741	Methoxychlor	100	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
2499	Toxaphene	2000	ug/L	330	ug/L	20080402	C	Y			70	130	20	C	Y			70	130	20
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **I-3H-QJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> Waste Dilution
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6374							Spike List 6375						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
232	gamma-BHC (Lindane)	50	ug/L	1.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
476	Chlordane (technical)	500	ug/L	20.0	ug/L	20080402	C	Y			70	130	20	C	Y			70	130	20
1052	Dieldrin	50	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1241	Endosulfan sulfate	50	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1270	Endrin	50	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1470	Heptachlor	50	ug/L	1.5	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1479	Heptachlor epoxide	50	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
1741	Methoxychlor	100	ug/L	5.0	ug/L	20080402	C	Y	0.50	ug/L	70	130	20	C	Y	0.50	ug/L	70	130	20
2499	Toxaphene	2000	ug/L	330.0	ug/L	20080402	C	Y			70	130	20	C	Y			70	130	20
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **I-44-QJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-W(1312) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.5	ug/L	0.05	ug/L	20100601														
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	78	117	20	C	Y	5	ug/L	68	131	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	75	125	20	C	Y	5	ug/L	78	129	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	75	131	20	C	Y	5	ug/L	56	193	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	80	118	20	C	Y	5	ug/L	54	144	20
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	70	123	20	C	Y	10	ug/L	65	138	20
2499	Toxaphene	20	ug/L	3.30	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	77	129	0	X	Y	50	ug/L	68	146	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	71	132	0	X	Y	50	ug/L	66	148	0

TAL Reference Data Summary

Structured Analysis Code: **I-47-QJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-E(1312) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.5	ug/L	0.05	ug/L	20100601														
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	78	117	20	C	Y	5	ug/L	68	131	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	75	125	20	C	Y	5	ug/L	78	129	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	75	131	20	C	Y	5	ug/L	56	193	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	80	118	20	C	Y	5	ug/L	54	144	20
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	70	123	20	C	Y	10	ug/L	65	138	20
2499	Toxaphene	20	ug/L	3.30	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	77	129	0	X	Y	50	ug/L	68	146	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	71	132	0	X	Y	50	ug/L	66	148	0

TAL Reference Data Summary

Structured Analysis Code: **I-48-QJ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	78	117	20	C	Y	5	ug/L	68	131	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	75	125	20	C	Y	5	ug/L	78	129	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	75	131	20	C	Y	5	ug/L	56	193	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	80	118	20	C	Y	5	ug/L	54	144	20
1482	Hexachlorobenzene	0.5	ug/L			0														
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	70	123	20	C	Y	10	ug/L	65	138	20
2499	Toxaphene	20	ug/L	6.02	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	77	129	0	X	Y	50	ug/L	68	146	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	71	132	0	X	Y	50	ug/L	66	148	0

TAL Reference Data Summary

Structured Analysis Code: **A-KH-QJ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Low Level Liq/Liq, CONT (P/P)
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20030214														
226	alpha-BHC	0.1	ug/L	0.0058	ug/L	20050923														
228	beta-BHC	0.1	ug/L	0.034	ug/L	20030214														
230	delta-BHC	0.1	ug/L	0.02	ug/L	20030214														
232	gamma-BHC (Lindane)	0.1	ug/L	0.0053	ug/L	20050923	C	Y	5	ug/L	81	135	20	C	Y	5	ug/L	78	141	20
476	Chlordane (technical)	0.250	ug/L	0.0542	ug/L	20050923	C	Y			70	130	20							
770	4,4'-DDD	0.025	ug/L	0.0056	ug/L	20050923														
777	4,4'-DDE	0.05	ug/L	0.006	ug/L	20030214														
780	4,4'-DDT	0.05	ug/L	0.014	ug/L	20030214														
1052	Dieldrin	0.1	ug/L	0.0053	ug/L	20050923														
1236	Endosulfan I	0.1	ug/L	0.0045	ug/L	20050923														
1239	Endosulfan II	0.1	ug/L	0.0066	ug/L	20050923														
1241	Endosulfan sulfate	0.1	ug/L	0.0076	ug/L	20050923														
1270	Endrin	0.1	ug/L	0.0174	ug/L	20030214	C	Y	5	ug/L	79	140	20	C	Y	5	ug/L	80	148	20
1277	Endrin aldehyde	0.1	ug/L	0.0087	ug/L	20050923														
1470	Heptachlor	0.1	ug/L	0.013	ug/L	20030214	C	Y	5	ug/L	65	140	20	C	Y	5	ug/L	52	150	20
1479	Heptachlor epoxide	0.1	ug/L	0.0057	ug/L	20050923	C	Y	5	ug/L	79	132	20	C	Y	5	ug/L	83	136	20
1741	Methoxychlor	0.2	ug/L	0.026	ug/L	20030214	C	Y	10	ug/L	74	138	20	C	Y	10	ug/L	69	144	20
2499	Toxaphene	4.0	ug/L	0.054	ug/L	20030213	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	78	124	0	X	Y	50	ug/L	69	131	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	79	115	0	X	Y	50	ug/L	74	121	0

TAL Reference Data Summary

Structured Analysis Code: **A-13-QJ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	1.7	ug/kg	0.306	ug/kg	20120228	C	Y	16.7	ug/kg	61	126	20	C	Y	16.7	ug/kg	49	135	30
226	alpha-BHC	1.7	ug/kg	0.185	ug/kg	20120228	C	Y	16.7	ug/kg	59	132	20	C	Y	16.7	ug/kg	47	145	30
228	beta-BHC	1.7	ug/kg	0.300	ug/kg	20120228	C	Y	16.7	ug/kg	58	126	20	C	Y	16.7	ug/kg	43	140	30
230	delta-BHC	1.7	ug/kg	0.242	ug/kg	20120228	C	Y	16.7	ug/kg	55	140	20	C	Y	16.7	ug/kg	50	150	30
232	gamma-BHC (Lindane)	1.7	ug/kg	0.339	ug/kg	20120228	C	Y	16.7	ug/kg	59	127	20	C	Y	16.7	ug/kg	57	128	30
497	alpha-Chlordane	1.7	ug/kg	0.567	ug/kg	20120228	C	Y	16.7	ug/kg	65	128	20	C	Y	16.7	ug/kg	54	139	30
499	gamma-Chlordane	1.7	ug/kg	0.286	ug/kg	20120223	C	Y	16.7	ug/kg	63	131	20	C	Y	16.7	ug/kg	52	147	30
476	Chlordane (technical)	17	ug/kg	3.729	ug/kg	20120214	C	Y			70	130	20	C	Y			50	150	30
770	4,4'-DDD	1.7	ug/kg	0.221	ug/kg	20120218	C	Y	16.7	ug/kg	65	134	20	C	Y	16.7	ug/kg	40	150	30
2779	2,4'-DDD	1.7	ug/kg	0.223	ug/kg	20120215														
777	4,4'-DDE	1.7	ug/kg	0.390	ug/kg	20120228	C	Y	16.7	ug/kg	62	130	20	C	Y	16.7	ug/kg	47	150	30
2781	2,4'-DDE	1.7	ug/kg	0.314	ug/kg	20120215														
780	4,4'-DDT	1.7	ug/kg	0.628	ug/kg	20120228	C	Y	16.7	ug/kg	57	140	20	C	Y	16.7	ug/kg	38	150	30
2783	2,4'-DDT	1.7	ug/kg	0.328	ug/kg	20120215														
1052	Dieldrin	1.7	ug/kg	0.215	ug/kg	20120228	C	Y	16.7	ug/kg	64	134	20	C	Y	16.7	ug/kg	45	150	30
1236	Endosulfan I	1.7	ug/kg	0.570	ug/kg	20120228	C	Y	16.7	ug/kg	61	133	20	C	Y	16.7	ug/kg	38	150	30
1239	Endosulfan II	1.7	ug/kg	0.235	ug/kg	20120228	C	Y	16.7	ug/kg	64	129	20	C	Y	16.7	ug/kg	54	141	30
1241	Endosulfan sulfate	1.7	ug/kg	0.340	ug/kg	20120228	C	Y	16.7	ug/kg	62	129	20	C	Y	16.7	ug/kg	52	144	30
1270	Endrin	1.7	ug/kg	0.158	ug/kg	20120228	C	Y	16.7	ug/kg	67	134	20	C	Y	16.7	ug/kg	51	150	30
1277	Endrin aldehyde	1.7	ug/kg	0.389	ug/kg	20120228	C	Y	16.7	ug/kg	52	129	20	C	Y	16.7	ug/kg	46	134	30
1279	Endrin ketone	1.7	ug/kg	0.417	ug/kg	20120228	C	Y	16.7	ug/kg	59	132	20	C	Y	16.7	ug/kg	50	148	30
1470	Heptachlor	1.7	ug/kg	0.204	ug/kg	20120228	C	Y	16.7	ug/kg	46	140	20	C	Y	16.7	ug/kg	28	150	30
1479	Heptachlor epoxide	1.7	ug/kg	0.429	ug/kg	20120228	C	Y	16.7	ug/kg	63	128	20	C	Y	16.7	ug/kg	45	149	30
1482	Hexachlorobenzene	1.7	ug/kg	0.450	ug/kg	20120215														
1741	Methoxychlor	3.3	ug/kg	0.719	ug/kg	20120228	C	Y	16.7	ug/kg	47	140	20	C	Y	16.7	ug/kg	37	150	30
2499	Toxaphene	67	ug/kg	15.16	ug/kg	20120214	C	Y			50	150	30	C	Y			50	150	30
2732	Decachlorobiphenyl						X	Y	6.67	ug/kg	72	116	0	X	Y	6.67	ug/kg	46	150	0
2739	Tetrachloro-m-xylene						X	Y	6.67	ug/kg	67	119	0	X	Y	6.67	ug/kg	52	127	0

TAL Reference Data Summary

Structured Analysis Code: **A-14-QJ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6374							Spike List 6375						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	50	ug/kg	2.84	ug/kg	20080212	C	Y	16.7	ug/kg	56	132	20	C	Y	16.7	ug/kg	56	132	20
226	alpha-BHC	50	ug/kg	8.47	ug/kg	20080212	C	Y	16.7	ug/kg	55	136	20	C	Y	16.7	ug/kg	55	136	20
228	beta-BHC	50	ug/kg	5.59	ug/kg	20080212	C	Y	16.7	ug/kg	64	123	20	C	Y	16.7	ug/kg	64	123	20
230	delta-BHC	50	ug/kg	5.01	ug/kg	20080212	C	Y	16.7	ug/kg	58	124	20	C	Y	16.7	ug/kg	58	124	20
232	gamma-BHC (Lindane)	50	ug/kg	3.70	ug/kg	20080212	C	Y	16.7	ug/kg	64	128	20	C	Y	16.7	ug/kg	64	128	20
497	alpha-Chlordane	50	ug/kg	6.31	ug/kg	20080212	C	Y	16.7	ug/kg	60	127	20	C	Y	16.7	ug/kg	60	127	20
499	gamma-Chlordane	50	ug/kg	2.35	ug/kg	20080212	C	Y	16.7	ug/kg	65	123	20	C	Y	16.7	ug/kg	65	123	20
476	Chlordane (technical)	500	ug/kg	69.8	ug/kg	20080212														
770	4,4'-DDD	50	ug/kg	2.68	ug/kg	20080212	C	Y	16.7	ug/kg	55	140	20	C	Y	16.7	ug/kg	55	140	20
2780	o,p'-DDD	50	ug/kg	9.16	ug/kg	20080212														
2779	2,4'-DDD	50	ug/kg	9.16	ug/kg	20080212														
777	4,4'-DDE	50	ug/kg	5.77	ug/kg	20080212	C	Y	16.7	ug/kg	62	136	20	C	Y	16.7	ug/kg	62	136	20
2782	o,p'-DDE	50	ug/kg	6.01	ug/kg	20080212														
2781	2,4'-DDE	50	ug/kg	6.01	ug/kg	20080212														
780	4,4'-DDT	50	ug/kg	6.06	ug/kg	20080212	C	Y	16.7	ug/kg	61	150	20	C	Y	16.7	ug/kg	61	150	20
2784	o,p'-DDT	50	ug/kg	12.1	ug/kg	20080212														
2783	2,4'-DDT	50	ug/kg	12.1	ug/kg	20080212														
1052	Dieldrin	50	ug/kg	2.74	ug/kg	20080212	C	Y	16.7	ug/kg	66	128	20	C	Y	16.7	ug/kg	66	128	20
1236	Endosulfan I	50	ug/kg	3.16	ug/kg	20080212	C	Y	16.7	ug/kg	61	130	20	C	Y	16.7	ug/kg	61	130	20
1239	Endosulfan II	50	ug/kg	2.78	ug/kg	20080212	C	Y	16.7	ug/kg	63	128	20	C	Y	16.7	ug/kg	63	128	20
1241	Endosulfan sulfate	50	ug/kg	7.85	ug/kg	20080212	C	Y	16.7	ug/kg	61	127	20	C	Y	16.7	ug/kg	61	127	20
1270	Endrin	50	ug/kg	2.36	ug/kg	20080212	C	Y	16.7	ug/kg	65	138	20	C	Y	16.7	ug/kg	65	138	20
1277	Endrin aldehyde	50	ug/kg	5.37	ug/kg	20080212	C	Y	16.7	ug/kg	59	122	20	C	Y	16.7	ug/kg	59	122	20
1279	Endrin ketone	50	ug/kg	4.90	ug/kg	20080212	C	Y	16.7	ug/kg	63	131	20	C	Y	16.7	ug/kg	63	131	20
1470	Heptachlor	50	ug/kg	5.16	ug/kg	20080212	C	Y	16.7	ug/kg	56	140	20	C	Y	16.7	ug/kg	56	140	20
1479	Heptachlor epoxide	50	ug/kg	3.92	ug/kg	20080212	C	Y	16.7	ug/kg	64	126	20	C	Y	16.7	ug/kg	64	126	20
1741	Methoxychlor	100	ug/kg	9.46	ug/kg	20080212	C	Y	16.7	ug/kg	62	153	20	C	Y	16.7	ug/kg	62	153	20
2499	Toxaphene	2000	ug/kg	174	ug/kg	20080212														
2732	Decachlorobiphenyl						X	Y	6.67	ug/kg	57	150	0	X	Y	6.67	ug/kg	57	150	0
2739	Tetrachloro-m-xylene						X	Y	6.67	ug/kg	38	142	0	X	Y	6.67	ug/kg	38	142	0

TAL Reference Data Summary

Structured Analysis Code: **A-3H-QJ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311) -> Waste Dilution
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6374							Spike List 6375						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
232	gamma-BHC (Lindane)	50	ug/L	1.5	ug/L	20080402	C	Y	16.7	ug/kg	64	128	20	C	Y	16.7	ug/kg	64	128	20
476	Chlordane (technical)	500	ug/L	20.0	ug/L	20080402														
1052	Dieldrin	50	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	66	128	20	C	Y	16.7	ug/kg	66	128	20
1241	Endosulfan sulfate	50	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	61	127	20	C	Y	16.7	ug/kg	61	127	20
1270	Endrin	50	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	65	138	20	C	Y	16.7	ug/kg	65	138	20
1470	Heptachlor	50	ug/L	1.5	ug/L	20080402	C	Y	16.7	ug/kg	56	140	20	C	Y	16.7	ug/kg	56	140	20
1479	Heptachlor epoxide	50	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	64	126	20	C	Y	16.7	ug/kg	64	126	20
1741	Methoxychlor	100	ug/L	5.0	ug/L	20080402	C	Y	16.7	ug/kg	62	153	20	C	Y	16.7	ug/kg	62	153	20
2499	Toxaphene	2000	ug/L	330.0	ug/L	20080402														
2732	Decachlorobiphenyl						X	Y	6.67	ug/kg	57	150	0	X	Y	6.67	ug/kg	57	150	0
2739	Tetrachloro-m-xylene						X	Y	6.67	ug/kg	38	142	0	X	Y	6.67	ug/kg	38	142	0

TAL Reference Data Summary

Structured Analysis Code: **A-44-QJ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-W(1312) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.5	ug/L	0.05	ug/L	20100601														
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	81	135	20	C	Y	5	ug/L	78	141	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
480	Chlordane	5.0	ug/L	0.20	ug/L	20100601														
770	4,4'-DDD	0.5	ug/L	0.05	ug/L	20100601														
777	4,4'-DDE	0.5	ug/L	0.10	ug/L	20100601														
780	4,4'-DDT	0.5	ug/L	0.05	ug/L	20100601														
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	79	140	20	C	Y	5	ug/L	80	148	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	65	140	20	C	Y	5	ug/L	52	150	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	79	132	20	C	Y	5	ug/L	83	136	20
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	74	138	20	C	Y	10	ug/L	69	144	20
2499	Toxaphene	20	ug/L	3.30	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	78	124	0	X	Y	50	ug/L	69	131	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	79	115	0	X	Y	50	ug/L	74	121	0

TAL Reference Data Summary

Structured Analysis Code: **A-47-QJ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E(1312) -> LIQ/LIQ, CONT - Nominal
Method: Pesticides (8081A)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6190							Spike List 6191						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.5	ug/L	0.05	ug/L	20100601														
226	alpha-BHC	0.5	ug/L	0.05	ug/L	20100601														
228	beta-BHC	0.5	ug/L	0.05	ug/L	20100601														
230	delta-BHC	0.5	ug/L	0.05	ug/L	20100601														
232	gamma-BHC (Lindane)	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	81	135	20	C	Y	5	ug/L	78	141	20
476	Chlordane (technical)	5.0	ug/L	0.20	ug/L	20100601	C	Y			70	130	20							
480	Chlordane	5.0	ug/L	0.20	ug/L	20100601														
777	4,4'-DDE	0.5	ug/L	0.10	ug/L	20100601														
780	4,4'-DDT	0.5	ug/L	0.05	ug/L	20100601														
1052	Dieldrin	0.5	ug/L	0.05	ug/L	20100601														
1241	Endosulfan sulfate	0.5	ug/L	0.05	ug/L	20100601														
1270	Endrin	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	79	140	20	C	Y	5	ug/L	80	148	20
1277	Endrin aldehyde	0.5	ug/L	0.05	ug/L	20100601														
1470	Heptachlor	0.5	ug/L	0.015	ug/L	20100601	C	Y	5	ug/L	65	140	20	C	Y	5	ug/L	52	150	20
1479	Heptachlor epoxide	0.5	ug/L	0.05	ug/L	20100601	C	Y	5	ug/L	79	132	20	C	Y	5	ug/L	83	136	20
1741	Methoxychlor	1.0	ug/L	0.05	ug/L	20100601	C	Y	10	ug/L	74	138	20	C	Y	10	ug/L	69	144	20
2499	Toxaphene	20	ug/L	3.30	ug/L	20100601	C	Y			70	130	20							
2732	Decachlorobiphenyl						X	Y	50	ug/L	78	124	0	X	Y	50	ug/L	69	131	0
2739	Tetrachloro-m-xylene						X	Y	50	ug/L	79	115	0	X	Y	50	ug/L	74	121	0

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 971 to 984

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

TAL Reference Data Summary

Structured Analysis Code: **I-KI-QH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Low Level Liq/Liq, SEPF w/ Acid Strip (PCB)
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6192							Spike List 6004						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	0.5	ug/L	0.13	ug/L	20061218														
2082	Aroclor 1016	0.5	ug/L	0.13	ug/L	20061218	C	Y	5	ug/L	51	127	20	C	Y	5	ug/L	28	135	20
2083	PCB-1221	0.5	ug/L	0.13	ug/L	20061218														
2085	Aroclor 1221	0.5	ug/L	0.13	ug/L	20061218														
2086	PCB-1232	0.5	ug/L	0.13	ug/L	20061218														
2088	Aroclor 1232	0.5	ug/L	0.13	ug/L	20061218														
2089	PCB-1242	0.5	ug/L	0.13	ug/L	20061218														
2091	Aroclor 1242	0.5	ug/L	0.13	ug/L	20061218														
2092	PCB-1248	0.5	ug/L	0.13	ug/L	20061218														
2094	Aroclor 1248	0.5	ug/L	0.13	ug/L	20061218														
2095	PCB-1254	0.5	ug/L	0.13	ug/L	20061218														
2097	Aroclor 1254	0.5	ug/L	0.13	ug/L	20061218														
2098	PCB-1260	0.5	ug/L	0.13	ug/L	20061218														
2100	Aroclor 1260	0.5	ug/L	0.13	ug/L	20061218	C	Y	5	ug/L	68	134	20	C	Y	5	ug/L	40	146	20
2101	PCB-1262	0.5	ug/L	0.13	ug/L	20061218														
2103	Aroclor 1262	0.5	ug/L	0.13	ug/L	20061218														
4246	Aroclor 1268	0.5	ug/L	0.13	ug/L	20061218														
2950	PCB-1268	0.5	ug/L	0.13	ug/L	20061218														
2211	PCBs (total)	4.5	ug/L	1.17	ug/L	20061218														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	68	143	0	X	Y	0.2	ug/L	51	147	0

TAL Reference Data Summary

Structured Analysis Code: **I-KJ-QH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: Low Level Liq/Liq, CONT w/ Acid Strip (PCB)
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6194							Spike List 6195						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	0.1	ug/L	0.071	ug/L	20060103														
2082	Aroclor 1016	0.1	ug/L	0.071	ug/L	20060103	C	Y	5	ug/L	65	118	20	C	Y	5	ug/L	64	127	20
2083	PCB-1221	0.1	ug/L	0.071	ug/L	20060103														
2085	Aroclor 1221	0.1	ug/L	0.071	ug/L	20060103														
2086	PCB-1232	0.1	ug/L	0.071	ug/L	20060103														
2088	Aroclor 1232	0.1	ug/L	0.071	ug/L	20060103														
2089	PCB-1242	0.1	ug/L	0.071	ug/L	20060103														
2091	Aroclor 1242	0.1	ug/L	0.071	ug/L	20060103														
2092	PCB-1248	0.1	ug/L	0.071	ug/L	20060103														
2094	Aroclor 1248	0.1	ug/L	0.071	ug/L	20060103														
2095	PCB-1254	0.1	ug/L	0.018	ug/L	20060103														
2097	Aroclor 1254	0.1	ug/L	0.018	ug/L	20060103														
2098	PCB-1260	0.1	ug/L	0.018	ug/L	20060103														
2100	Aroclor 1260	0.1	ug/L	0.018	ug/L	20060103	C	Y	5	ug/L	81	121	20	C	Y	5	ug/L	78	111	20
2101	PCB-1262	0.1	ug/L	0.018	ug/L	20060103														
2103	Aroclor 1262	0.1	ug/L	0.018	ug/L	20060103														
2950	PCB-1268	0.1	ug/L	0.018	ug/L	20060103														
4246	Aroclor 1268	0.1	ug/L	0.018	ug/L	20060103														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	135	0	X	Y	0.2	ug/L	67	138	0

TAL Reference Data Summary

Structured Analysis Code: **I-2W-QH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION w/ACID STRIP (PCB)
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6069							Spike List 6070						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1000	ug/L	440	ug/L	20061006														
2082	Aroclor 1016	1000	ug/L	440	ug/L	20061006	C	Y	50000	ug/L	82	130	20	C	Y	50000	ug/L	30	150	30
2083	PCB-1221	1000	ug/L	440	ug/L	20061006														
2085	Aroclor 1221	1000	ug/L	440	ug/L	20061006														
2086	PCB-1232	1000	ug/L	440	ug/L	20061006														
2088	Aroclor 1232	1000	ug/L	440	ug/L	20061006														
2089	PCB-1242	1000	ug/L	440	ug/L	20061006														
2091	Aroclor 1242	1000	ug/L	440	ug/L	20061006														
2092	PCB-1248	1000	ug/L	440	ug/L	20061006														
2094	Aroclor 1248	1000	ug/L	440	ug/L	20061006														
2095	PCB-1254	1000	ug/L	300	ug/L	20061006														
2097	Aroclor 1254	1000	ug/L	300	ug/L	20061006														
2098	PCB-1260	1000	ug/L	300	ug/L	20061006														
2100	Aroclor 1260	1000	ug/L	300	ug/L	20061006	C	Y	50000	ug/L	77	130	20	C	Y	50000	ug/L	68	148	30
2101	PCB-1262	1000	ug/L	300	ug/L	20061006														
2103	Aroclor 1262	1000	ug/L	300	ug/L	20061006														
4246	Aroclor 1268	1000	ug/L	300	ug/L	20061006														
2950	PCB-1268	1000	ug/L	300	ug/L	20061006														
2211	PCBs (total)	9000	ug/L	3400	ug/L	20061006														
2732	Decachlorobiphenyl						X	Y	2000	ug/L	65	138	0	X	Y	2000	ug/L	20	150	0

TAL Reference Data Summary

Structured Analysis Code: I-3S-QH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> LIQ/LIQ, CONT w/ACID STRIP (PCB) - Nom
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6303							Spike List 6304						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	10	ug/L	0.854	ug/L	20080227														
2082	Aroclor 1016	10	ug/L	0.854	ug/L	20080227	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	30
2083	PCB-1221	10	ug/L	0.854	ug/L	20080227														
2085	Aroclor 1221	10	ug/L	0.854	ug/L	20080227														
2086	PCB-1232	10	ug/L	0.854	ug/L	20080227														
2088	Aroclor 1232	10	ug/L	0.854	ug/L	20080227														
2089	PCB-1242	10	ug/L	0.854	ug/L	20080227														
2091	Aroclor 1242	10	ug/L	0.854	ug/L	20080227														
2092	PCB-1248	10	ug/L	0.854	ug/L	20080227														
2094	Aroclor 1248	10	ug/L	0.854	ug/L	20080227														
2095	PCB-1254	10	ug/L	1.69	ug/L	20080227														
2097	Aroclor 1254	10	ug/L	1.69	ug/L	20080227														
2098	PCB-1260	10	ug/L	1.69	ug/L	20080227														
2100	Aroclor 1260	10	ug/L	1.69	ug/L	20080227	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	30
2101	PCB-1262	10	ug/L	1.69	ug/L	20080227														
2103	Aroclor 1262	10	ug/L	1.69	ug/L	20080227														
2950	PCB-1268	10	ug/L	1.69	ug/L	20080227														
4246	Aroclor 1268	10	ug/L	1.69	ug/L	20080227														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **I-4T-QH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-W(1312)->LIQ/LIQ, CONT W/ACID STRIP (PCB) - N
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6303							Spike List 6304						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	10	ug/L	1.39	ug/L	20090311														
2082	Aroclor 1016	10	ug/L	1.39	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	30
2083	PCB-1221	10	ug/L	1.39	ug/L	20090311														
2085	Aroclor 1221	10	ug/L	1.39	ug/L	20090311														
2086	PCB-1232	10	ug/L	1.39	ug/L	20090311														
2088	Aroclor 1232	10	ug/L	1.39	ug/L	20090311														
2089	PCB-1242	10	ug/L	1.39	ug/L	20090311														
2091	Aroclor 1242	10	ug/L	1.39	ug/L	20090311														
2092	PCB-1248	10	ug/L	1.39	ug/L	20090311														
2094	Aroclor 1248	10	ug/L	1.39	ug/L	20090311														
2095	PCB-1254	10	ug/L	0.926	ug/L	20090311														
2097	Aroclor 1254	10	ug/L	0.926	ug/L	20090311														
2098	PCB-1260	10	ug/L	0.926	ug/L	20090311														
2100	Aroclor 1260	10	ug/L	0.926	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	30
2101	PCB-1262	10	ug/L	0.926	ug/L	20090311														
2103	Aroclor 1262	10	ug/L	0.926	ug/L	20090311														
2950	PCB-1268	10	ug/L	0.926	ug/L	20090311														
4246	Aroclor 1268	10	ug/L	0.926	ug/L	20090311														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **I-5C-QH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LEACHATE,Citrate Buffer, CA Title 22 WET -> SOLVENT E
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6303							Spike List 6304						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1	ug/L	0.139	ug/L	20090311														
2082	Aroclor 1016	1	ug/L	0.139	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	30
2083	PCB-1221	1	ug/L	0.139	ug/L	20090311														
2085	Aroclor 1221	1	ug/L	0.139	ug/L	20090311														
2086	PCB-1232	1	ug/L	0.139	ug/L	20090311														
2088	Aroclor 1232	1	ug/L	0.139	ug/L	20090311														
2089	PCB-1242	1	ug/L	0.139	ug/L	20090311														
2091	Aroclor 1242	1	ug/L	0.139	ug/L	20090311														
2092	PCB-1248	1	ug/L	0.139	ug/L	20090311														
2094	Aroclor 1248	1	ug/L	0.139	ug/L	20090311														
2095	PCB-1254	1	ug/L	0.093	ug/L	20090311														
2097	Aroclor 1254	1	ug/L	0.093	ug/L	20090311														
2098	PCB-1260	1	ug/L	0.093	ug/L	20090311														
2100	Aroclor 1260	1	ug/L	0.093	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	30
2101	PCB-1262	1	ug/L	0.093	ug/L	20090311														
2103	Aroclor 1262	1	ug/L	0.093	ug/L	20090311														
4246	Aroclor 1268	1	ug/L	0.093	ug/L	20090311														
2950	PCB-1268	1	ug/L	0.093	ug/L	20090311														
2211	PCBs (total)	9	ug/L	1.07	ug/L	20090311														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **I-60-QH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL w/ACID STRIP (PCB) - Nominal
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6192							Spike List 6004						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1	ug/L	0.241	ug/L	20110308														
2082	Aroclor 1016	1	ug/L	0.241	ug/L	20110308	C	Y	5	ug/L	51	127	20	C	Y	5	ug/L	28	135	20
2083	PCB-1221	1	ug/L	0.241	ug/L	20110308														
2085	Aroclor 1221	1	ug/L	0.241	ug/L	20110308														
2086	PCB-1232	1	ug/L	0.241	ug/L	20110308														
2088	Aroclor 1232	1	ug/L	0.241	ug/L	20110308														
2089	PCB-1242	1	ug/L	0.241	ug/L	20110308														
2091	Aroclor 1242	1	ug/L	0.241	ug/L	20110308														
2092	PCB-1248	1	ug/L	0.241	ug/L	20110308														
2094	Aroclor 1248	1	ug/L	0.241	ug/L	20110308														
2095	PCB-1254	1	ug/L	0.166	ug/L	20110308														
2097	Aroclor 1254	1	ug/L	0.166	ug/L	20110308														
2098	PCB-1260	1	ug/L	0.166	ug/L	20110308														
2100	Aroclor 1260	1	ug/L	0.166	ug/L	20110308	C	Y	5	ug/L	68	134	20	C	Y	5	ug/L	40	146	20
2101	PCB-1262	1	ug/L	0.166	ug/L	20110308														
2103	Aroclor 1262	1	ug/L	0.166	ug/L	20110308														
4246	Aroclor 1268	1	ug/L	0.166	ug/L	20110308														
2950	PCB-1268	1	ug/L	0.166	ug/L	20110308														
2211	PCBs (total)	9	ug/L	1.87	ug/L	20110308														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	68	143	0	X	Y	0.2	ug/L	51	147	0

TAL Reference Data Summary

Structured Analysis Code: **I-61-QH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT w/ACID STRIP (PCB) - Nominal
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6194							Spike List 6195						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1	ug/L	0.089	ug/L	20080227														
2082	Aroclor 1016	1	ug/L	0.089	ug/L	20080227	C	Y	5	ug/L	65	118	20	C	Y	5	ug/L	64	127	20
2083	PCB-1221	1	ug/L	0.089	ug/L	20080227														
2085	Aroclor 1221	1	ug/L	0.089	ug/L	20080227														
2086	PCB-1232	1	ug/L	0.089	ug/L	20080227														
2088	Aroclor 1232	1	ug/L	0.089	ug/L	20080227														
2089	PCB-1242	1	ug/L	0.089	ug/L	20080227														
2091	Aroclor 1242	1	ug/L	0.089	ug/L	20080227														
2092	PCB-1248	1	ug/L	0.089	ug/L	20080227														
2094	Aroclor 1248	1	ug/L	0.089	ug/L	20080227														
2095	PCB-1254	1	ug/L	0.169	ug/L	20080227														
2097	Aroclor 1254	1	ug/L	0.169	ug/L	20080227														
2098	PCB-1260	1	ug/L	0.169	ug/L	20080227														
2100	Aroclor 1260	1	ug/L	0.169	ug/L	20080227	C	Y	5	ug/L	81	121	20	C	Y	5	ug/L	78	111	20
2101	PCB-1262	1	ug/L	0.169	ug/L	20080227														
2103	Aroclor 1262	1	ug/L	0.169	ug/L	20080227														
4246	Aroclor 1268	1	ug/L	0.169	ug/L	20080227														
2950	PCB-1268	1	ug/L	0.169	ug/L	20080227														
2211	PCBs (total)	9	ug/L	1.12	ug/L	20080227														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	135	0	X	Y	0.2	ug/L	67	138	0

TAL Reference Data Summary

Structured Analysis Code: **I-S3-QH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SOXHLET (NOMINAL) w/Acid Strip (PCB)
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6119							Spike List 6120						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1	ug/L	0.139	ug/L	20090311														
2082	Aroclor 1016	1	ug/L	0.139	ug/L	20090311	C	N	5	ug/L	70	130	30	C	N	5	ug/L	70	130	20
2083	PCB-1221	1	ug/L	0.139	ug/L	20090311														
2085	Aroclor 1221	1	ug/L	0.139	ug/L	20090311														
2086	PCB-1232	1	ug/L	0.139	ug/L	20090311														
2088	Aroclor 1232	1	ug/L	0.139	ug/L	20090311														
2089	PCB-1242	1	ug/L	0.139	ug/L	20090311														
2091	Aroclor 1242	1	ug/L	0.139	ug/L	20090311														
2092	PCB-1248	1	ug/L	0.139	ug/L	20090311														
2094	Aroclor 1248	1	ug/L	0.139	ug/L	20090311														
2095	PCB-1254	1	ug/L	0.093	ug/L	20090311														
2097	Aroclor 1254	1	ug/L	0.093	ug/L	20090311														
2098	PCB-1260	1	ug/L	0.093	ug/L	20090311														
2100	Aroclor 1260	1	ug/L	0.093	ug/L	20090311	C	N	5	ug/L	71	130	20	C	N	5	ug/L	71	130	20
2101	PCB-1262	1	ug/L	0.093	ug/L	20090311														
2103	Aroclor 1262	1	ug/L	0.093	ug/L	20090311														
4246	Aroclor 1268	1	ug/L	0.093	ug/L	20090311														
2950	PCB-1268	1	ug/L	0.093	ug/L	20090311														
2211	PCBs (total)	9	ug/L	1.07	ug/L	20090311														
2732	Decachlorobiphenyl						X	N	0.2	ug/L	68	130	0	X	N	0.2	ug/L	68	130	0

TAL Reference Data Summary

Structured Analysis Code: **A-2W-QH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION w/ACID STRIP (PCB)
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6069							Spike List 6070						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1000	ug/kg	440	ug/kg	20061006														
2082	Aroclor 1016	1000	ug/kg	440	ug/kg	20061006	C	Y	167	ug/kg	75	135	20	C	Y	50000	ug/kg	22	140	30
2083	PCB-1221	1000	ug/kg	440	ug/kg	20061006														
2085	Aroclor 1221	1000	ug/kg	440	ug/kg	20061006														
2086	PCB-1232	1000	ug/kg	440	ug/kg	20061006														
2088	Aroclor 1232	1000	ug/kg	440	ug/kg	20061006														
2089	PCB-1242	1000	ug/kg	440	ug/kg	20061006														
2091	Aroclor 1242	1000	ug/kg	440	ug/kg	20061006														
2092	PCB-1248	1000	ug/kg	440	ug/kg	20061006														
2094	Aroclor 1248	1000	ug/kg	440	ug/kg	20061006														
2095	PCB-1254	1000	ug/kg	300	ug/kg	20061006														
2097	Aroclor 1254	1000	ug/kg	300	ug/kg	20061006														
2098	PCB-1260	1000	ug/kg	300	ug/kg	20061006														
2100	Aroclor 1260	1000	ug/kg	300	ug/kg	20061006	C	Y	167	ug/kg	71	137	20	C	Y	50000	ug/kg	36	135	30
2101	PCB-1262	1000	ug/kg	300	ug/kg	20061006														
2103	Aroclor 1262	1000	ug/kg	300	ug/kg	20061006														
4246	Aroclor 1268	1000	ug/kg	300	ug/kg	20061006														
2950	PCB-1268	1000	ug/kg	300	ug/kg	20061006														
2211	PCBs (total)	9000	ug/kg	3400	ug/kg	20061006														
2732	Decachlorobiphenyl						X	Y	167	ug/kg	65	140	0	X	Y	167	ug/kg	33	150	0

TAL Reference Data Summary

Structured Analysis Code: **A-S3-QH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SOXHLET (NOMINAL) w/Acid Strip (PCB)
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6119							Spike List 6120						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2082	Aroclor 1016	33	ug/kg	7.712	ug/kg	20070517	C	Y	167	ug/kg	72	138	30	C	Y	167	ug/kg	37	150	30
2085	Aroclor 1221	33	ug/kg	7.712	ug/kg	20070517														
2088	Aroclor 1232	33	ug/kg	7.712	ug/kg	20070517														
2091	Aroclor 1242	33	ug/kg	7.712	ug/kg	20070517														
2094	Aroclor 1248	33	ug/kg	7.712	ug/kg	20070517														
2097	Aroclor 1254	33	ug/kg	7.263	ug/kg	20070517														
2100	Aroclor 1260	33	ug/kg	7.263	ug/kg	20070517	C	Y	167	ug/kg	76	140	20	C	Y	167	ug/kg	62	150	20
2103	Aroclor 1262	33	ug/kg	7.263	ug/kg	20070517														
4246	Aroclor 1268	33	ug/kg	7.263	ug/kg	20070517														
2211	PCBs (total)	300	ug/kg	67.61	ug/kg	20070517														
2732	Decachlorobiphenyl						X	Y	6.67	ug/kg	68	140	0	X	Y	6.67	ug/kg	47	150	0
2739	Tetrachloro-m-xylene						X	Y			70	130	0	X	Y			70	130	0

TAL Reference Data Summary

Structured Analysis Code: **A-4T-QH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-W(1312)->LIQ/LIQ, CONT W/ACID STRIP (PCB) - N
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6303							Spike List 6304						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	10	ug/L	1.39	ug/L	20090311														
2082	Aroclor 1016	10	ug/L	1.39	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	20
2083	PCB-1221	10	ug/L	1.39	ug/L	20090311														
2085	Aroclor 1221	10	ug/L	1.39	ug/L	20090311														
2086	PCB-1232	10	ug/L	1.39	ug/L	20090311														
2088	Aroclor 1232	10	ug/L	1.39	ug/L	20090311														
2089	PCB-1242	10	ug/L	1.39	ug/L	20090311														
2091	Aroclor 1242	10	ug/L	1.39	ug/L	20090311														
2092	PCB-1248	10	ug/L	1.39	ug/L	20090311														
2094	Aroclor 1248	10	ug/L	1.39	ug/L	20090311														
2095	PCB-1254	10	ug/L	0.926	ug/L	20090311														
2097	Aroclor 1254	10	ug/L	0.926	ug/L	20090311														
2098	PCB-1260	10	ug/L	0.926	ug/L	20090311														
2100	Aroclor 1260	10	ug/L	0.926	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	20
2101	PCB-1262	10	ug/L	0.926	ug/L	20090311														
2103	Aroclor 1262	10	ug/L	0.926	ug/L	20090311														
2950	PCB-1268	10	ug/L	0.926	ug/L	20090311														
4246	Aroclor 1268	10	ug/L	0.926	ug/L	20090311														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **A-5C-QH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE,Citrate Buffer, CA Title 22 WET -> SOLVENT E
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6303							Spike List 6304						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1	ug/L	0.139	ug/L	20090311														
2082	Aroclor 1016	1	ug/L	0.139	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	20
2083	PCB-1221	1	ug/L	0.139	ug/L	20090311														
2085	Aroclor 1221	1	ug/L	0.139	ug/L	20090311														
2086	PCB-1232	1	ug/L	0.139	ug/L	20090311														
2088	Aroclor 1232	1	ug/L	0.139	ug/L	20090311														
2089	PCB-1242	1	ug/L	0.139	ug/L	20090311														
2091	Aroclor 1242	1	ug/L	0.139	ug/L	20090311														
2092	PCB-1248	1	ug/L	0.139	ug/L	20090311														
2094	Aroclor 1248	1	ug/L	0.139	ug/L	20090311														
2095	PCB-1254	1	ug/L	0.093	ug/L	20090311														
2097	Aroclor 1254	1	ug/L	0.093	ug/L	20090311														
2098	PCB-1260	1	ug/L	0.093	ug/L	20090311														
2100	Aroclor 1260	1	ug/L	0.093	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	20
2101	PCB-1262	1	ug/L	0.093	ug/L	20090311														
2103	Aroclor 1262	1	ug/L	0.093	ug/L	20090311														
4246	Aroclor 1268	1	ug/L	0.093	ug/L	20090311														
2950	PCB-1268	1	ug/L	0.093	ug/L	20090311														
2211	PCBs (total)	9	ug/L	1.07	ug/L	20090311														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **A-7A-QH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP(1311)-> LIQ/LIQ, SEP FUNNEL w/ACID STRIP (PCB
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6303							Spike List 6304						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	10	ug/L	1.39	ug/L	20090311														
2082	Aroclor 1016	10	ug/L	1.39	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	20
2083	PCB-1221	10	ug/L	1.39	ug/L	20090311														
2085	Aroclor 1221	10	ug/L	1.39	ug/L	20090311														
2086	PCB-1232	10	ug/L	1.39	ug/L	20090311														
2088	Aroclor 1232	10	ug/L	1.39	ug/L	20090311														
2089	PCB-1242	10	ug/L	1.39	ug/L	20090311														
2091	Aroclor 1242	10	ug/L	1.39	ug/L	20090311														
2092	PCB-1248	10	ug/L	1.39	ug/L	20090311														
2094	Aroclor 1248	10	ug/L	1.39	ug/L	20090311														
2095	PCB-1254	10	ug/L	0.93	ug/L	20090311														
2097	Aroclor 1254	10	ug/L	0.93	ug/L	20090311														
2098	PCB-1260	10	ug/L	0.93	ug/L	20090311														
2100	Aroclor 1260	10	ug/L	0.93	ug/L	20090311	C	Y	5	ug/L	70	130	20	C	Y	5	ug/L	70	130	20
2101	PCB-1262	10	ug/L	0.93	ug/L	20090311														
2103	Aroclor 1262	10	ug/L	0.93	ug/L	20090311														
4246	Aroclor 1268	10	ug/L	0.93	ug/L	20090311														
2950	PCB-1268	10	ug/L	0.93	ug/L	20090311														
2211	PCBs (total)	70	ug/L	10.7	ug/L	20090311														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	130	0	X	Y	0.2	ug/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **A-71-QH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION w/ACID STRIP (PCB)
Method: PCBs (8082)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6194							Spike List 6195						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2082	Aroclor 1016	33	ug/kg	8.72	ug/kg	20110322	C	Y	167	ug/kg	76	131	20	C	Y	167	ug/kg	35	150	30
2085	Aroclor 1221	33	ug/kg	8.72	ug/kg	20110322														
2088	Aroclor 1232	33	ug/kg	8.72	ug/kg	20110322														
2091	Aroclor 1242	33	ug/kg	8.72	ug/kg	20110322														
2094	Aroclor 1248	33	ug/kg	8.72	ug/kg	20110322														
2097	Aroclor 1254	33	ug/kg	5.50	ug/kg	20110322														
2100	Aroclor 1260	33	ug/kg	5.50	ug/kg	20110322	C	Y	167	ug/kg	74	139	20	C	Y	167	ug/kg	43	150	30
2103	Aroclor 1262	33	ug/kg	5.50	ug/kg	20110322														
4246	Aroclor 1268	33	ug/kg	5.50	ug/kg	20110322														
2211	PCBs (total)	300	ug/kg	65.6	ug/kg	20110322														
2732	Decachlorobiphenyl						X	Y	6.67	ug/kg	74	140	0	X	Y	6.67	ug/kg	54	150	0

TAL Reference Data Summary

Structured Analysis Code: **I-10-DM-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (PAH,P/P,TPH) - Nominal
Method: Pesticides/PCB (608)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6012							Spike List 6011						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
60	Aldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	74	140	20	C	Y	0.50	ug/L	69	144	20
226	alpha-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	78	140	20	C	Y	0.50	ug/L	76	144	20
228	beta-BHC	0.05	ug/L	0.013	ug/L	20100601	C	Y	0.50	ug/L	73	138	20	C	Y	0.50	ug/L	69	144	20
230	delta-BHC	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	62	140	20	C	Y	0.50	ug/L	54	150	20
232	gamma-BHC (Lindane)	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	76	140	20	C	Y	0.50	ug/L	75	144	20
497	alpha-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	77	139	20	C	Y	0.50	ug/L	70	144	20
499	gamma-Chlordane	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	78	140	20	C	Y	0.50	ug/L	69	150	20
476	Chlordane (technical)	0.5	ug/L	0.231	ug/L	20100601	C	Y			70	130	20	C	Y			50	150	20
770	4,4'-DDD	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	76	140	20	C	Y	0.50	ug/L	68	140	20
2779	2,4'-DDD	0.05	ug/L	0.01	ug/L	20100601														
777	4,4'-DDE	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	73	140	20	C	Y	0.50	ug/L	73	142	20
2781	2,4'-DDE	0.05	ug/L	0.01	ug/L	20100601														
780	4,4'-DDT	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	72	140	20	C	Y	0.50	ug/L	63	150	20
2783	2,4'-DDT	0.05	ug/L	0.02	ug/L	20100601														
1052	Dieldrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	77	140	20	C	Y	0.50	ug/L	70	149	20
1236	Endosulfan I	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	73	140	20	C	Y	0.50	ug/L	67	149	20
1239	Endosulfan II	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	77	139	20	C	Y	0.50	ug/L	65	149	20
1241	Endosulfan sulfate	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	76	139	20	C	Y	0.50	ug/L	73	145	20
1270	Endrin	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	82	140	20	C	Y	0.50	ug/L	65	150	20
1277	Endrin aldehyde	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	72	140	20	C	Y	0.50	ug/L	60	150	20
1279	Endrin ketone	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	76	140	20	C	Y	0.50	ug/L	74	144	20
1470	Heptachlor	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	63	140	20	C	Y	0.50	ug/L	69	150	20
1479	Heptachlor epoxide	0.05	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	79	138	20	C	Y	0.50	ug/L	64	150	20
1741	Methoxychlor	0.1	ug/L	0.01	ug/L	20100601	C	Y	0.50	ug/L	70	140	20	C	Y	0.50	ug/L	61	150	20
2499	Toxaphene	2.0	ug/L	0.66	ug/L	20100601	C	Y			50	150	30							
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	74	121	0	X	Y	0.2	ug/L	75	117	0
2739	Tetrachloro-m-xylene						X	Y	0.2	ug/L	70	120	0	X	Y	0.2	ug/L	74	114	0

TAL Reference Data Summary

Structured Analysis Code: **I-60-H9-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL w/ACID STRIP (PCB) - Nominal
Method: PCB (608)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6192							Spike List 6004						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1	ug/L	0.0841	ug/L	20100216														
2082	Aroclor 1016	1	ug/L	0.0841	ug/L	20100216	C	Y	5	ug/L	51	127	20	C	Y	5	ug/L	28	135	20
2083	PCB-1221	1	ug/L	0.0841	ug/L	20100216														
2085	Aroclor 1221	1	ug/L	0.0841	ug/L	20100216														
2086	PCB-1232	1	ug/L	0.0841	ug/L	20100216														
2088	Aroclor 1232	1	ug/L	0.0841	ug/L	20100216														
2089	PCB-1242	1	ug/L	0.0841	ug/L	20100216														
2091	Aroclor 1242	1	ug/L	0.0841	ug/L	20100216														
2092	PCB-1248	1	ug/L	0.0841	ug/L	20100216														
2094	Aroclor 1248	1	ug/L	0.0841	ug/L	20100216														
2095	PCB-1254	1	ug/L	0.0845	ug/L	20100216														
2097	Aroclor 1254	1	ug/L	0.0845	ug/L	20100216														
2098	PCB-1260	1	ug/L	0.0845	ug/L	20100216														
2100	Aroclor 1260	1	ug/L	0.0845	ug/L	20100216	C	Y	5	ug/L	68	134	20	C	Y	5	ug/L	40	146	20
2101	PCB-1262	1	ug/L	0.0845	ug/L	20100216														
2103	Aroclor 1262	1	ug/L	0.0845	ug/L	20100216														
4246	Aroclor 1268	1	ug/L	0.0845	ug/L	20100318														
2950	PCB-1268	1	ug/L	0.0845	ug/L	20100318														
2211	PCBs (total)	9	ug/L	0.7585	ug/L	20100216														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	68	143	0	X	Y	0.2	ug/L	51	147	0

TAL Reference Data Summary

Structured Analysis Code: **I-61-H9-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT w/ACID STRIP (PCB) - Nominal
Method: PCB (608)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6194							Spike List 6195						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2080	PCB-1016	1	ug/L	0.27	ug/L	20061106														
2082	Aroclor 1016	1	ug/L	0.27	ug/L	20061106	C	Y	5	ug/L	65	118	20	C	Y	5	ug/L	64	127	20
2083	PCB-1221	1	ug/L	0.27	ug/L	20061106														
2085	Aroclor 1221	1	ug/L	0.27	ug/L	20061106														
2086	PCB-1232	1	ug/L	0.27	ug/L	20061106														
2088	Aroclor 1232	1	ug/L	0.27	ug/L	20061106														
2089	PCB-1242	1	ug/L	0.27	ug/L	20061106														
2091	Aroclor 1242	1	ug/L	0.27	ug/L	20061106														
2092	PCB-1248	1	ug/L	0.27	ug/L	20061106														
2094	Aroclor 1248	1	ug/L	0.27	ug/L	20061106														
2095	PCB-1254	1	ug/L	0.21	ug/L	20061106														
2097	Aroclor 1254	1	ug/L	0.21	ug/L	20061106														
2098	PCB-1260	1	ug/L	0.21	ug/L	20061106														
2100	Aroclor 1260	1	ug/L	0.21	ug/L	20061106	C	Y	5	ug/L	81	121	20	C	Y	5	ug/L	78	111	20
2101	PCB-1262	1	ug/L	0.21	ug/L	20061106														
2103	Aroclor 1262	1	ug/L	0.21	ug/L	20061106														
4246	Aroclor 1268	1	ug/L	0.21	ug/L	20061106														
2950	PCB-1268	1	ug/L	0.21	ug/L	20061106														
2211	PCBs (total)	9	ug/L	2.19	ug/L	20061106														
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	135	0	X	Y	0.2	ug/L	67	138	0

TAL Reference Data Summary

Structured Analysis Code: I-09-70-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (PAH,P/P,TPH,Dioxin) - Nominal
Method: Pesticides (608)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Target List		Detection Limits					Check List 6194							Spike List 6195						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	135	0	X	Y	0.2	ug/L	67	138	0

TAL Reference Data Summary

Structured Analysis Code: **I-10-70-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (PAH,P/P,TPH) - Nominal
Method: Pesticides (608)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Target List		Detection Limits					Check List 6194							Spike List 6195						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2732	Decachlorobiphenyl						X	Y	0.2	ug/L	70	135	0	X	Y	0.2	ug/L	67	138	0

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 1005 to 1067

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

TAL Reference Data Summary

Structured Analysis Code: I-09-KI-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (PAH,P/P,TPH,Dioxin) - Nominal
Method: Hydrocarbons, Extractable Petroleum (8015B)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6036							Spike List 6036						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5291	TPH - Diesel Range - WTPH-D	25	mg/L	0.017	mg/L	20090529														
2862	Diesel Range Organics	25	mg/L	0.017	mg/L	20090529														
4412	Mineral Spirits	0.50	mg/L	0.5	mg/L	20011109														
3517	TPH (as Gasoline)	0.5	mg/L	0.5	mg/L	20011109														
2861	Gasoline Range Organics	0.5	mg/L	0.5	mg/L	20011109														
5444	C6 - C12	0.5	mg/L	0.5	mg/L	20011109														
1601	Kerosene	0.50	mg/L	0.010	mg/L	20090529														
3453	Motor Oil Range Organics	0.5	mg/L	0.023	mg/L	20090529														
3992	Oil Range Organics (C26 - C40)	0.5	mg/L	0.023	mg/L	20090529														
3060	TPH (as Jet Fuel A)	0.50	mg/L	0.5	mg/L	20011109														
3053	TPH (as Motor Oil)	0.50	mg/L	0.08	mg/L	20030123														
3052	TPH (as Diesel)	25	mg/L	0.017	mg/L	20090529	C	Y	2.5	mg/L	30	100	20	C	Y	2.5	mg/L	30	100	20
5360	Extractable Petroleum Hydrocarbon (E	25	mg/L	1.52	mg/L	20051207														
3013	TPH C10 - C28	25	mg/L	1.52	mg/L	20051207														
2425	o-Terphenyl						X	Y	0.050	mg/L	53	115	0	X	Y	0.050	mg/L	53	115	0

TAL Reference Data Summary

Structured Analysis Code: I-09-HS-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (PAH,P/P,TPH,Dioxin) - Nominal
Method: Hydrocarbons, Extractable Petroleum (8015 MOD)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6036							Spike List 6037						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5291	TPH - Diesel Range - WTPH-D	0.50	mg/L	0.017	mg/L	20090529														
2862	Diesel Range Organics	0.50	mg/L	0.017	mg/L	20090529														
3517	TPH (as Gasoline)	0.5	mg/L	0.5	mg/L	20011109														
2861	Gasoline Range Organics	0.5	mg/L	0.5	mg/L	20011109														
5444	C6 - C12	0.5	mg/L	0.5	mg/L	20011109														
1601	Kerosene	0.50	mg/L	0.010	mg/L	20090529														
1898	Mineral spirits	0.50	mg/L			0														
3992	Oil Range Organics (C26 - C40)	0.5	mg/L	0.023	mg/L	20090529														
5162	Oil Range Organics	0.5	mg/L	0.023	mg/L	20090529														
3453	Motor Oil Range Organics	0.5	mg/L	0.023	mg/L	20090529														
3052	TPH (as Diesel)	0.50	mg/L	0.017	mg/L	20090529	C	Y	2.5	mg/L	30	100	20	C	Y	2.5	mg/L	28	115	20
2425	o-Terphenyl						X	Y	0.050	mg/L	53	115	0	X	Y	0.050	mg/L	47	136	0

TAL Reference Data Summary

Structured Analysis Code: **I-14-HS-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: WASTE DILUTION
Method: Hydrocarbons, Extractable Petroleum (8015 MOD)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 6036							Spike List 6037						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5291	TPH - Diesel Range - WTPH-D	500	mg/L	60	mg/L	20030123														
2862	Diesel Range Organics	500	mg/L	60	mg/L	20030123														
3517	TPH (as Gasoline)	500	mg/L	500	mg/L	20011109														
2861	Gasoline Range Organics	500	mg/L	500	mg/L	20011109														
1601	Kerosene	500	mg/L	500	mg/L	20011109														
3992	Oil Range Organics (C26 - C40)	500	mg/L	500	mg/L	20011109														
3453	Motor Oil Range Organics	500	mg/L	500	mg/L	20011109														
3060	TPH (as Jet Fuel A)	500	mg/L	500	mg/L	20011109														
3053	TPH (as Motor Oil)	500	mg/L	80	mg/L	20030123														
3052	TPH (as Diesel)	500	mg/L	60	mg/L	20030123	C	Y	2.5	mg/L	30	100	20	C	Y	2.5	mg/L	28	115	20
3013	TPH C10 - C28	500	mg/L	60	mg/L	20030123														
5360	Extractable Petroleum Hydrocarbon (E	500	mg/L	60	mg/L	20030123														
2425	o-Terphenyl						X	Y	0.050	mg/L	53	115	0	X	Y	0.050	mg/L	47	136	0

TAL Reference Data Summary

Structured Analysis Code: A-13-HS-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Hydrocarbons, Extractable Petroleum (8015 MOD)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6036							Spike List 6037						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5291	TPH - Diesel Range - WTPH-D	25	mg/kg	0.333	mg/kg	20090530														
2862	Diesel Range Organics	25	mg/kg	0.333	mg/kg	20090530														
4412	Mineral Spirits	25	mg/kg			0														
2861	Gasoline Range Organics	25	mg/kg	0.701	mg/kg	20061107														
1601	Kerosene	25	mg/kg	0.333	mg/kg	20090530														
5162	Oil Range Organics	25	mg/kg	0.637	mg/kg	20090530														
3992	Oil Range Organics (C26 - C40)	25	mg/kg	0.637	mg/kg	20090530														
3453	Motor Oil Range Organics	25	mg/kg	0.637	mg/kg	20090530														
3518	Unknown Hydrocarbon	25	mg/kg	25	mg/kg	20080208														
3052	TPH (as Diesel)	25	mg/kg	0.333	mg/kg	20090530	C	Y	83.3	mg/kg	48	102	20	C	Y	83.3	mg/kg	18	140	30
2425	o-Terphenyl						X	Y	2.5	mg/kg	57	126	0	X	Y	2.5	mg/kg	49	133	0

TAL Reference Data Summary

Structured Analysis Code: A-14-HS-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Hydrocarbons, Extractable Petroleum (8015 MOD)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6036							Spike List 6037						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5291	TPH - Diesel Range - WTPH-D	500	mg/kg	60	mg/kg	20030123														
2862	Diesel Range Organics	500	mg/kg	60	mg/kg	20030123														
4412	Mineral Spirits	500	mg/kg			0														
3517	TPH (as Gasoline)	500	mg/kg	500	mg/kg	20011109														
2861	Gasoline Range Organics	500	mg/kg	500	mg/kg	20011109														
1601	Kerosene	500	mg/kg	0.5	mg/kg	20011018														
3453	Motor Oil Range Organics	500	mg/kg	500	mg/kg	20011109														
3992	Oil Range Organics (C26 - C40)	500	mg/kg	500	mg/kg	20011109														
3052	TPH (as Diesel)	500	mg/kg	60	mg/kg	20030123	C	Y	83.3	mg/kg	48	102	20	C	Y	83.3	mg/kg	18	140	30
2909	TPH (as Gasoline)	500	mg/kg	500	mg/kg	20011109														
2425	o-Terphenyl						X	Y	2.5	mg/kg	57	126	0	X	Y	2.5	mg/kg	49	133	0

TAL Reference Data Summary

Structured Analysis Code: I-09-BT-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, SEP FUNNEL (PAH,P/P,TPH,Dioxin) - Nominal
Method: Hydrocarbons, Petroleum (OA-2, Extractable) - Iowa
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6036							Spike List 6037						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5291	TPH - Diesel Range - WTPH-D	0.50	mg/L	0.017	mg/L	20090529														
2862	Diesel Range Organics	0.50	mg/L	0.017	mg/L	20090529														
3517	TPH (as Gasoline)	0.5	mg/L	0.5	mg/L	20011109														
5444	C6 - C12	0.5	mg/L	0.5	mg/L	20011109														
2861	Gasoline Range Organics	0.5	mg/L	0.5	mg/L	20011109														
1601	Kerosene	0.50	mg/L	0.010	mg/L	20090529														
3992	Oil Range Organics (C26 - C40)	0.5	mg/L	0.023	mg/L	20090529														
3453	Motor Oil Range Organics	0.5	mg/L	0.023	mg/L	20090529														
3052	TPH (as Diesel)	0.50	mg/L	0.017	mg/L	20090529	C	Y	2.5	mg/L	30	100	20	C	Y	2.5	mg/L	28	115	20
2425	o-Terphenyl						X	Y	0.050	mg/L	53	115	0	X	Y	0.050	mg/L	47	136	0

TAL Reference Data Summary

Structured Analysis Code: I-10-BT-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: LIQ/LIQ, CONT (PAH,P/P,TPH) - Nominal
Method: Hydrocarbons, Petroleum (OA-2, Extractable) - Iowa
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6198							Spike List 6199						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5291	TPH - Diesel Range - WTPH-D	0.5	mg/L	0.06	mg/L	20030123	C	Y	2.5	mg/L	70	130	20	C	Y	2.5	mg/L	70	130	20
2862	Diesel Range Organics	0.5	mg/L	0.06	mg/L	20030123														
3517	TPH (as Gasoline)	0.5	mg/L	0.5	mg/L	20011109														
2861	Gasoline Range Organics	0.5	mg/L	0.5	mg/L	20011109														
1601	Kerosene	0.5	mg/L	0.5	mg/L	20011109														
3453	Motor Oil Range Organics	0.5	mg/L	0.5	mg/L	20011109														
3992	Oil Range Organics (C26 - C40)	0.5	mg/L	0.5	mg/L	20011109														
3052	TPH (as Diesel)	0.5	mg/L	0.06	mg/L	20030123	C	Y	2.5	mg/L	70	130	20	C	Y	2.5	mg/L	70	130	20
2425	o-Terphenyl						X	Y	0.050	mg/L	70	130	0	X	Y	0.050	mg/L	70	130	0

TAL Reference Data Summary

Structured Analysis Code: **A-13-BT-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SONICATION - Low Level
Method: Hydrocarbons, Petroleum (OA-2, Extractable) - Iowa
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6036							Spike List 6037						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1601	Kerosene	3	mg/kg	0.333	mg/kg	20090530														
5162	Oil Range Organics	3	mg/kg	0.637	mg/kg	20090530														
3453	Motor Oil Range Organics	3	mg/kg	0.637	mg/kg	20090530														
3992	Oil Range Organics (C26 - C40)	3	mg/kg	0.637	mg/kg	20090530														
3052	TPH (as Diesel)	3	mg/kg	0.333	mg/kg	20090530	C	Y	83.3	mg/kg	48	102	20	C	Y	83.3	mg/kg	18	140	30
2425	o-Terphenyl						X	Y	2.5	mg/kg	57	126	0	X	Y	2.5	mg/kg	49	133	0

TAL Reference Data Summary

Structured Analysis Code: A-14-BT-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: WASTE DILUTION
Method: Hydrocarbons, Petroleum (OA-2, Extractable) - Iowa
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List			Detection Limits				Check List 0							Spike List 0						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5291	TPH - Diesel Range - WTPH-D	500	mg/kg	60	mg/kg	20090530														
2862	Diesel Range Organics	500	mg/kg	60	mg/kg	20090530														
3517	TPH (as Gasoline)	500	mg/kg	500	mg/kg	20090530														
2861	Gasoline Range Organics	500	mg/kg	500	mg/kg	20090530														
1601	Kerosene	500	mg/kg	3	mg/kg	20011018														
3453	Motor Oil Range Organics	500	mg/kg	500	mg/kg	20090530														
5162	Oil Range Organics	500	mg/kg	500	mg/kg	20090530														
3992	Oil Range Organics (C26 - C40)	500	mg/kg	500	mg/kg	20090530														
3052	TPH (as Diesel)	500	mg/kg	60	mg/kg	20090530														
2909	TPH (as Gasoline)	500	mg/kg	500	mg/kg	20090530														

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 1077 to 1094

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

Table II Interference Check Sample Concentrations

Element	ICSA (ug/L)	ICSAB (ug/L)
Aluminum	50,000	50,000
Antimony	-	50
Arsenic	-	100
Barium	-	100
Beryllium	-	100
Bismuth	-	100
Boron	-	200
Cadmium	-	100
Calcium	50,000	50,000
Carbon	100,000	100,000
Chromium	-	100
Chlorine	500,000	500,000
Cobalt	-	100
Copper	-	100
Iron	50,000	50,000
Lead	-	100
Lithium	-	100
Magnesium	50,000	50,000
Manganese	-	100
Molybdenum	1,000	1,000
Nickel	-	100
Niobium	-	100
Palladium	-	25
Platinum	-	25
Phosphorus	50,000	50,000
Potassium	50,000	50,000
Samarium	-	100
Selenium	-	100
Silicon	-	500
Silver	-	20
Sodium	50,000	50,000
Strontium	-	100
Sulfur	50,000	50,000
Thallium	-	100
Thorium	-	100
Tin	-	100
Titanium	1,000	1,000
Tungsten	-	100
Uranium	-	100
Vanadium	-	100
Zinc	-	100
Zirconium	-	100
Hafnium	-	100
Cesium	-	100
Yttrium	-	100
Tantalum	-	100
Tellurium	-	100
Rhodium	-	100
Ruthenium	-	100
Cerium	-	100

Lanthanum	-	100
Praseodymium	-	100
Neodymium	-	100
Technetium	-	0.233
U233	-	0.958
U234	-	1.786
U235	-	3.761
U236	-	0.162
U238	-	0.436

* Clients may request higher concentrations (LANL, Pantex), See client requirements memo.

Table III, QC Criteria

Methods	**6020A**	**200.8**
Corr Coeff.	>0.998	
Tuning Res	<0.9amu	≈ 0.75amu
Int Std	>70%	60-125%
LCS	80-120%	85-115%
ICV	90-110%	90-110%
CCV	90-110%	85-115%
PDS	80-120%	N/A
MS	75-125%	70-130%
LLICV	70-130%	N/A

TAL Reference Data Summary

Structured Analysis Code: **I-JX-QV-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED 2% HCL, DISSOLVED
Method: ICP-Mass Spectrometry (200.8)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6226							Spike List 6227						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
128	Antimony	5	ug/L	1.67	ug/L	20110110	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
194	Barium	2	ug/L	0.196	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
313	Boron	50	ug/L	10.0	ug/L	20110110	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
643	Copper	1	ug/L	0.097	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1616	Lithium	5	ug/L	0.674	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1618	Magnesium	50	ug/L	5.20	ug/L	20110110	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
3924	Niobium	25	ug/L	2.23	ug/L	20100115														
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115														
2200	Phosphorus	20.0	ug/L	8.23	ug/L	20100108								C	Y	1000	ug/L	70	130	20
2209	Platinum	1	ug/L	0.060	ug/L	20100108														
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
3927	Rhenium	1	ug/L	0.578	ug/L	20060328														
5936	Ruthenium 101	0.5	ug/L	0.00155	ug/L	20051128														
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	Y	100	ug/L	85	115	20	C	Y	100	ug/L	70	130	20
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	Y	10000	ug/L	85	115	20	C	Y	10000	ug/L	70	130	20
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2602	Tungsten	5	ug/L	0.839	ug/L	20100108								C	Y	1000	ug/L	70	130	20

Structured Analysis Code: I-JX-QV-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED 2% HCL, DISSOLVED
Method: ICP-Mass Spectrometry (200.8)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6226							Spike List 6227						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3827	Uranium	1	ug/L	0.14	ug/L	20110110	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227														
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227														
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227														
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227														
4133	Uranium 238	0.05	ug/L	0.0016	ug/L	20071227														
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	Y	1000	ug/L	85	115	20	C	Y	1000	ug/L	70	130	20

TAL Reference Data Summary

Structured Analysis Code: **I-GJ-MH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	12.9	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
128	Antimony	5	ug/L	1.67	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
194	Barium	2	ug/L	0.203	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.350	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
307	Bismuth	20.0	ug/L	0.732	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
313	Boron	50	ug/L	10.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.10	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
413	Calcium	100	ug/L	68.1	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3489	Cerium	10	ug/L	0.886	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3488	Cesium	0.10	ug/L	0.053	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2952	Chromium	10	ug/L	3.26	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
643	Copper	1	ug/L	0.451	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3917	Hafnium	10	ug/L	1.13	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3922	Lanthanum	2	ug/L	0.051	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1616	Lithium	5	ug/L	0.694	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1618	Magnesium	50	ug/L	5.20	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.245	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1906	Molybdenum	5	ug/L	1.00	ug/L	20110624	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3490	Neodymium	2	ug/L	0.104	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.40	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
3925	Palladium	1	ug/L	0.059	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.53	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.079	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2214	Potassium	100	ug/L	41.6	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3926	Praseodymium	2	ug/L	0.042	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3927	Rhenium	1	ug/L	0.025	ug/L	20110906	C	Y	100	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
3928	Rhodium	10	ug/L	0.817	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3930	Ruthenium	10	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3931	Samarium	10	ug/L	0.326	ug/L	20110124														
2281	Selenium	5	ug/L	1.59	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20110124	C	Y	5000	ug/L	80	120	20	C	Y	5000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20

Structured Analysis Code: I-GJ-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2315	Sodium	50	ug/L	15.0	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2353	Strontium	5	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2876	Sulfur	5000	ug/L	333	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3742	Tellurium	10.0	ug/L	0.536	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2477	Thallium	2	ug/L	0.55	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2479	Tin	2	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2482	Titanium	5	ug/L	2.1	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2602	Tungsten	5	ug/L	2.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3827	Uranium	1	ug/L	0.231	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20110124	C	Y	0.386	ug/L	80	120	20	C	Y	0.386	ug/L	75	125	20
4129	Uranium 234	0.05	ug/L	0.0021	ug/L	20110124	C	Y	0.175	ug/L	80	120	20	C	Y	0.175	ug/L	75	125	20
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20110124	C	Y	0.228	ug/L	80	120	20	C	Y	0.228	ug/L	75	125	20
5385	Uranium 236	0.05	ug/L	0.0015	ug/L	20110124	C	Y	1.75	ug/L	80	120	20	C	Y	1.75	ug/L	75	125	20
4133	Uranium 238	1.0	ug/L	0.0082	ug/L	20110124	C	Y	33.6	ug/L	80	120	20	C	Y	33.6	ug/L	75	125	20
2607	Vanadium	10	ug/L	2.37	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2726	Yttrium	5	ug/L	0.212	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2649	Zinc	10	ug/L	8.29	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20

TAL Reference Data Summary

Structured Analysis Code: **I-JX-MH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED 2% HCL, DISSOLVED
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	12.9	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
128	Antimony	5	ug/L	1.67	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
194	Barium	2	ug/L	0.203	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.350	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
313	Boron	50	ug/L	10.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.10	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
413	Calcium	100	ug/L	68.1	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3489	Cerium	10	ug/L	0.886	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3488	Cesium	0.10	ug/L	0.053	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128	C	Y	500	ug/L	80	120	20	C	Y	10.00	ug/L	75	125	20
2952	Chromium	10	ug/L	3.26	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
643	Copper	1	ug/L	0.451	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1616	Lithium	5	ug/L	0.694	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1618	Magnesium	50	ug/L	5.20	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.245	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1906	Molybdenum	5	ug/L	1.00	ug/L	20110624	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.40	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
3925	Palladium	0.5	ug/L	0.059	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.53	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.079	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2214	Potassium	100	ug/L	41.6	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2281	Selenium	5	ug/L	1.59	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20110124	C	Y	5000	ug/L	80	120	20	C	Y	5000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2315	Sodium	50	ug/L	15.0	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2353	Strontium	5	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2479	Tin	2	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2482	Titanium	5	ug/L	2.1	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2602	Tungsten	5	ug/L	2.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20

Structured Analysis Code: I-JX-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED 2% HCL, DISSOLVED
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3827	Uranium	1	ug/L	0.231	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20110124	C	Y	0.386	ug/L	80	120	20	C	Y	0.386	ug/L	75	125	20
4129	Uranium 234	0.05	ug/L	0.0021	ug/L	20110124	C	Y	0.175	ug/L	80	120	20	C	Y	0.175	ug/L	75	125	20
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20110124	C	Y	0.228	ug/L	80	120	20	C	Y	0.228	ug/L	75	125	20
5385	Uranium 236	0.05	ug/L	0.0015	ug/L	20110124	C	Y	1.75	ug/L	80	120	20	C	Y	1.75	ug/L	75	125	20
4133	Uranium 238	0.05	ug/L	0.0082	ug/L	20110124	C	Y	33.6	ug/L	80	120	20	C	Y	33.6	ug/L	75	125	20
2607	Vanadium	10	ug/L	2.37	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2649	Zinc	10	ug/L	8.29	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20

TAL Reference Data Summary

Structured Analysis Code: **I-JV-MH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-E -> LOW LEVEL, 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6038							Spike List 6223						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
194	Barium	2	ug/L	0.196	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
313	Boron	50	ug/L	7.47	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	200	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
643	Copper	1	ug/L	0.097	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20100115														
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	Y	250	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.23	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.060	ug/L	20100108														
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	Y	250	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2602	Tungsten	5	ug/L	0.839	ug/L	20100108														
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227														
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227														

Structured Analysis Code: I-JV-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-E -> LOW LEVEL, 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6038							Spike List 6223						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227														
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227														
4133	Uranium 238	0.05	ug/L	0.0016	ug/L	20071227														
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20

TAL Reference Data Summary

Structured Analysis Code: **A-GK-MH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6428							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	5.0	mg/kg	1.67	mg/kg	20110125	C	Y	9780	mg/kg	44	155	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	0.5	mg/kg	0.164	mg/kg	20110125	C	Y	121	mg/kg	21	251	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	1.0	mg/kg	0.203	mg/kg	20110125	C	Y	109	mg/kg	70	131	20	C	Y	100	mg/kg	75	125	30
194	Barium	2.0	mg/kg	0.057	mg/kg	20110125	C	Y	325	mg/kg	74	125	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.1	mg/kg	0.017	mg/kg	20110125	C	Y	92	mg/kg	74	126	20	C	Y	100	mg/kg	75	125	30
307	Bismuth	2.0	mg/kg	0.151	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
313	Boron	10	mg/kg	3.34	mg/kg	20110125	C	Y	142	mg/kg	63	136	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.05	mg/kg	0.016	mg/kg	20110125	C	Y	110	mg/kg	73	139	20	C	Y	100	mg/kg	75	125	30
413	Calcium	50	mg/kg	5.82	mg/kg	20110125	C	Y	6700	mg/kg	74	125	20	C	Y	1000	mg/kg	75	125	30
3489	Cerium	1.0	mg/kg	0.035	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3488	Cesium	0.01	mg/kg	0.005	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	50	mg/kg	75	125	30
2952	Chromium	1.0	mg/kg	0.45	mg/kg	20110125	C	Y	93.4	mg/kg	69	130	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	0.2	mg/kg	0.043	mg/kg	20110125	C	Y	133	mg/kg	74	125	20	C	Y	100	mg/kg	75	125	30
643	Copper	1.0	mg/kg	0.064	mg/kg	20110125	C	Y	74.7	mg/kg	73	126	20	C	Y	100	mg/kg	75	125	30
1464	Gold	0.50	mg/kg	0.05	mg/kg	20111019								C	Y	100	mg/kg	75	125	30
3917	Hafnium	1.0	mg/kg	0.302	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
1539	Iron	5.0	mg/kg	3.30	mg/kg	20110125	C	Y	13100	mg/kg	32	167	20	C	Y	1000	mg/kg	75	125	30
3922	Lanthanum	0.2	mg/kg	0.05	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
1605	Lead	0.30	mg/kg	0.10	mg/kg	20110125	C	Y	152	mg/kg	73	126	20	C	Y	100	mg/kg	75	125	30
1616	Lithium	1	mg/kg	0.30	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	mg/kg	3.80	mg/kg	20110125	C	Y	2980	mg/kg	66	134	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	0.5	mg/kg	0.077	mg/kg	20110125	C	Y	443	mg/kg	77	124	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	0.5	mg/kg	0.077	mg/kg	20110125	C	Y	82.5	mg/kg	69	138	20	C	Y	100	mg/kg	75	125	30
3490	Neodymium	0.2	mg/kg	0.03	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
1956	Nickel	0.5	mg/kg	0.0822	mg/kg	20110125	C	Y	109	mg/kg	72	126	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	2.5	mg/kg	0.38	mg/kg	20110125	C	Y	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.1	mg/kg	0.011	mg/kg	20110125	C	Y	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2200	Phosphorus	50	mg/kg	1.36	mg/kg	20110125	C	Y	500	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2209	Platinum	0.1	mg/kg	0.013	mg/kg	20110125	C	Y	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	10	mg/kg	3.00	mg/kg	20110125	C	Y	2770	mg/kg	61	138	20	C	Y	1000	mg/kg	75	125	30
3926	Praseodymium	0.2	mg/kg	0.023	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3927	Rhenium	1.0	mg/kg	0.022	mg/kg	20110906	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3928	Rhodium	1.0	mg/kg	0.037	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3930	Ruthenium	1.0	mg/kg	0.043	mg/kg	20110125	C	Y	50.0	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3931	Samarium	1.0	mg/kg	0.0700	mg/kg	20110125														
2281	Selenium	0.5	mg/kg	0.158	mg/kg	20110125	C	Y	207	mg/kg	69	131	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	25	mg/kg	7.12	mg/kg	20110125	C	Y	754	mg/kg	80	120	20	C	Y	500	mg/kg	75	125	30

Structured Analysis Code: A-GK-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6428							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2285	Silver	20	mg/kg	6.67	mg/kg	20110624	C	Y	52	mg/kg	66	133	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	20	mg/kg	6.67	mg/kg	20110624	C	Y	724	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	0.5	mg/kg	0.212	mg/kg	20110125	C	Y	111	mg/kg	70	128	20	C	Y	100	mg/kg	75	125	30
2876	Sulfur	500	mg/kg	55.9	mg/kg	20110125	C	Y	1000	mg/kg	80	120	20	C	Y	1000	mg/kg	75	125	30
3933	Tantalum	1.0	mg/kg	0.156	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3742	Tellurium	1.0	mg/kg	0.109	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2477	Thallium	0.2	mg/kg	0.10	mg/kg	20110125	C	Y	171	mg/kg	68	131	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	0.2	mg/kg	0.078	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2479	Tin	0.2	mg/kg	0.10	mg/kg	20110125	C	Y	135	mg/kg	59	140	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	0.5	mg/kg	0.25	mg/kg	20110125	C	Y	2340	mg/kg	29	171	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	0.5	mg/kg	0.25	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	0.10	mg/kg	0.0199	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.005	mg/kg	0.0015	mg/kg	20110125	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.005	mg/kg	0.00067	mg/kg	20110125	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30
4131	Uranium 235	0.005	mg/kg	0.00203	mg/kg	20110125	C	Y	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30
5385	Uranium 236	0.005	mg/kg	0.00078	mg/kg	20110125	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	0.1	mg/kg	0.00055	mg/kg	20110125	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	1.0	mg/kg	0.735	mg/kg	20110125	C	Y	110	mg/kg	67	132	20	C	Y	100	mg/kg	75	125	30
2726	Yttrium	1.0	mg/kg	0.034	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2649	Zinc	5.0	mg/kg	1.33	mg/kg	20110125	C	Y	299	mg/kg	71	128	20	C	Y	100	mg/kg	75	125	30
2651	Zirconium	1.0	mg/kg	0.104	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: **A-JV-MH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E -> LOW LEVEL, 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6038							Spike List 6223						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
194	Barium	2	ug/L	0.196	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
313	Boron	50	ug/L	7.47	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	200	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
643	Copper	1	ug/L	0.097	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
1616	Lithium	5	ug/L	0.674	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20100115														
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	N	250	ug/L	80	120	200	C	Y	250	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.23	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.060	ug/L	20100108														
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	Y	250	ug/L	80	120	20	C	Y	50	ug/L	75	125	20
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	Y	25000	ug/L	80	120	20	C	Y	50000	ug/L	75	125	20
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20
2602	Tungsten	5	ug/L	0.839	ug/L	20100108	C	Y	2500	ug/L	80	120	20							
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	N	2000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227														

Structured Analysis Code: A-JV-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: SPLP-E -> LOW LEVEL, 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6038							Spike List 6223						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4129	Uranium 234	0.05	ug/L	0.00004	ug/L	20071227														
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227														
5385	Uranium 236	0.05	ug/L	0.00012	ug/L	20071227														
4133	Uranium 238	0.05	ug/L	0.0016	ug/L	20071227														
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	Y	2500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	Y	2500	ug/L	80	120	20	C	Y	2000	ug/L	75	125	20

TAL Reference Data Summary

Structured Analysis Code: **A-MV-MH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; 2% HCl
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6428							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	5.0	mg/kg	1.67	mg/kg	20110125	C	Y	9780	mg/kg	44	155	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	0.5	mg/kg	0.164	mg/kg	20110125	C	Y	121	mg/kg	21	251	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	1.0	mg/kg	0.203	mg/kg	20110125	C	Y	109	mg/kg	70	131	20	C	Y	100	mg/kg	75	125	30
194	Barium	2.0	mg/kg	0.057	mg/kg	20110125	C	Y	325	mg/kg	74	125	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.1	mg/kg	0.017	mg/kg	20110125	C	Y	92	mg/kg	74	126	20	C	Y	100	mg/kg	75	125	30
307	Bismuth	2.0	mg/kg	0.151	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
313	Boron	10	mg/kg	3.34	mg/kg	20110125	C	Y	142	mg/kg	63	136	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.05	mg/kg	0.016	mg/kg	20110125	C	Y	110	mg/kg	73	139	20	C	Y	100	mg/kg	75	125	30
413	Calcium	50	mg/kg	5.82	mg/kg	20110125	C	Y	6700	mg/kg	74	125	20	C	Y	1000	mg/kg	75	125	30
3488	Cesium	0.01	mg/kg	0.005	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	50	mg/kg	75	125	30
2952	Chromium	1.0	mg/kg	0.45	mg/kg	20110125	C	Y	93.4	mg/kg	69	130	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	0.2	mg/kg	0.043	mg/kg	20110125	C	Y	133	mg/kg	74	125	20	C	Y	100	mg/kg	75	125	30
643	Copper	1.0	mg/kg	0.064	mg/kg	20110125	C	Y	74.7	mg/kg	73	126	20	C	Y	100	mg/kg	75	125	30
3917	Hafnium	1.0	mg/kg	0.302	mg/kg	20110125	C	Y	100	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
1539	Iron	5.0	mg/kg	3.30	mg/kg	20110125	C	Y	13100	mg/kg	32	167	20	C	Y	1000	mg/kg	75	125	30
1605	Lead	0.30	mg/kg	0.10	mg/kg	20110125	C	Y	152	mg/kg	73	126	20	C	Y	100	mg/kg	75	125	30
1616	Lithium	1	mg/kg	0.30	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	mg/kg	3.80	mg/kg	20110125	C	Y	2980	mg/kg	66	134	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	0.5	mg/kg	0.074	mg/kg	20110125	C	Y	443	mg/kg	77	124	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	0.5	mg/kg	0.077	mg/kg	20110125	C	Y	82.5	mg/kg	69	138	20	C	Y	100	mg/kg	75	125	30
1956	Nickel	0.5	mg/kg	0.0822	mg/kg	20110125	C	Y	109	mg/kg	72	126	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	2.5	mg/kg	0.38	mg/kg	20110125	C	Y	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.1	mg/kg	0.011	mg/kg	20110125	C	Y	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2200	Phosphorus	50	mg/kg	1.36	mg/kg	20110125	C	Y	500	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2209	Platinum	0.1	mg/kg	0.013	mg/kg	20110125	C	Y	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	10	mg/kg	3.00	mg/kg	20110125	C	Y	2770	mg/kg	61	138	20	C	Y	1000	mg/kg	75	125	30
3928	Rhodium	1.0	mg/kg	0.037	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2281	Selenium	0.5	mg/kg	0.158	mg/kg	20110125	C	Y	207	mg/kg	69	131	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	25	mg/kg	7.12	mg/kg	20110125	C	Y	754	mg/kg	80	120	20	C	Y	500	mg/kg	75	125	30
2285	Silver	0.2	mg/kg	0.0139	mg/kg	20110125	C	Y	52	mg/kg	66	133	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	20	mg/kg	6.67	mg/kg	20110624	C	Y	724	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	0.5	mg/kg	0.212	mg/kg	20110125	C	Y	111	mg/kg	70	128	20	C	Y	100	mg/kg	75	125	30
2876	Sulfur	500	mg/kg	55.9	mg/kg	20110125	C	Y	1000	mg/kg	80	120	20	C	Y	1000	mg/kg	75	125	30
3933	Tantalum	1.0	mg/kg	0.156	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
3742	Tellurium	1.0	mg/kg	0.109	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2477	Thallium	0.2	mg/kg	0.10	mg/kg	20110125	C	Y	171	mg/kg	68	131	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	0.2	mg/kg	0.078	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

Structured Analysis Code: A-MV-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; 2% HCl
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6428							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2479	Tin	0.2	mg/kg	0.10	mg/kg	20110125	C	Y	135	mg/kg	59	140	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	0.5	mg/kg	0.25	mg/kg	20110125	C	Y	2340	mg/kg	29	171	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	0.5	mg/kg	0.25	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	0.10	mg/kg	0.0199	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.005	mg/kg	0.0015	mg/kg	20110125	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.005	mg/kg	0.00067	mg/kg	20110125	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30
4131	Uranium 235	0.005	mg/kg	0.00203	mg/kg	20110125	C	Y	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30
5385	Uranium 236	0.005	mg/kg	0.00078	mg/kg	20110125	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	0.1	mg/kg	0.00055	mg/kg	20110125	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	1.0	mg/kg	0.735	mg/kg	20110125	C	Y	110	mg/kg	67	132	20	C	Y	100	mg/kg	75	125	30
2726	Yttrium	1.0	mg/kg	0.034	mg/kg	20110125	C	Y	50	mg/kg	75	125	30	C	Y	100	mg/kg	75	125	30
2649	Zinc	5.0	mg/kg	1.33	mg/kg	20110125	C	Y	299	mg/kg	71	128	20	C	Y	100	mg/kg	75	125	30
2651	Zirconium	1.0	mg/kg	0.104	mg/kg	20110125	C	Y	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: **A-MY-MH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85) - 18 hour; 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	N	6320	mg/kg	58	142	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	N	81.5	mg/kg	10	150	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	N	161	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
194	Barium	2	ug/L	0.196	ug/L	20100108	C	N	252	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	N	94.4	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
313	Boron	50	ug/L	7.47	ug/L	20100108	C	N	136	mg/kg	56	144	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	N	128	mg/kg	81	119	20	C	Y	100	mg/kg	75	125	30
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	N	3320	mg/kg	79	121	20	C	Y	1000	mg/kg	75	125	30
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	N	69.5	mg/kg	78	121	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	N	35.2	mg/kg	73	127	20	C	Y	100	mg/kg	75	125	30
643	Copper	1	ug/L	0.097	ug/L	20100112	C	N	148	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	N	11200	mg/kg	57	143	20	C	Y	1000	mg/kg	75	125	30
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	N	142	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	N	2040	mg/kg	77	123	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	N	408	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	N	84.1	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	N	147	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	25	ug/L	2.23	ug/L	20100115	C	N	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2200	Phosphorus	50	ug/L	8.23	ug/L	20100108	C	Y	500	mg/kg	85	115	30	C	Y	100	mg/kg	75	125	30
2209	Platinum	1	ug/L	0.060	ug/L	20100108	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	N	1250	mg/kg	71	129	20	C	Y	1000	mg/kg	75	125	30
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	N	64.2	mg/kg	76	124	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	N	754	mg/kg	10	150	20	C	Y	500	mg/kg	75	125	30
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	N	130	mg/kg	53	147	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	N	1250	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	N	84.0	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	N	84	mg/kg	76	125	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	N	61.0	mg/kg	58	142	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	N	310	mg/kg	40	150	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	5	ug/L	0.839	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30

Structured Analysis Code: **A-MY-MH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85) - 18 hour; 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227	C	N	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30
5385	Uranium 236	0.05	ug/L	0.00012	ug/L	20071227	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	1.0	ug/L	0.0016	ug/L	20071227	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	N	97.3	mg/kg	75	125	20	C	Y	100	mg/kg	75	125	30
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	N	165	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: **A-M6-MH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: KD leach/2% HCl 3010
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	N	6320	mg/kg	58	142	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	N	81.5	mg/kg	10	150	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	N	161	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
194	Barium	2	ug/L	0.196	ug/L	20100108	C	N	252	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	N	94.4	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
313	Boron	50	ug/L	7.47	ug/L	20100108	C	N	136	mg/kg	56	144	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	N	128	mg/kg	81	119	20	C	Y	100	mg/kg	75	125	30
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	N	3320	mg/kg	79	121	20	C	Y	1000	mg/kg	75	125	30
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	N	69.5	mg/kg	78	121	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	N	35.2	mg/kg	73	127	20	C	Y	100	mg/kg	75	125	30
643	Copper	1	ug/L	0.097	ug/L	20100112	C	N	148	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	N	11200	mg/kg	57	143	20	C	Y	1000	mg/kg	75	125	30
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	N	142	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	N	2040	mg/kg	77	123	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	N	408	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	N	84.1	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	N	147	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	25	ug/L	2.23	ug/L	20100115	C	N	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2209	Platinum	1	ug/L	0.060	ug/L	20100108	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	N	1250	mg/kg	71	129	20	C	Y	1000	mg/kg	75	125	30
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	N	64.2	mg/kg	76	124	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	N	754	mg/kg	10	150	20	C	Y	500	mg/kg	75	125	30
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	N	130	mg/kg	53	147	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	N	1250	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	N	84.0	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	N	84	mg/kg	76	125	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	N	61.0	mg/kg	58	142	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	N	310	mg/kg	40	150	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	5	ug/L	0.839	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.05	ug/L	0.00004(	ug/L	20071227	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227	C	N	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30

Structured Analysis Code: A-M6-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: KD leach/2% HCl 3010
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	1.0	ug/L	0.0016	ug/L	20071227	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	N	97.3	mg/kg	75	125	20	C	Y	100	mg/kg	75	125	30
2649	Zinc	5	ug/L	3.74	ug/L	20100112	C	N	165	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: **A-3E-MH-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85)-18 hour > Digestion/Inor
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	4.47	ug/L	20100108	C	N	6320	mg/kg	58	142	20	C	Y	1000	mg/kg	75	125	30
128	Antimony	5	ug/L	1.12	ug/L	20100112	C	N	81.5	mg/kg	10	150	20	C	Y	50	mg/kg	75	125	30
140	Arsenic	10	ug/L	0.946	ug/L	20100108	C	N	161	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
194	Barium	2	ug/L	0.196	ug/L	20100108	C	N	252	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
222	Beryllium	0.5	ug/L	0.114	ug/L	20100108	C	N	94.4	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
313	Boron	50	ug/L	7.47	ug/L	20100108	C	N	136	mg/kg	56	144	20	C	Y	100	mg/kg	75	125	30
411	Cadmium	0.5	ug/L	0.055	ug/L	20100112	C	N	128	mg/kg	81	119	20	C	Y	100	mg/kg	75	125	30
413	Calcium	100	ug/L	48.7	ug/L	20100108	C	N	3320	mg/kg	79	121	20	C	Y	1000	mg/kg	75	125	30
5935	Cesium 133	0.5	ug/L	0.00282	ug/L	20051128														
2952	Chromium	10	ug/L	3.26	ug/L	20100108	C	N	69.5	mg/kg	78	121	20	C	Y	100	mg/kg	75	125	30
637	Cobalt	2	ug/L	0.217	ug/L	20100112	C	N	35.2	mg/kg	73	127	20	C	Y	100	mg/kg	75	125	30
643	Copper	1	ug/L	0.097	ug/L	20100112	C	N	148	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
1539	Iron	50	ug/L	20.35	ug/L	20100108	C	N	11200	mg/kg	57	143	20	C	Y	1000	mg/kg	75	125	30
1605	Lead	3	ug/L	0.173	ug/L	20100108	C	N	142	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1618	Magnesium	50	ug/L	1.73	ug/L	20100108	C	N	2040	mg/kg	77	123	20	C	Y	1000	mg/kg	75	125	30
1659	Manganese	2	ug/L	0.234	ug/L	20100108	C	N	408	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
1906	Molybdenum	5	ug/L	0.216	ug/L	20100112	C	N	84.1	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
1956	Nickel	5	ug/L	0.231	ug/L	20100112	C	N	147	mg/kg	82	118	20	C	Y	100	mg/kg	75	125	30
3924	Niobium	25	ug/L	2.23	ug/L	20100115	C	N	25	mg/kg	80	120	20	C	Y	25	mg/kg	75	125	30
3925	Palladium	0.5	ug/L	0.054	ug/L	20100115	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2200	Phosphorus	50	ug/L	8.23	ug/L	20100108	C	Y	500	mg/kg	85	115	30	C	Y	100	mg/kg	75	125	30
2209	Platinum	1	ug/L	0.060	ug/L	20100108	C	N	10	mg/kg	80	120	20	C	Y	10	mg/kg	75	125	30
2214	Potassium	100	ug/L	8.33	ug/L	20100108	C	N	1250	mg/kg	71	129	20	C	Y	1000	mg/kg	75	125	30
2281	Selenium	5	ug/L	0.308	ug/L	20100112	C	N	64.2	mg/kg	76	124	20	C	Y	100	mg/kg	75	125	30
2283	Silicon	250	ug/L	17.8	ug/L	20090119	C	N	754	mg/kg	10	150	20	C	Y	500	mg/kg	75	125	30
2285	Silver	2	ug/L	0.04	ug/L	20100108	C	N	130	mg/kg	53	147	20	C	Y	10.0	mg/kg	75	125	30
2315	Sodium	50	ug/L	5.30	ug/L	20100108	C	N	1250	mg/kg	56	144	20	C	Y	1000	mg/kg	75	125	30
2353	Strontium	5	ug/L	0.114	ug/L	20100112	C	N	84.0	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
4113	Technetium 99	0.5	ug/L	0.00050	ug/L	20051118														
2477	Thallium	2	ug/L	0.55	ug/L	20100108	C	N	84	mg/kg	76	125	20	C	Y	100	mg/kg	75	125	30
3935	Thorium	2	ug/L	0.552	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
2479	Tin	2	ug/L	0.150	ug/L	20100108	C	N	61.0	mg/kg	58	142	20	C	Y	100	mg/kg	75	125	30
2482	Titanium	2	ug/L	0.573	ug/L	20100108	C	N	310	mg/kg	40	150	20	C	Y	100	mg/kg	75	125	30
2602	Tungsten	5	ug/L	0.821	ug/L	20100222	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
3827	Uranium	1	ug/L	0.08	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20071227	C	Y	3.86	mg/kg	80	120	20	C	Y	3.86	mg/kg	75	125	30
4129	Uranium 234	0.05	ug/L	0.00004	ug/L	20071227	C	Y	1.75	mg/kg	80	120	20	C	Y	1.75	mg/kg	75	125	30

Structured Analysis Code: A-3E-MH-01-06

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85)-18 hour > Digestion/Inorg
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20071227	C	N	2.28	mg/kg	80	120	20	C	Y	2.28	mg/kg	75	125	30
5385	Uranium 236	0.05	ug/L	0.00012:	ug/L	20071227	C	Y	17.5	mg/kg	80	120	20	C	Y	17.5	mg/kg	75	125	30
4133	Uranium 238	1.0	ug/L	0.0016	ug/L	20071227	C	Y	336	mg/kg	80	120	20	C	Y	336	mg/kg	75	125	30
2607	Vanadium	10	ug/L	2.37	ug/L	20100108	C	N	97.3	mg/kg	75	125	20	C	Y	100	mg/kg	75	125	30
2649	Zinc	10	ug/L	3.74	ug/L	20100112	C	N	165	mg/kg	79	120	20	C	Y	100	mg/kg	75	125	30
2651	Zirconium	5	ug/L	0.248	ug/L	20100108	C	N	100	mg/kg	80	120	20	C	Y	100	mg/kg	75	125	30

TAL Reference Data Summary

Structured Analysis Code: **I-GJ-MH-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
88	Aluminum	30	ug/L	12.9	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
128	Antimony	5	ug/L	1.67	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
140	Arsenic	10	ug/L	0.946	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
194	Barium	2	ug/L	0.203	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
222	Beryllium	0.5	ug/L	0.350	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
307	Bismuth	20.0	ug/L	0.732	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
313	Boron	50	ug/L	10.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
411	Cadmium	0.5	ug/L	0.10	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
413	Calcium	100	ug/L	68.1	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3489	Cerium	10	ug/L	0.886	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3488	Cesium	0.10	ug/L	0.053	ug/L	20110124	C	Y	500	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
2952	Chromium	10	ug/L	3.26	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
637	Cobalt	2	ug/L	0.217	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
643	Copper	1	ug/L	0.451	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3917	Hafnium	10	ug/L	1.13	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1539	Iron	50	ug/L	20.35	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3922	Lanthanum	2	ug/L	0.051	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1605	Lead	3	ug/L	0.173	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1616	Lithium	5	ug/L	0.694	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1618	Magnesium	50	ug/L	5.20	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
1659	Manganese	2	ug/L	0.245	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1906	Molybdenum	5	ug/L	1.00	ug/L	20110624	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3490	Neodymium	2	ug/L	0.104	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
1956	Nickel	5	ug/L	0.40	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3924	Niobium	25	ug/L	2.23	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	250	ug/L	75	125	20
3925	Palladium	1	ug/L	0.059	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2200	Phosphorus	50	ug/L	8.53	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2209	Platinum	1	ug/L	0.079	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20
2214	Potassium	100	ug/L	41.6	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3926	Praseodymium	2	ug/L	0.042	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3927	Rhenium	1	ug/L	0.025	ug/L	20110906	C	Y	100	ug/L	80	120	20	C	Y	500	ug/L	75	125	20
3928	Rhodium	10	ug/L	0.817	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3930	Ruthenium	10	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3931	Samarium	10	ug/L	0.326	ug/L	20110124														
2281	Selenium	5	ug/L	1.59	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2283	Silicon	250	ug/L	17.8	ug/L	20110124	C	Y	5000	ug/L	80	120	20	C	Y	5000	ug/L	75	125	20
2285	Silver	2	ug/L	0.04	ug/L	20110124	C	Y	100	ug/L	80	120	20	C	Y	100	ug/L	75	125	20

Structured Analysis Code: I-GJ-MH-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL - 2% HCL
Method: Inductively Coupled Plasma Mass Spectrometry(6020)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6224							Spike List 6225						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2315	Sodium	50	ug/L	15.0	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
2353	Strontium	5	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2876	Sulfur	5000	ug/L	333	ug/L	20110124	C	Y	10000	ug/L	80	120	20	C	Y	10000	ug/L	75	125	20
3742	Tellurium	10.0	ug/L	0.536	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2477	Thallium	2	ug/L	0.55	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3935	Thorium	2	ug/L	0.552	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2479	Tin	2	ug/L	1.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2482	Titanium	5	ug/L	2.1	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2602	Tungsten	5	ug/L	2.0	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
3827	Uranium	1	ug/L	0.231	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
5927	Uranium 233	0.05	ug/L	0.0066	ug/L	20110124	C	Y	0.386	ug/L	80	120	20	C	Y	0.386	ug/L	75	125	20
4129	Uranium 234	0.05	ug/L	0.0021	ug/L	20110124	C	Y	0.175	ug/L	80	120	20	C	Y	0.175	ug/L	75	125	20
4131	Uranium 235	0.05	ug/L	0.0034	ug/L	20110124	C	Y	0.228	ug/L	80	120	20	C	Y	0.228	ug/L	75	125	20
5385	Uranium 236	0.05	ug/L	0.0015	ug/L	20110124	C	Y	1.75	ug/L	80	120	20	C	Y	1.75	ug/L	75	125	20
4133	Uranium 238	1.0	ug/L	0.0082	ug/L	20110124	C	Y	33.6	ug/L	80	120	20	C	Y	33.6	ug/L	75	125	20
2607	Vanadium	10	ug/L	2.37	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2726	Yttrium	5	ug/L	0.212	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2649	Zinc	10	ug/L	8.29	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20
2651	Zirconium	5	ug/L	0.248	ug/L	20110124	C	Y	1000	ug/L	80	120	20	C	Y	1000	ug/L	75	125	20

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

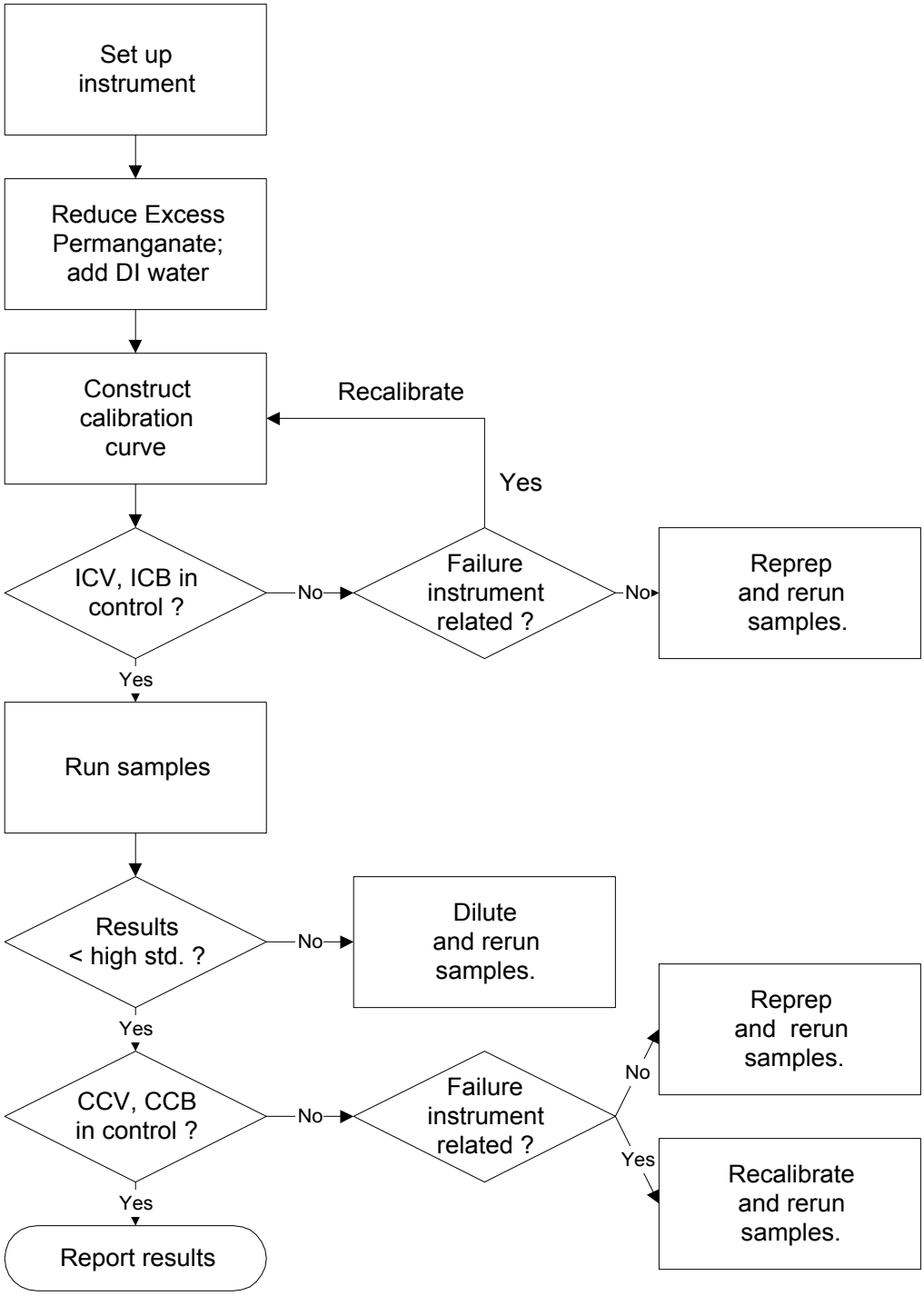
Pages 1119 to 1131

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

CVAA Mercury Analysis



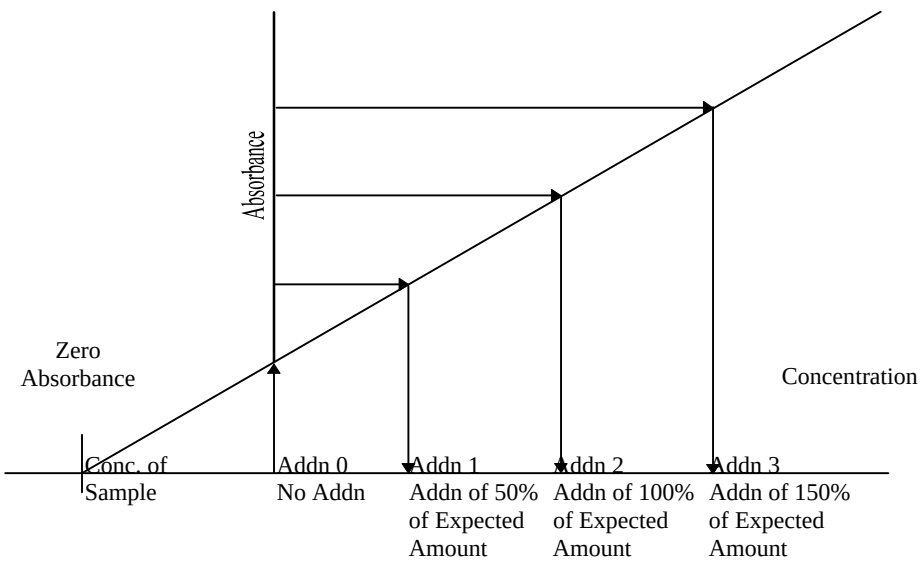
MSA GUIDANCE

Method of Standard Addition

Four equal volume aliquots of sample are measured and known amounts of standards are added to three aliquots. The fourth aliquot is the unknown and no standard is added to it. The concentration of standard added to the first aliquot should be 50% of the expected concentration. The concentration of standard added to the second aliquot should be 100% of the expected concentration and the concentration of standard added to the third aliquot should be 150% of the expected concentration. The volume of the unspiked and spiked aliquots should be the same (i.e., the volume of the spike added should be negligible in relation to the volume of sample).

To determine the concentration of analyte in the sample, the absorbance (or response) of each solution is determined and a linear regression performed. On the vertical axis the absorbance (or response) is plotted versus the concentrations of the standards on the horizontal axis using 0 as the concentration of the unspiked aliquot. An example plot is shown in Figure 1. When the resulting line is extrapolated back to zero absorbance, the point of interception of the horizontal axis is the concentration of the unknown. Calculate the correlation coefficient (r) and the x-intercept (where y=0) of the curve. The concentration in the digestate is equal to the negative x-intercept.

Figure



- For the method of standard additions to be correctly applied, the following limitations must be taken into consideration.
- The plot of the sample and standards must be linear over the concentration range of concern. For best results, the slope of the curve should be similar to that of a plot of the aqueous standard curve.
- The effect of the interference should not vary as the ratio of the standard added to the sample matrix changes.

TAL Reference Data Summary

Structured Analysis Code: **A-70-O9-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: METALS, TOTAL (Method Exclusive) - Solids
Method: Mercury (7471A, Cold Vapor) - Solids
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6111							Spike List 6112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.033	mg/kg	0.0112	mg/kg	20110111	C	Y	16.3	mg/kg	51	148	30	C	Y	0.1667	mg/kg	80	120	30

TAL Reference Data Summary

Structured Analysis Code: **A-MX-O9-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Soil Scoop Preparation/TCLP lab; Mercury
Method: Mercury (7471A, Cold Vapor) - Solids
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6111							Spike List 6112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.033	mg/kg	0.0112	mg/kg	20110111	C	Y	16.3	mg/kg	51	148	30	C	Y	0.1667	mg/kg	80	120	30

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 1136 to 1149

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

TAL Reference Data Summary

Structured Analysis Code: **I-19-BL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL (Method exclusive) - Waters
Method: Mercury (245.1, Cold Vapor)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6109							Spike List 6110						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.050	ug/L	20051026	C	Y	1.0	ug/L	85	115	20	C	Y	1.0	ug/L	85	115	20

TAL Reference Data Summary

Structured Analysis Code: **I-77-BL-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED (DISS) -> TOTAL (Method exclusive)
Method: Mercury (245.1, Cold Vapor)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6109							Spike List 6110						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.050	ug/L	20051026	C	Y	1.0	ug/L	85	115	20	C	Y	1.0	ug/L	85	115	20

TAL Reference Data Summary

Structured Analysis Code: **I-0K-O8-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-E(1312) -> METALS, TOTAL (Method exclusive)
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6113							Spike List 6114						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	1.0	ug/L	0.079	ug/L	20091211	C	Y	5.0	ug/L	80	120	20	C	Y	25	ug/L	70	130	20

TAL Reference Data Summary

Structured Analysis Code: I-0L-O8-01-06

Target Analyte List: All Analytes

Matrix: WATER
Extraction: SPLP-W(1312) -> METALS, TOTAL (Method exclusive)
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6113							Spike List 6114						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	1.0	ug/L	0.079	ug/L	20091211	C	Y	5.0	ug/L	80	120	20	C	Y	25	ug/L	70	130	20

TAL Reference Data Summary

Structured Analysis Code: **I-0M-O8-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: TCLP(1311) -> METALS, TOTAL (Method exclusive)
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6113							Spike List 6114						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	1.0	ug/L	0.079	ug/L	20091211	C	Y	5.0	ug/L	80	120	20	C	Y	25	ug/L	70	130	20

TAL Reference Data Summary

Structured Analysis Code: **I-19-O8-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, TOTAL (Method exclusive) - Waters
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6111							Spike List 6112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.06	ug/L	20110624	C	Y	1.0	ug/L	80	120	20	C	Y	1.0	ug/L	80	120	20

TAL Reference Data Summary

Structured Analysis Code: **I-77-O8-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: METALS, FILTERED (DISS) -> TOTAL (Method exclusive)
Method: Mercury (7470A, Cold Vapor) - Liquid
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6111							Spike List 6112						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
1701	Mercury	0.2	ug/L	0.06	ug/L	20110624	C	Y	1.0	ug/L	80	120	20	C	Y	1.0	ug/L	80	120	20

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 1157 to 1176

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

TAL Reference Data Summary

Structured Analysis Code: **I-06-IA-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: DISTILLATION, MICRO/MIDI - Acid
Method: Cyanide Amenable (9010B-Dist/9012A Automated)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3623	Amenable Cyanide	10	ug/L	1.5	ug/L	20110407	C	Y	100	ug/L	85	115	20	C	Y	100	ug/L	66	120	20

TAL Reference Data Summary

Structured Analysis Code: **A-Z9-IA-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Cyanide Extraction (9013) for Solids and Oils
Method: Cyanide Amenable (9010B-Dist/9012A Automated)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3623	Amenable Cyanide	0.5	mg/kg	0.12	mg/kg	20050823	C	Y	10	mg/kg	85	115	20	C	Y	12.5	mg/kg	60	130	30

TAL Reference Data Summary

Structured Analysis Code: **A-06-IA-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: DISTILLATION, MICRO/MIDI - Acid
Method: Cyanide Amenable (9010B-Dist/9012A Automated)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3623	Amenable Cyanide	0.5	mg/kg	0.112	mg/kg	20110408	C	Y	10	mg/kg	85	115	20	C	Y	12.5	mg/kg	60	130	30

TAL Reference Data Summary

Structured Analysis Code: **A-Z9-IA-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Cyanide Extraction (9013) for Solids and Oils
Method: Cyanide Amenable (9010B-Dist/9012A Automated)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
3623	Amenable Cyanide	0.5	mg/kg	0.12	mg/kg	20050823	C	Y	10	mg/kg	85	115	20	C	Y	12.5	mg/kg	60	130	30

TAL Reference Data Summary

Structured Analysis Code: **I-06-QP-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: DISTILLATION, MICRO/MIDI - Acid
Method: Cyanide, Total (9012A, Automated)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
667	Total Cyanide	10	ug/L	1.5	ug/L	20110407	C	Y	200	ug/L	85	115	20	C	Y	200	ug/L	66	120	20

TAL Reference Data Summary

Structured Analysis Code: **A-Z9-QP-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: Cyanide Extraction (9013) for Solids and Oils
Method: Cyanide, Total (9012A, Automated)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
667	Total Cyanide	0.5	mg/kg	0.12	mg/kg	20050823	C	Y	2.4	mg/kg	85	115	20	C	Y	2.4	mg/kg	60	130	30

TAL Reference Data Summary

Structured Analysis Code: **A-06-QP-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: DISTILLATION, MICRO/MIDI - Acid
Method: Cyanide, Total (9012A, Automated)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
667	Total Cyanide	0.5	mg/kg	0.112	mg/kg	20110408	C	Y	2.4	mg/kg	85	115	20	C	Y	2.4	mg/kg	60	130	30

TAL Reference Data Summary

Structured Analysis Code: **A-2F-QP-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: LEACHATE, DI (ASTM D3987-85) -> DIST., MICRO/MIDI - /
Method: Cyanide, Total (9012A, Automated)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
667	Total Cyanide	5	ug/L	0.1	mg/kg	20040510	C	Y	2.4	mg/kg	85	115	20	C	Y	2.4	mg/kg	60	130	30

TAL Reference Data Summary

Structured Analysis Code: **I-06-O2-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: DISTILLATION, MICRO/MIDI - Acid
Method: Cyanide, Total (335.4)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
667	Total Cyanide	10	ug/L	1.50	ug/L	20110407	C	Y	200	ug/L	85	115	20	C	Y	200	ug/L	66	120	20

TAL Reference Data Summary

Structured Analysis Code: **A-3V-O2-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: TCLP (1311) -> DISTILLATION, MICRO/MIDI - Acid
Method: Cyanide, Total (335.4)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6115							Spike List 6116						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
667	Total Cyanide	5	ug/L	4.654	ug/L	20020212	C	Y	2.4	mg/kg	85	115	20	C	Y	2.4	mg/kg	60	130	30

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))
Privileged/confidential trade secrets, commercial, financial information

Pages 1187 to 1199

YOU MAY APPEAL THIS DECISION

Based on the redaction, this constitutes a partial denial of your request. Because your request has been denied in part, you are advised of your right to appeal this determination in writing.

Please refer to the accompanying correspondence from the FOIA Office for directions and information about the appeal process.

TAL Reference Data Summary

Structured Analysis Code: **I-08-UQ-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: DISTILLATION, MACRO - Acid
Method: Phenolics (Manual - 420.1)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6021							Spike List 6022						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2155	Phenol	50	ug/L	14.05	ug/L	20090317	C	Y	200	ug/L	79	113	20	C	Y	200	ug/L	54	131	20

TAL Reference Data Summary

Structured Analysis Code: **I-08-UP-01-06**

Target Analyte List: All Analytes

Matrix: WATER
Extraction: DISTILLATION, MACRO - Acid
Method: Phenolics (Manual - 9065)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6021							Spike List 6022						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2155	Phenol	50	ug/L	14.054	ug/L	20070320	C	Y	200	ug/L	79	113	20	C	Y	200	ug/L	54	131	20
2162	Total Recoverable Phenolics	50	ug/L	14.054	ug/L	20070320	C	Y	200	ug/L	79	113	20	C	Y	50	ug/L	54	131	20

TAL Reference Data Summary

Structured Analysis Code: **A-08-UP-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: DISTILLATION, MACRO - Acid
Method: Phenolics (Manual - 9065)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6021							Spike List 6022						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2155	Phenol	5	mg/kg	4.453	mg/kg	20070320	C	Y	25	mg/kg	76	113	20	C	Y	25	mg/kg	69	118	30

TAL Reference Data Summary

Structured Analysis Code: **A-08-UQ-01-06**

Target Analyte List: All Analytes

Matrix: SOLID
Extraction: DISTILLATION, MACRO - Acid
Method: Phenolics (Manual - 420.1)
QC Program: STANDARD TEST SET
Location: TestAmerica St. Louis

Analyte List		Detection Limits					Check List 6021							Spike List 6022						
Syn	Compound	RL	Units	MDL	Units	Run Date	T	A	Amt	Units	LCL	UCL	RPD	T	A	Amt	Units	LCL	UCL	RPD
2155	Phenol	5	mg/kg	4.453	mg/kg	20070320	C	Y	25	mg/kg	76	113	20	C	Y	25	mg/kg	69	118	30

Bienkowski, Lisa

To: Bienkowski, Lisa
Subject: SOP signature

From: Glenn Massey [mailto:gmassey@amerisci.com]
Sent: Thursday, November 15, 2012 3:42 PM
To: Bienkowski, Lisa
Subject: Re: Asbestos SOP with signatures

Lisa,

When we give a customer or compliance agency an SOP for review, we no longer have control over it, so it called an uncontrolled document. We can only control what's inside our building. The annual review is handled primarily in our corporate office, though we do review it with our annual internal audits. For years, and probably decades now, the versions have been approved and released without the signatures. Our compliance officer did clarify that the asbestos SOP released to a customer without signatures is to indicate that it's an uncontrolled document and should be accepted as the current and reviewed document we operate under. That's the policy and why you received it that way. Review notes are part of other internal records that we don't release, and no further changes have been made to the version you have.

Glenn

AmeriSci Group. Standard Operating Procedures

SECTION III - A

Analysis of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM)

(40 CFR Ch. I (1-1-87 edition) Pt 763, Subpt. F, App. A, pages 293-299)

1. Principle and Application

1.1. Application

This method of analysis is useful for the qualitative identification of asbestos and the semi-quantitative determination of asbestos content of bulk samples, which is useful information to characterize the potential hazard of a given material with regard to asbestos. This method is strictly applicable to friable building materials only. Quantitative removal of matrix and other non-asbestos components sensitive to heat and/or acid treatment may provide additional information for selected samples (see section III-A.6). Non-friable materials are addressed in other portions of Section III (see III-B and III-C). Asbestos is a fibrous, fire-resistant mineral once widely used in building materials and now known to be a human carcinogen. Hazardous materials must be identified so that necessary safety precautions may be taken when the material is handled.

1.2. Principle

1.3. Accessory Methods for Problem Samples

Some types of friable samples and most non-friable samples present a series of problems of varying difficulty for the asbestos analyst. Typical problem materials include matrix coated materials including plaster samples, joint compound, roofing samples, mastic, vinyl or asphalt floor tiles, cement products, caulking, rubberized coatings, paints and other materials. Coatings on asbestos bundles which prevent the proper observation of characteristic optical properties may be removed by mechanical, chemical (HCl treatment) or thermal (ashing at 480C) treatment. Great care must be taken when applying matrix modification or removal in order to track the processes quantitatively by Gravimetric Reduction (section III-A-6.). Analysis of non-friable materials and other special materials is addressed in Section III-C. Materials such as floor tiles, plasters, or paints suspected of having substantial quantities of fibers with diameters thinner than 0.25 micrometers (optical limitation of the light microscope) should be referred for TEM preparation and examination (section VII). Foreign soil samples are subject to special handling requirements (USDA Circular Q-330.300-2) and disposal treatments (section XXII-A). The CARB 435 method requires 400 pt ct analysis of samples with <10% asbestos content by visual estimate.

2. Equipment and Materials

2.1. Microscope, polarized light, and:

2.1.1. 10 x oculars with cross-hair reticule

2.1.2. Objectives such as 4x, 10x, 20x, and 40x

2.1.3. Polarizer placed parallel to the reticule cross-line and analyzer capable of being placed at 90° angle to polarizer.

2.1.4. Accessory slot for wave plate and analyzer

2.1.5. Retardation plate (red I compensator plate), 550 nm retardation with known fast and slow vibration directions

2.1.6. 360° rotatable stage

2.1.7. Substage condenser with iris diaphragm

2.1.8. Light source with iris diaphragm and blue day-light filter

2.2. Microscope slides: 75 mm x 25 mm

2.3. Cover slips: 18 mm x 18 mm, No 1 1/2

2.4. HEPA-filtered hood

2.5. Mortar and pestle

2.6. Stereomicroscope, ca. 10x to 45x, with incandescent light source

2.7. Mini-hot plate

2.8. Tweezers, dissecting needles, spatulas, probes, and scalpels

2.9. Pencils, #2

2.10. Glassine weighing papers or plastic weighing boats

2.11. Analytical balance readable to one milligram

2.12. 10 ml Pyrex beakers

2.13. Muffle furnace capable of 500° C

2.14. Filters, 0.4 µm pore size polycarbonate

2.15. Petri dishes, disposable (locking and non-locking)

2.16 Glass filtration assembly with vacuum pump

2.17. Drying oven

2.18. Desiccator with silica gel

2.19 10 ml graduated pipettes

2.20. 500 ml volumetric flasks

2.21. Nalgene wash bottles

2.22. Ultrasonic bath

2.23 Timers

2.24. Wrist action grinder with removable cups

2.25. High temperature thermometer (500 C) readable to 5° C

2.26. Room temperature thermometer readable to 2° C

2.27. Chalkley point count reticule

2.28. Monochromatic filter - 589.3 nm (orange)

2.29. Alcohol burner lamp

2.30. 200 Tyler mesh sieve

3. Reagents

3.1. Refractive index (RI) liquids 1.490-1.570 high dispersion and 1.580-1.720 in increments of 0.005 or less

3.2 Asbestos reference samples such as SRM #1866 and #1867, available from the National Institute of Standards and Technology

3.3 Calibrated refractory glasses for verifying refractive indices

3.4 Distilled water

3.5. Concentrated HCl and NaCl, reagent grade

4. Sample Collection and Identification Procedure

4.1. A sample size of 1 to 10 grams is recommended, although sufficient sample size is sample-type dependent. Sample size should be adjusted to ensure that it is representative of the parent material. Samples should be submitted in a carefully sealed and labeled sample container and packed to prevent damage or sample loss.

4.2. A sample submitted for testing should contain all layers of a material and should be relatively undisturbed so that the analyst may view the sample in its original form. Since each layer must be analyzed as a separate sample, separable layers should be separated and identified in the field if possible. If not separable, an identifier should be used which will allow later identification by orientation, position, color, texture, etc. If identifiable, the outside or top of a sample should be labeled as the first layer.

4.3 When logged into the AmeriSci data base each sample or separable layer must be labeled with and thereafter referred to by the unique lab assigned job/sample number consisting of an 9 digit job number followed by sequential digits which serve as the specific sample identifier within the job (ex. 1-0201-1523-27). For layered samples not addressed by unique client identifiers at Log-in the job/sample number may be further subdivided by creation of a decimal addition to the sample specific digit such that each of the decimals relate to the original client identifier. For example, the third layer from the top in a roofing sample would be identified as 1-0201-1523-27.3 unless specified differently by the client. As an alternative procedure, different materials combined under a single client sample number may be identified by a Letter suffix rather than a decimal. For example, a floor tile, mastic group identified

by a single client number might be identified by AmeriSci as 1-0201-1523-27T and 1-0201-1523-27M. Letters available for use as suffixes include: M, T, C and F which may be followed by sequencing digits for more that one occurrence of a material in a sample bag such as -27T, -27M1 and 27M2.

5. Sample Slide Preparation Procedure

5.1. Examine the paperwork for necessary client information regarding processing and reporting of the samples. Samples may be analyzed individually after preparation or prepped and analyzed as a job batch depending on analyst preference. Prepare a QC-blank test slide with standard non-asbestos particulate material after every 19 client samples in a job batch (see 5.20.). Record any sample modification or treatment must be on the sample worksheet (or directly in the LIMS using comment/footnote).

5.2. If the sample has been selected for quality control analysis place the sample container in the analyst specific quality control bin after completion of primary analysis.

5.3. Visually examine samples with a low-magnification stereomicroscope under a ventilation hood with HEPA filtration. Samples should only be opened for examination under a properly operating HEPA hood.

5.3.1. Observe and note the following on the sample worksheet (or directly into the LIMS):

5.3.1.1. AmeriSci job/sample number (decimal sample number indicates layered sample)

5.3.1.2. Homogeneity

5.3.1.3. Color

5.3.1.4. Texture

5.3.1.5. Semi-quantitative estimation of amount of fibrous material present

5.4. If the sample appears to be wet, transfer to a labeled petri dish and dry in a low temperature drying oven at 60C. Cool before proceeding.

5.5. Label a slide with the sample's AmeriSci number (job # plus individual sample #).

5.6. Under the hood, remove a portion of the sample and examine the edges for emergent fibers. If any layers are observed they should be addressed as individual samples for analysis and reporting purposes if possible.

5.7. If there are obvious separable layers, analyze and report each layer separately using a suffix (decimal or letter identifier added to the AmeriSci job/sample number). If not entering analysis directly into the LIMS package add the suffix to the sample number on the analysis sheet and use a blank analysis sheet for each additional layer/material. Attach the additional layer sheets to the original sample sheet.

> **Note:** Under EPA guidelines (40 CFR 61, FR 59.3.542) single, combined analyses may not be reported except for a joint compound / wallboard system. OSHA does not allow combined analyses.

5.8 Forceps and a scalpel may be used to cut the sample layers into smaller pieces after placing it in the RI liquid on the slide. The scalpel blade may also be used to "scrape" coatings from fiber bundles in order to remove interference effects.

5.9 Grind non-homogeneous samples in a mortar until thoroughly mixed.

5.10. If the sample has large hard particles, grind in a mortar to reduce grain size to less than 200 Tyler mesh to facilitate accurate quantitation (required by CARB 435).

5.11. Place a small drop of 1.550 HD dispersion staining fluid on appropriately labeled slide.

5.12. Using forceps, randomly transfer a small pinch sample from the homogenized sample to the mounting medium on the slide.

5.13. Evenly disperse the sample throughout the fluid using needles or a mincing action with forceps and a scalpel.

5.14. Using needles, scalpel and forceps tease homogenous samples not previously ground to facilitate separation of fibers from matrix materials. Bundles of fibers should be “scraped” with a scalpel to remove adhering particulate which causes a “milky way effect” when observed by PLM/DS. Pretreatment with dilute HCl may aid removal.

5.15. Place a coverslip over preparation. Add more refractive index fluid if necessary by dropping liquid on slide rather than touching the slide. Note: This must be done cautiously since the RI fluid may be easily contaminated at this point.

5.16. An even dispersion of sample should cover the entire area under the cover slip. If necessary, a clean pencil eraser may be used to grip the coverslip while sliding it over the preparation to thin and evenly distribute the material. Mild heating may assist separation of binder materials.

5.17. For those samples which will have quantitation by EPA 400 pt. (or 1000 pt.) point-counting, eight (twenty) or more sub-samples must be mounted on labeled microscope slides under separate coverslips. A maximum of 50 points per mount should be counted. Two mount/coverslips may be mounted on the same slide.

5.18. Prepare additional subsamples as necessary in specified RI fluid by repeating steps 5.7 through 5.17.

5.19. If specified, QC slides for duplicate and replicate analysis may be prepared by repeating steps 5.7. through 5.17.

5.20. Prepare a QC-Blank slide by placing small pinch sample of blank fiberglass or NaCl on a slide following steps 5.11. through 5.16. (See "SOP for Housekeeping", Section V.4. for further information concerning QC-blank sample evaluation.)

5.21. Thoroughly clean work area, mortar and pestle and all other mounting tools between each sample preparation.

5.23. Repeat sample preparation steps for all samples in the client's job request and all QC samples indicated by the accompanying paperwork.

6. <u>Gravimetric Reduction</u> (Point Count or TEM preparation - modified Chatfield)

This procedure is not part of the standard procedure for friable samples. This method is particularly useful to reduce the possibly of false negatives if thin fibers below the resolution limit of the light microscope are suspected and to provide additional quantitative data for samples which contain low levels of asbestos. Such samples when requested, may be gravimetrically reduced prior to PLM slide preparation. A Gravimetric Reduction Worksheet must be completed for each job. All Non-friable Organically Bound (NOB) samples are addressed by Section III-B or III-C.

6.1 Examine the paperwork for necessary client information regarding processing and reporting of the samples. Using a scalpel or other tool, shave or break off approximately 300 to 500 mg (100 minimum)of homogenous sample into a marked, pre-weighed 10 ml beaker and weigh. Non-homogenous, layered and mixed type

samples must be separated as previously described in sections 4 & 5.

6.2. Record sample color, morphology and weight on appropriate Gravimetric Reduction (GR) worksheet as described in section 5. Maintain GR worksheet with job folder.

6.3. Cover and place in a muffle furnace at 480°C for 6-12 hours or until sample weight stabilizes. Record temp/time into and out of the furnace on the GR worksheet.

6.4. Cool in a desiccator with silica gel (Do Not use Drierite due to contaminating dust).

6.5 Reweigh and record weight on appropriate worksheet.

6.6. Add approximately 5 ml of 6:1 HCl and using a spatula or probe break up any lumps or residue in beaker.

6.7. Cover and place sample in ultrasonic bath for approximately 10 minutes.

6.8. Preweigh a plastic petri dish and 0.4 µm polycarbonate filter for each sample. A locking petri dish should be used if the sample is to be saved, shipped or for PLM.

6.9. When all obvious signs of reaction (bubbling) have stopped, pour sample solution into filtration apparatus containing a pre-weighed 0.4 µm polycarbonate filter.

6.10. Using distilled water, thoroughly rinse beaker into filtration apparatus and rinse down the inside of the apparatus. Record treatment time on GR worksheet.

6.11. When filtration is complete, carefully transfer filter and residue to the appropriate pre-weighed petri dish.

6.12. Dry filter and residue (in petri dish) in drying oven. The presence of any large grains of aggregate material must be noted on the Gravimetric Reduction Worksheet (Rocks Y/N) and accounted for quantitatively.

6.13. Re-weigh filter and residue in petri-dish. Record weight on appropriate work sheet.

6.14. If residue weight is less than 1% of original subsample weight, analysis may be halted and sample reported as a non-ACM. Note: Unless analysis termination is requested at this point by the client, analysis should continue in order to make client aware of potential site or personal contamination by low level , non-regulated, asbestos containing material.

6.15. If residue weight is ≥ 1% of original subsample weight, transfer petri-dish to a HEPA filtered preparation hood for PLM analysis.

6.16. Cut the filter in half. Retain one undisturbed half in the petri-dish. Detach a section of residue from the second half filter and mount random pinch samples on 2 separate, clearly labeled slides making 2 coverslip preparations on each slide using steps 5.11 thru 5.17. Additional mounts may be necessary. During analysis compare the sample to 2 known standards with similar type and amount of asbestos, if available.

6.17. Save the remaining half filter in the petri-dish for possible TEM confirmation.

6.18. Thoroughly clean filtration apparatus between each sample.

7. Sample Analysis Procedure - Qualitative Assessment

7.1. Microscope Setup: Refer to "SOP for Calibration and Maintenance of Equipment - Asbestos" for details on daily microscope calibration and setup.

7.2. Inspect the sample macroscopically and note the color and bulk morphology on the analyst's worksheet (either hard copy or computer file). Prepare slides as necessary for PLM examination following procedures outlined in Section III.A.5.

7.3. Examine the slide under PLM. All fibrous components in the sample must be identified.

7.3.1. If matrix material coats the fibers, place a pencil eraser on the coverslip to press and slide the coverslip until the fibers are freed, (heating may assist). Some coatings may require "scraping" with a scalpel blade or solvent treatment prior to applying the coverslip.

7.3.2. Asbestos fibers must be positively identified by observing each of the following criteria. If not entering data directly into the LIMS package record all observations in the appropriate space on the analyst's worksheet for each sample analyzed.

7.3.2.1. Scan the preparation using crossed polars with the first order red compensator inserted. For each type of suspected asbestos fiber found, observe and record the following on the analyst's worksheet.

7.3.2.2. Morphology: refer to EPA Test Method Table 2-2 for optical properties of asbestos fibers.

7.3.2.3. Sign of elongation: note as either + (positive) or - (negative) on analyst's worksheet.

7.3.2.4. Remove the first order red compensater and observe extinction characteristics. Note angle of extinction as parallel, or in degrees if different from parallel, on analyst's worksheet.

7.3.2.5. Remove the analyzer and observe under plane polarized light for color and pleochroism. Record observations on analyst's worksheet.

7.3.2.6. Insert the dispersion staining objective and observe dispersion staining colors parallel and perpendicular to the fiber length. Record these colors in that order on worksheet. Refer to EPA Test Method Table 2-3 for typical central stop dispersion staining colors.

7.3.2.7. Record index of refraction (RI) parallel and perpendicular to the fiber length. Note: See Reference- Single Liquid Method - for assistance in determining RI values by Dispersion Staining Method; record all RI values to 4 significant figures.

7.3.2.7.1 Most samples are originally mounted in 1.550 HD refractive index (RI) oil. It will be necessary to mount subsamples of original bulk materials with suspect amphiboles in other RI oils.

7.3.2.7.1.1 Mount suspected amosite samples in 1.680 RI oil.

7.3.2.7.1.2 Mount suspected crocidolite samples in 1.680 and 1.700 RI oil.

7.3.2.7.1.3. Mount suspected anthophyllite, actinolite, or tremolite samples in 1.605 RI oil.

7.3.2.7.2. Dispersion staining colors along with temperature may be used to establish refractive indices of chrysotile, amosite, and crocidolite. Alternatively, refractive indices may be established by observation of Becke lines under plane polarized light.

7.3.2.8. Record Birefringence on analyst's worksheet as none (isotropic), high, med. (medium), or low.

7.3.3. All fibrous components of the sample must be positively identified as asbestiform or

non-asbestiform. Check synthetic "chrysotile" look-likes by heating with mini-hot plate, they should melt at 300-500 F. Only one distinguishing characteristic for each non-asbestos fiber type needs to be recorded. Refer to EPA Test Method Tables 2-4 and 2-5 for optical properties of non-asbestos fibers.

7.4. Man Made Vitreous Fibers - Some non-asbestos fibers such as man made vitreous fibers (MMVFs) and in particular refractory ceramic fibers (RCFs) may be identified by a combination of physical and PLM optical methods which are not addressed in the EPA methods.

7.4.1. Vitreous fibers are fibers which are isotropic (glass) and may be either natural or synthetic. Refractory ceramic fibers (RCFs) are synthetic, vitreous fibers which may be separated from other MMVFs such as glass wool, mineral wool, rock wool or slag wool based upon refractive index measurements and a flame test as follows (Buetow, 1998):

7.4.1.1. Isotropic MMVFs may be separated into rock/slag/mineral wool and glass wool/RCFs based upon refractive index either above or below 1.600 respectively. RCFs exhibit indices of refraction between 1.54 and 1.59. Glass wool fibers generally have indices between 1.51 and 1.54. Rock/Slag wool have higher indices in the range of 1.6 to 1.8.

7.4.1.2. Hold a bundle of suspect fibers in the flame of an alcohol lamp (about 1050 C) for at least 60 seconds. Vitreous Refractory ceramic fibers (RCFs which have a melting point above 1500 C) will glow red but will not melt. Fiberglass, rock, mineral and slag wool should melt at temperatures over 100 degrees below the temperature of the alcohol flame.

7.4.1.3. Suspect RCFs from a positive flame test should be referred to chemical composition testing by TEM/EDS for identification as to RCF type.

8. Sample Analysis Procedure - Quantitative Assessment

8.1 Semi Quantitation by Visual Estimation

8.1.1. Estimate the content of the asbestos type present in the sample using the 1.550 RI preparation. Do not use HCl or heat treated samples unless losses were quantified.

8.1.2. Express the estimate as an area percent of all material present, taking into account the loading and distribution of all sample material on the slide. Use permanently mounted, in-house calibration standards to aid in arriving at an estimate, if available. Alternatively, for samples in ranges where no in-house standard are yet available, refer to Appendix B "Visual Estimation Comparators", also see illustrations in NIOSH 9002 document.

8.1.3. If additional unidentified fibers are present in the sample, continue with the qualitative assessment (Section III.A.7.).

8.1.4. Record on the analyst's worksheet estimated percentages of all other materials identified which are present at greater than trace levels. The sum of expressed percentages should equal 100% of material observed. Note: If evaluating inert residue from matrix reduction process the expressed percentages should equal the inert residue percentage.

8.1.5. The quantity of asbestos by visual estimation is reported as **trace** if six or more asbestos fibers are observed in a minimum of three slides. The background level has been determined to be a single fiber in a minimum of three slides. Four fibers are required to be considered statistically significant above background, for a total of six fibers in a minimum of three slides.

8.1.6. Indicate calibrated visual estimation (CVES) as the method of quantitation

8.2 Quantitation by Point Counting (EPA 400 pt or 1000 pt)

8.2.1. Summary and Application

Samples with less than 10% asbestos by visual estimation need further quantification using either the 400 or 1000 point count method, which may be extended in order to provide lower detection limits as appropriate. Point counting may be performed only on friable materials or those non-friable materials having undergone gravimetric reduction.

8.2.2. Point Counting Criteria

A **Point** is a discrete point (as on a Chalkley Reticule) or the intersection of two mutually perpendicular lines in the eyepiece reticule. A non-empty point is the visual superimposition of such a **Point** over any material in the slide preparation. Empty points are those points which lie over areas containing no materials.

8.2.2.1. A non-empty point must be noted as one of the following:

8.2.2.1.1. Specific asbestos varieties

8.2.2.1.1.1. CH: chrysotile
8.2.2.1.1.2. AM: amosite
8.2.2.1.1.3. CR: crocidolite
8.2.2.1.1.4. TR/AC: tremolite/actinolite
8.2.2.1.1.5. AN: anthophyllite

8.2.2.1.2. Specific non-asbestos fibers (optional)

8.2.2.1.2.1. CF: cellulose fiber
8.2.2.1.2.2. FG: fibrous glass (mineral/glass wool)
8.2.2.1.2.3. SF: synthetic fiber
8.2.2.1.2.4. WL: wollastonite
8.2.2.1.2.5. OF: other fiber (talc, brucite, etc.)

8.2.2.1.3. Non-fibrous material

8.2.2.3. Before beginning analysis for a particular sample, scan each preparation and thin or re-prepare as necessary. Ideally, slides should contain approximately 50% non-empty points with a minimum of clumping.

8.2.2.4. Moving to new fields of view must always be done at random, with the analyst looking away temporarily while moving the slide. The slide must never be deliberately moved to preferred fields of view under the reticule.

8.2.2.5. If the **point** lies over an area of heavy clumping, randomly move the slide to another area to avoid attempting to count multiple layers under a point. Record only one point if two or more points are positioned over some particle or fiber.

8.2.2.6. If two particles are occasionally superimposed under a **point**, count both particles as

separate points.

8.2.3. Point Counting Rules

8.2.3.1. All counting must be done at 100x magnification, usually between crossed polars with the first order red compensator inserted in the 45° port above the slide. (In some situations where extremely fine asbestos fibers are present, it may be preferable to analyze the sample between slightly uncrossed polars without the compensator. Other situations may warrant point counting in a dispersion-staining mode.)

8.2.3.2. For each of the coverslip preparations, count until 50 non-empty points are counted.

8.2.3.3. Continue counting until 400 (or 1000) non-empty points have been counted on eight (or twenty) preparations (mounts). When extending the points counted, maintain the system with a maximum of 50 points per slide..

8.2.3.4. Utilize a uniform scan pattern (i.e. always begin with upper left point in NW quadrant and end with lower right point in SW quadrant counting each point between in a systematic pattern) so that an asbestos fiber is not always the first point counted in a field.

8.2.3.5. If asbestos appears in a field of view but not directly under a point, the analyst must note this on the sheet and "trace asbestos" must be noted on the final report.

8.2.3.6. If the analyst suspects asbestos from the macroscopic examination but none is detected during the point count analysis, the analyst must retrieve the original bulk material, remove any suspicious fibers, mount them in an appropriate medium, and determine their identity. If the fibers are confirmed as asbestos, this is noted on the analysis sheet. Although these observations will not be used for quantitation, they will be incorporated into the final report to prevent false negatives.

8.3 Continue qualitative and quantitative analysis for each sample in the work order until all samples for that order including appropriate Quality Control samples (duplicates and blanks) have been completed. The final report will not be released until replicate QC samples have been completed.

8.4. Analyze QC samples in-line with other samples if available. For each QC sample, record on a separate "Intralaboratory QC Bulk Analysis Worksheet" (or directly in the appropriate LIMS QA job) all information recorded for initial analyses (Section

III-A.7 - 7.3.3).

8.5. Contamination Testing - Blank Slides - Note that any material (asbestos or non-asbestos) should be considered contamination.

Analyze QC-Blank slides in-line with other samples (after nineteen samples). If suspected contamination may have occurred, a blank slide may be prepared at any time. Note that any fibrous material (asbestos or non-asbestos) must be identified and may be considered contamination. Record the following in the appropriate "Contamination Check" spaces of the Calibration logbook.

8.5.1. Initials of analyst (or analysts) analyzing blank slide

8.5.2. Date of analysis

8.5.3. Note "none" if no fibrous contamination is apparent. Note percentage and type of contamination detected if found. Cease analyses until the source of the contamination is resolved. Notify the laboratory supervisor for necessary corrective action.

8.5.3.1. If non-asbestos, fibrous contamination is detected, clean all tools and workspace. Mount and analyze samples of NaCl until the source of the contamination is resolved. Reanalyze any samples analyzed after the previous clean blank, which may have been affected by the contamination.

8.5.3.2. If asbestos contamination is detected, clean all tools and workspace. Mount and analyze samples of Reference fiberglass until the source of the contamination is resolved. Reanalyze any samples analyzed after the previous clean blank, which may have been affected by the contamination.

8.5.3.3. Document completely the sequence of events leading to the contamination event and its resolution. Report the event in its entirety to the Quality Control Officer.

9. <u>Calculations</u>

9.1. Point Count (EPA 400 point or 1000 point)

9.1.1. The percentage of each asbestos type, non-asbestos fiber types, and non-fibrous components are calculated by dividing the number of non-empty points of that component by the total non-empty points counted for that sample.

If AP = 0 report "NAD" (no asbestos detected)

If $0 < AP \leq 3$ report "<1% asbestos"

If $AP \geq 4$ calculate the % Asbestos as follows

Thus: % Asbestos = (AP / TP) 100%

Where: AP = number of points counted for a specific asbestos type
TP = total number of non-empty points counted (400 or 1000)

9.1.2. For example, if point counting yielded 15 chrysotile points and amosite was counted as 4 points, then:

TP = 400 (total non-empty points counted) or 1000 (total non-empty points counted)

<u>AP for chrysotile</u> = 15 (total chrysotile points counted) ;
thus (15 / 400) X 100% = 3.75% chrysotile
or (15/1000) X100% = 1.50% chrysotile

<u>AP for amosite</u> = 4 (total amosite points counted);
thus (4 / 400) X 100% = 1.00% amosite
or (4/1000) X 100% = 0.40% amosite

<u>AP for total asbestos</u> = 4 (amosite) + 15 (chrysotile) = 19 (total);
thus (19 / 400) X 100% = 4.75% asbestos
or (19/1000) X 100% = 1.90% asbestos

9.2 Gravimetric Reduction

9.2.1. Percent Asbestos for samples which have undergone gravimetric reduction is calculated using the following formula:

$$\% \text{ Asbestos} = (W_{Res}/W_{Orig.}) \times Asb\%$$

where: W_{Res} = Weight of residue after furnace and acid treatments (mg)
W_{Orig} = Weight of original subsample (mg)
Asb% = Mean percentage of asbestos (versus inorganic residue) in

final slide preparations

10. Calibration and Quality Control Measures

10.1 Contamination Control

10.1.1. Blank slides prepared within the work flow from verified non-ACM (NaCl, Reference fiberglass or NIST 1866 fiberglass) are analyzed at a rate of one after every nineteen client samples.

10.2 Calibration of Equipment and Supplies

10.2.1. Refractive Index Media

10.2.1.1. The refractive index of the dispersion staining oils currently in use are checked monthly, when any bottle is first opened or refilled from a larger bottle, or when in question for any reason. If a bottle is used after a period of non-use longer than a month the bottle must be calibrated in order to verify the reference value.

10.2.1.2. Refer to SOP for Calib. and Maint. - Asbestos for details on RI verification.

10.2.2. **Polarized Light Microscope**

10.2.2.1. Check PLM calibration daily and document the calibration in the microscope log book.

10.2.2.2. See SOP for Equip. Calib. and Maint. - Asbestos for calibration details.

11. Available Reference Standards

11.1. NIST Standard 1866 for chrysotile, amosite, crocidolite, and fibrous glass, and the NIST Standard 1867 for anthophyllite, actinolite, and tremolite. Low level ACM standards and slides are available.

11.2. All NIST and other proficiency testing materials are retained for use as reference standards and training materials.

11.3. Cargille Optical Glass reference sets (M-8 and M-25) are available for verifying refractive index oils.

11.4. Reagent grade NaCl, Reference fiberglass and SRM 1866 fiberglass are available for use as contamination testing materials.

11.5. Various samples of industrial grade materials such as mineral wool, talc, cellulose, etc. are available for comparison.

12. Bulk Asbestos Quality Control

12.1. Because quality control for bulk samples is difficult to quantify, the QC for bulk asbestos samples is based on a error classification scheme in which various differences between two analyses of the same bulk material are denoted by an error category and an error type.

12.2. There are two error categories: major and minor.

12.2.1. A major error requires immediate attention to determine if the analysis was invalid.

12.2.2. Minor errors are not considered significant unless repeated frequently by an analyst.

12.3. The various error types are given in the table below:

Error Category	Error Type	Meaning
Major	False positive	A substance was found in the original analysis but not in the QC analysis. Note: Trace vs NAD is considered a Minor quantitation error.
Major	False negative	A substance was found in the QC analysis but not in the original analysis. Note: Trace vs NAD is considered a Minor quantitation error.
Major	Mis-ID	An asbestos mineral was found in the original analysis but a different asbestos mineral was found in the QC analysis (except for actinolite-tremolite; see below).
Major	Quantitation	The quantity of a substance found in the original sample analysis differs 30% or more from the quantity of the same substance found in the QC analysis.
Minor	Mis-ID	Actinolite was found in the original sample but tremolite was found in the QC analysis, or vice versa.
Minor	Quantitation	The quantity of a substance found in the original analysis differs 15% to 29% from the quantity of the same substance found in the QC analysis. Note: Trace vs NAD is considered a Minor quantitation error.

12.4. The only analytes considered in the classification scheme are the asbestos minerals.

12.5. Intralaboratory Quality Control

12.5.1. Intralaboratory quality control is used to estimate the variability of bulk asbestos identification within the laboratory. One out of every ten bulk samples is chosen to be analyzed blind in duplicate and/or replicate. A QC-blank sample is prepared after every nineteen client samples.

12.5.1.1. Duplicate: one sample is blindly analyzed two times by the same analyst; monitoring analyst precision.

12.5.1.2. Replicate: one sample is blindly analyzed by two different analysts; monitoring intralaboratory precision and accuracy.

12.5.2. Corrective action: If a major error is found (by either duplicate or replicate QC evaluations), the Laboratory Supervisor will have the sample reanalyzed, preferably by someone other than the original analyst. The sample will continue to be reanalyzed until at least two analyses do not have any major errors. All other like samples (as described in the Sample Identification field of the sample submittal form) within the work order will also be reanalyzed. If the error is NSD vs Trace or a low asbestos percentage TEM verification may be requested.

12.5.2.1. Contaminated Blanks: If fibrous material (asbestos or non-asbestos) is detected in a QC-blank sample, the prep area and equipment are cleaned and new blanks analyzed until the problem is resolved (see Section III.A.8.5. for a detailed discussion). All samples analyzed since the previous clean blank will also be reanalyzed.

12.5.3. If subsequent analysis shows that an error has been reported prior to the final report being issued, the report is corrected without an amended note (since the data faxed is marked preliminary) and the client contact notified of the change from the preliminary data. If for any reason the final report has been issued an amended report is issued and the client contact notified of the change prior to it being sent. With approval by the laboratory director the client may receive credit for the invoice if already issued.

12.5.4. The Quality Control Coordinator will on at least a monthly basis provide a blank sample and a known asbestos containing sample for blind analysis. Additional samples may be provided at any time if deemed necessary.

12.5.4.1. SRM 1866, Reference fiberglass or other asbestos standards are submitted as a blind sample at least once per month.

12.6. Interlaboratory Quality Control

12.6.1. Interlaboratory quality control is performed by Round Robin analyses in order to provide a comparison of AmeriSci analysts and analysts at other accredited laboratories.

12.6.2. NVLAP Proficiency Testing Program

Samples are prepared semi-annually by a NVLAP contractor. The results of all analyses of these materials and the comparison of AmeriSci's analysis with NIST's analysis are maintained in AmeriSci's QC files. Additionally, individual analyst's results are reviewed with NIST's analysis to monitor individual performance. These samples are available and used for training and QA/QC purposes

12.6.3. Round Robin Programs

AmeriSci participates with other accredited laboratories by analyzing submitted samples semi-annually. Participating laboratories rotate the responsibility of initiating samples and summarizing the analysis results. The round robin program gives AmeriSci an external QC check on samples typical of those analyzed on a daily basis.

12.7. Monthly Summaries

The Quality Control Coordinator at each facility will provide monthly summaries of QA analyses, including results from: blanks, duplicates, replicates, proficiency testing and interlaboratory testing as available. The report will also include discussion of any deficiency corrections addressed during the month. Overall accuracy and precision for each analyst will be maintained in individual personnel folders and addressed in the monthly report.

13. Evaluation of Method

13.1 Interferences

Other fibers with optical properties similar to the asbestos minerals may give positive interferences. Optical properties of asbestos fibers may be obscured by coatings on the fibers. Fibers finer than the resolving power of the microscope (ca. 0.25 µm) will not be detected. Heat and acid treatment may alter the index of refraction of asbestos and change its color.

13.2. Limitations

The method is useful for the qualitative identification of asbestos and the semi-quantitative determination of asbestos content of bulk samples, expressed as a percent of projected area. The method measures percent asbestos as perceived by the analyst in comparison to the standards which include real calibration samples, projections, photos, and drawings. The method is not applicable to samples containing large amounts of fine fibers below the resolution of the light microscope.

Since some samples may contain fibers too small to be resolved by PLM (<0.25 µm in diameter), quantitation of total fibers in such samples may not be possible without use of transmission electron microscopy (TEM).

13.3 Range and Limit of Detection (may be extended by gravimetric reduction and/or point counting)

13.3.1. Range of Detection: 1% to 100% asbestos

13.3.2. Estimated Limit of Detection: <1% asbestos for CVES
< 0.25% for 400 points counted
< 0.10% for 1000 points counted

14. Evaluation of Analysis Results

Any material containing asbestos at any level is considered to be a potential health hazard and must be handled with applicable precautions.

15. Safety Considerations

Standard laboratory safety should be observed during all benchwork procedures. Lab coats should be worn at all times. All sample inspection and mounting procedures should be conducted under the exhaust hood. More extensive safety guidelines can be found in the AmeriSci Health & Safety Manual and Chemical Hygiene Plan.

16. References

Buetow, D.H. 1998, “The Identification of Refractory Ceramic Fibers in Bulk Building Materials by Optical and Physical Methods”, EIA Technical Monographs, Vol 4, 8 pages.

CARB: Method 435, "Determination of Asbestos Content of Serpentine Aggregate" California Air Resources Board, California Environmental Protection Agency, 18 p, June 6, 1991.

NIOSH: Method 9002, “Asbestos (bulk) by PLM”, Issue 2, 8/15/94, NIOSH Manual of Analytical Methods, 4th Edition, issued 8/15/94.

Su, Shu-Chun 1996, "Rapidly and Accurately Determining Refractive Indices of Asbestos by Using Dispersion Staining Method", References for Bulk Asbestos Identification by PLM, 1997 NVLAP Asbestos Regional Meeting, Boston, MA

USEPA: “Interim Method for the Determination of Asbestos in Bulk Insulation Samples", EPA/600/M4-82-020, Dec 1982

USEPA: “Method for the Determination of Asbestos in Bulk Building Materials”, EPA/600R-93/116, July 1993

APPENDIX D

EXAMPLE OF CHAIN-OF-CUSTODY, SAMPLE LABEL, AND CUSTODY SEAL (on CD only)

This page intentionally left blank.

TETRA TECH
1230 Columbia Street, Suite 500
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		

Project Information Section Do not submit to Laboratory

SAMPLE ID	DATE COLLECTED	TIME COLLECTED	NO. OF CONTAINER	LEVEL 3	LEVEL 4	TYPE	TAT									COMMENTS	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)
COMPANY	TIME	COMPANY	TEMPERATURE: _____ SAMPLE CONDITION: ☐ INTACT ☐ BROKEN COOLER SEAL: ☐ INTACT ☐ BROKEN

SAMPLING COMMENT:

White - Laboratory; Pink - Laboratory; Canary - 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_____
_____

ATTACHMENT 2

PROJECT CONTRACTOR QUALITY CONTROL PLAN

This page intentionally left blank.

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

CONTRACT NO. N62473-10-D-0809
CTO NO. 0013

ATTACHMENT 2

FINAL
PROJECT CONTRACTOR QUALITY CONTROL PLAN
April 2013

NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

DCN: RMAC-0809-0013-0007

Prepared by:

TETRA TECH EC, INC.

1230 Columbia Street, Suite 750
San Diego, California 92101-8530

Gregory D. Joyce

Greg Joyce
QC Program Manager

TABLE OF CONTENTS

PAGE

ABBREVIATIONS AND ACRONYMS v

1.0 INTRODUCTION 1-1
1.1 SITE BACKGROUND 1-1
1.2 PURPOSE 1-2

2.0 PROJECT ORGANIZATION, RESPONSIBILITY, AND POINTS OF CONTACT 2-1
2.1 REMEDIAL PROJECT MANAGER 2-1
2.2 QUALITY ASSURANCE OFFICER 2-1
2.3 RESIDENT OFFICER IN CHARGE OF CONSTRUCTION 2-2
2.4 ENVIRONMENTAL PROTECTION MANAGER 2-2
2.5 PROJECT MANAGER 2-2
2.6 LABORATORY COORDINATOR 2-3
2.7 DATA MANAGER 2-4
2.8 PROJECT ENVIRONMENTAL SAFETY MANAGER 2-4
2.9 QUALITY CONTROL PROGRAM MANAGER 2-5
2.10 PROJECT SUPERINTENDENT 2-5
2.11 PROJECT QUALITY CONTROL MANAGER 2-6
2.12 SITE SAFETY AND HEALTH OFFICER 2-7
2.13 PROGRAM CHEMIST 2-8
2.14 LICENSE RADIATION SAFETY OFFICER (CORPORATE HEALTH AND PHYSICS MANAGER) 2-8
2.15 SUBCONTRACTORS AND VENDORS 2-10
2.16 POINTS OF CONTACT 2-11

3.0 DEFINABLE FEATURES OF WORK 3-1

4.0 SUBMITTALS 4-1
4.1 REVIEW OF SUBMITTALS 4-1
4.2 SUBMITTAL PROCESS 4-2
4.3 REVIEW AND PROCESSING OF SUBMITTALS THAT DO NOT REQUIRE DON APPROVAL 4-2
4.4 REVIEW AND PROCESSING OF SUBMITTALS THAT REQUIRE DON APPROVAL 4-2
4.5 REVISED SUBMITTALS 4-3

5.0 TESTING 5-1
5.1 DOCUMENTATION 5-1
5.2 LABORATORY SERVICES 5-1
5.3 TESTING PLAN LOG 5-1

TABLE OF CONTENTS
(Continued)

PAGE

6.0 QUALITY CONTROL MEETINGS 6-1
6.1 COORDINATION AND MUTUAL UNDERSTANDING MEETING 6-1
6.2 QC MEETINGS 6-1

7.0 INSPECTION 7-1
7.1 PREPARATORY PHASE INSPECTION 7-1
7.2 INITIAL PHASE INSPECTION 7-2
7.3 FOLLOW-UP PHASE INSPECTION 7-2
7.4 RECEIPT INSPECTION 7-3
7.5 ADDITIONAL INSPECTIONS 7-3
7.6 COMPLETION INSPECTION 7-3
7.6.1 Construction Quality Control Completion Inspections 7-3
7.6.2 Prefinal Inspection 7-3
7.6.3 Final Acceptance Inspection 7-4
7.7 INSPECTION DOCUMENTATION 7-4

8.0 DOCUMENTATION 8-1
8.1 DAILY CONTRACTOR QUALITY CONTROL REPORT 8-1
8.2 CONTRACTOR PRODUCTION REPORT 8-2
8.3 LOGBOOKS 8-3
8.4 PHOTOGRAPHS AND PHOTOGRAPH LOGS 8-3
8.5 CONFERENCE NOTES AND CONFIRMATION NOTES 8-3

9.0 CHANGE MANAGEMENT 9-1
9.1 DESIGN CHANGE NOTICES 9-1
9.1.1 Identification 9-1
9.1.2 Preparation 9-1
9.1.3 Review and Approval 9-1
9.1.4 Implementation of Approved DCNs 9-1
9.1.5 Records 9-1
9.2 FIELD CHANGE REQUEST 9-2
9.3 DISTRIBUTION OF DCN AND FCR FORMS 9-2

10.0 NONCONFORMANCE 10-1
10.1 ROOT CAUSE ANALYSIS 10-1
10.2 CORRECTIVE ACTION 10-2
10.3 CONDITION REQUIRING STOP WORK 10-2

11.0 QUALITY MANAGEMENT 11-1

12.0 REFERENCES 12-1

TABLE OF CONTENTS
(Continued)

TABLES

Table 3-1 Definable Features of Work

FIGURES

Figure 2-1 Project Organization Chart

APPENDICES

Appendix A Delegation of Authority Letters and Resumes

Appendix B Contractor Quality Control Forms

This page intentionally left blank.

ABBREVIATIONS AND ACRONYMS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
BRAC	Base Realignment and Closure
CDPH	California Department of Public Health
CQC	Contractor Quality Control
CSO	Caretaker Support Office
CTO	Contract Task Order
DCN	Design Change Notice
DFW	definable feature of work
DN	deficiency notice
DoD	Department of Defense
DON	Department of the Navy
EHS	Environmental Health and Safety
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FCR	Field Change Request
FSS	Final Status Survey
IR	Installation Restoration (Program)
LLRW	low-level radioactive waste
NAVSTA TI	Naval Station Treasure Island
NCR	Nonconformance Report
NELAP	National Environmental Laboratory Accreditation Program
NRC	Nuclear Regulatory Commission
NTCRA	non-time-critical removal action
PCQC	Project Contractor Quality Control
PESM	Project Environmental Safety Manager
PjM	Project Manager

ABBREVIATIONS AND ACRONYMS
(Continued)

PQCM	Project Quality Control Manager
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
QCPM	Quality Control Program Manager
Ra-226	radium-226
RASO	Radiological Affairs Support Office
RCA	radiologically controlled area
RML	Radiation Material License
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RPP	Radiological Protection Program
RSO	Radiation Site Officer
RSOR	Radiation Site Officer Representative
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SWDA	Solid Waste Disposal Area
TtEC	Tetra Tech EC, Inc.
UFGS	Unified Facilities Guide Specification

1.0 INTRODUCTION

This Project Contractor Quality Control (PCQC) Plan establishes the procedures and methods to be implemented for specific activities pertaining to removal of two hot spots identified in the California Department of Public Health (CDPH) Site 12 Gamma Survey Report (CDPH 2011) and the demolition of Buildings 1121 and 1323 within Installation Restoration (IR) Site 12, Naval Station Treasure Island (NAVSTA TI), San Francisco, California. Tetra Tech EC, Inc. (TtEC) has been contracted by the Department of the Navy (DON) to perform this work at NAVSTA TI for the Base Realignment and Closure (BRAC) Program Management Office West under Naval Facilities Engineering Command Southwest Contract No. N62473-10-D-0809, Contract Task Order (CTO) 0013. This PCQC Plan fulfills the TtEC quality control (QC) system requirements.

1.1 SITE BACKGROUND

NAVSTA TI is located in San Francisco Bay, midway between San Francisco and Oakland, California. The former naval station consists of two contiguous islands: Treasure Island, which is approximately 403 acres, and Yerba Buena Island, which is approximately 147 acres. Treasure Island is a manmade island constructed of materials dredged from the bay. Military activities at the former NAVSTA TI date back to 1866, before the construction of Treasure Island, when the U.S. government took possession of Yerba Buena Island for defensive fortifications. In 1993, NAVSTA TI was designated for closure under the Base Closure and Realignment Act of 1990. The naval station was closed on September 30, 1997, and is currently in the transfer process.

IR Site 12 is located on the northwest portion of NAVSTA TI on a relatively flat 93-acre area. The site consists of multiplex housing units with private backyards and common area front yards, side yards, and surrounding greenbelts. The area was originally used as a parking lot during the 1939–1940 Golden Gate International Exposition. After Navy occupation of the island in 1940, the area was developed for bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields, and disposal or burning of solid waste. Beginning in the1960s, areas of IR Site 12 were incrementally developed into housing for Navy personnel and their dependents. Former residential Buildings 1121 and 1323 are located within IR Site 12 near Westside Drive.

A non-critical removal action (NTCRA) was implemented in May 2006 to remediate chemicals in soil associated with chemical/fuel storage and disposal or burning of solid waste in four Solid Waste Disposal Areas (SWDAs) (SWDA A & B, SWDA 1231/1233, SWDA 1207/1209, and SWDA Bigelow Court) located within IR Site 12. A Historical Radiological Assessment (HRA) (Weston 2006) identified the radiological contamination potential for the SWDAs as “unlikely”

and recommended radiation monitoring during excavation of identified SWDAs. During the initial stages of this NTCRA, a radiation survey and sample analysis identified radium-226 (Ra-226)-impacted debris and soil in some of the SWDAs. Subsequently, an Action Memorandum (DON 2007) summarizing the site characteristics identified the chemicals of potential concern (COPCs) and the horizontal extent of the SWDAs. Generally, the radiological contamination in IR Site 12 SWDAs is colocated with chemical contaminants. The NTCRAs at IR Site 12 determined that some of the SWDAs were contaminated with radiological items or soil containing Ra-226. Elevated gamma readings were also detected along the northern and southern fence lines (two areas) of SWDA A & B by the CDPH Radiologic Health Branch during a gamma survey conducted in April 2011. The current scope of work is to investigate and remediate these two areas with elevated gamma readings.

The Westside Drive SWDA, also known as SWDA A & B, is an approximately 4.5-acre area on the west side of IR Site 12 abutting Perimeter Road. Two radiological hot spots were identified near the Westside Drive SWDA along the northern and southern fence lines during the 2011 CDPH survey of this area. The source of radioactivity is believed to be near-surface radiological commodities containing Ra-226 (deck markers, foils containing radium powder, instrument gauges) but may include limited pockets of soil contamination. Based on CDPH's report, there is one area of elevated activity north of the currently established Radiologically Controlled Area (RCA) (Northern Hot Spot) and four locations of elevated activity south of the RCA (Southern Hot Spot). This NTCRA focuses only on radiological contamination in the two radiological hot spots. The ongoing NTCRA activities in the center of SWDA A & B are currently being performed by another contractor under a separate contract.

1.2 PURPOSE

The purpose of this PCQC Plan is to establish specific procedures and methods for field inspections, and provide an effective QC system to ensure the quality of all work performed by TtEC and its subcontractor personnel during the removal and demolition activities. This plan is applicable to all definable features of work (DFWs) listed in Section 3.0 and will be available on-site at NAVSTA TI. All work activities will be conducted in accordance with this PCQC Plan and the NTCRA Work Plan to which it is attached.

2.0 PROJECT ORGANIZATION, RESPONSIBILITY, AND POINTS OF CONTACT

This section describes the organization and authority of project personnel. The organizational structure, functional responsibilities, levels of authority, and lines of communication within the organization have been established to ensure high-quality work. The project organization chart showing the reporting lines for key personnel is provided on Figure 2-1. The responsibilities of key personnel are described in the following subsections. A listing of the points of contact for the project is provided in Section 2.16. Delegation of Authority letters and resumes for QC personnel are provided in Appendix A.

2.1 REMEDIAL PROJECT MANAGER

The Remedial Project Manager (RPM) has primary responsibility with the DON for day-to-day management of the project activities performed under this NTCRA Work Plan and for its successful completion. The RPM is responsible for the following:

- Perform project management for the DON.
- Ensure the project scope of work requirements are fulfilled.
- Oversee the project cost and schedule.
- Provide formal technical direction to the TtEC project team, as needed.
- Coordinate with other RPMs for other projects being performed to ensure that proper controls are in place.
- Act as lead in interacting with regulatory agencies.

2.2 QUALITY ASSURANCE OFFICER

The Quality Assurance Officer (QAO) is the DON representative with primary responsibility for ensuring that the contract-required quality assurance (QA) measures are in place and effective for the work performed. The QAO is responsible for the following:

- Review and approval of Sampling and Analysis Plans.
- Provide DON oversight of the TtEC QA Program.
- Provide quality-related directives through the Contracting Officer.
- Act as the point of contact for matters pertaining to generating data and maintaining the quality of data.
- Authorize the suspension of project execution if QA requirements are not adequately met.

2.3 RESIDENT OFFICER IN CHARGE OF CONSTRUCTION

The Resident Officer in Charge of Construction (ROICC) is the DON representative with the primary responsibility for providing on-site QA and safety oversight of contractors. The ROICC is responsible for the following:

- Verify that all work has been completed per contract and technical specifications prior to final government acceptance.
- Perform field verification for QA of Contractor's implementation of the QC Program.
- Notify the contractor of any work not in compliance.
- Notify the contractor of any work being performed in an unsafe manner.
- Interact with the contractor's Project Quality Control Manager (PQCM) on quality-related issues.
- Review and sign waste manifests as the generator's representative.
- Review daily Contract Quality Control (CQC) Reports for completeness and accuracy.
- Attend preparatory phase, initial phase, prefinal, and final acceptance inspections.
- Attend weekly QC meetings.

2.4 ENVIRONMENTAL PROTECTION MANAGER

The Environmental Protection Manager is the technical lead for the Radiological Affairs Support Office (RASO) and is responsible for the technical oversight and review of the project documents and all issues related to radiological activities. The RASO acts as the lead interface with regulatory agencies on radiological issues, survey plans and reports, and radiological release criteria.

2.5 PROJECT MANAGER

The Project Manager (PjM) is the TtEC representative responsible for the direction, execution, and successful completion of project tasks 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. The PjM is responsible for the following:

- Coordinate work activities of subcontractors and TtEC personnel and ensure that all personnel adhere to the administrative and technical requirements of the project.
- Monitor the status and progress of work and ensure that project deliverables are completed on time and within the project budget.
- Monitor the budget and schedule, and notify the client and the Program Manager of any changes that may require administrative actions.

- Ensure adherence to the quality requirements of the contract, project scope of work, and the QC plans.
- Ensure that all work meets the requirements of the project plans, procedures, and technical specifications and complies with applicable codes and regulations.
- Ensure that all work activities are conducted in a safe manner in accordance with the Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) – Safety and Health Requirements (Engineer Manual [EM] 385-1-1) (USACE 2008), and all applicable Occupational Safety and Health Administration regulations.
- Ensure that change conditions are properly identified and documented with the appropriate approvals.
- Serve as the primary contact with the DON and TtEC for actions and information related to the work and make sure to include appropriate TtEC lead and experts in decision-making.
- Coordinate satisfactory resolution and completion of evaluation and acceptance for Nonconformance Reports (NCRs).
- Attend required meetings, including the preconstruction conference, weekly QC meetings, pre- and postconstruction site inspections, and other scheduled and unscheduled meetings.

2.6 LABORATORY COORDINATOR

The Laboratory Coordinator will be the point of contact for laboratory matters. The Laboratory Coordinator will:

- Coordinate the submittal of samples to the radiological and chemical laboratories.
- Ensure that the Final Status Survey (FSS) gamma spectroscopy samples are transferred to Curtis and Tompkins, Ltd., a laboratory accredited by the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) and California Department of Public Health (CDPH) National Environmental Laboratory Accreditation Program (NELAP).
- Ensure that the alpha spectroscopy samples (if required) are transferred to TestAmerica-St. Louis, a DoD ELAP and CDPH NELAP accredited laboratory.
- Coordinate with the nonradiological waste disposal contractor to determine the chemical analyses required for waste characterization of the radiologically cleared soil and debris.
- Coordinate with the NAVSTA TI Publicly Owned Treatment Works to determine the chemical analyses required for waste characterization of any decontamination water generated.
- Ensure that soil, debris, and decontamination water samples are collected for chemical analysis from the radiologically cleared soil and building debris, and that these samples are submitted to the Curtis and Tompkins, Ltd. or TestAmerica-St. Louis for the appropriate chemical analyses.

- Coordinate with the low-level radioactive waste (LLRW) waste disposal contractor by providing the radiological results from the excavated soil radiological clearing process and excavation sampling and analysis so the contractor can determine any additional analyses required for waste characterization purposes, which would be performed for the LLRW waste disposal contractor.
- Ensure the proper archiving and storage of the soil samples.

2.7 DATA MANAGER

The Data Manager will be responsible for managing the "cradle-to-grave" data management system to ensure that it seamlessly integrates all phases of the radiological and construction work process from the initial survey, excavation (hot spot removal), and remediation activities through backfilling of excavations and site restoration, as well as radiological survey activities to support demolition of Buildings 1121 and 1323. The Data Manager will:

- Ensure the Soil Screening Operations Module tracks excavated soil from the time it enters the radiological soil screening pad through radiological survey and, if necessary, remediation and disposal activities until final disposition and transfer to the appropriate LLRW or non-LLRW waste contractors.
- Ensure the Chain-of-Custody Module tracks samples from generation through delivery to the laboratories.
- Ensure the Waste Management Module tracks quantities of LLRW and non-LLRW contaminated soil and building demolition debris for disposal by the waste contractors.
- Ensure the analytical results module tracks the status of each sample submitted and supports the generation of laboratory analytical reports for laboratory analytical results.

2.8 PROJECT ENVIRONMENTAL SAFETY MANAGER

The Project Environmental Safety Manager (PESM) is the TtEC representative responsible for implementing and overseeing the Contract Health and Safety Program and for developing, implementing, and approving all APP/SSHP documents. Any changes to the established Contract Health and Safety Program or APP/SSHP must be at the direction and approval of the PESM, with concurrence of the DON Administrative Contracting Officer. The PESM or designee will not necessarily be on-site during all removal activities but will be readily available for consultation when required.

The PESM or designee is a Certified Industrial Hygienist who is certified by the American Board of Industrial Hygiene. The PESM supervises and directs the activities of the Site Safety and Health Officer (SSHO). The PESM has the authority to stop unsafe operations, remove unqualified personnel from the work area, and approve changes to the APP/SSHP. The PESM is responsible for the following:

- Oversee all aspects of the APP/SSHP from development to implementation.

- Advise the SSHO on all related health and safety matters.
- Review site-specific plans for completeness and compliance.
- Review other site documents as they affect health and safety (e.g., Activity Hazard Analyses [AHAs] and sampling plans).
- Review and evaluate all monitoring results.
- Establish and monitor all related health and safety procedures through site safety inspections and audits.
- Ensure that TtEC employees receive required Environmental Health and Safety (EHS) regulatory training.
- Fulfill specific responsibilities for project EHS personnel that are identified within each EHS procedure.
- Function as a technical resource for all environmental compliance, safety, loss control, and industrial hygiene issues.

2.9 QUALITY CONTROL PROGRAM MANAGER

The Quality Control Program Manager (QCPM) is the TtEC representative responsible for the oversight of program QC, including field activities and data acquisition. The QCPM is responsible for the following:

- Coordinate and resolve quality concerns.
- Provide quality-related direction and ensure the training of the PQCM and others performing quality-related functions.
- Suspend project activities if quality standards are not maintained.
- Interact with the DON, including the QAO, on quality-related issues.
- Review audit and surveillance reports.
- Implement the DON technical directives related to quality.

2.10 PROJECT SUPERINTENDENT

The Project Superintendent is a TtEC representative who reports to the PjM and is responsible for coordinating, directing, implementing, and supervising site construction activities. The Project Superintendent or designated representative will be on-site at all times during field activities. The Project Superintendent is responsible for the following:

- Implement field activities in accordance with the NTCRA Work Plan.
- Direct support personnel and subcontractors.
- Administer site access and communication.

- Maintain the work site, facilities, vehicles, and equipment.
- Coordinate work activities and ensure all personnel adhere to the administrative and technical requirements of the project.
- Prepare status reports and estimate future scheduling needs.
- Prepare daily Contractor Production Reports.
- Monitor the status and progress of field activities and ensure that project deliverables are completed on time and within the project budget.
- Ensure work activities in the field are conducted in a safe manner in accordance with the APP/SSHP.
- Investigate with the SSHO all incidents, accidents, injuries, illnesses, and near misses.

2.11 PROJECT QUALITY CONTROL MANAGER

The PQCM is the TtEC representative responsible for overall management of project QC and reports to the QCPM. 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 or designated representative will be on-site at all times during field activities. The PQCM is responsible for the following:

- Provide and maintain an effective QC system for all site activities.
- Perform ongoing field inspection to verify that all work is in compliance with both contract and technical specifications.
- Monitor QC activities to ensure conformance with authorized policies, procedures, contract specifications, required standards, and methods of quality construction.
- Prepare the daily CQC Reports.
- Coordinate and perform the three phases of inspection (preparatory, initial, and follow-up) for all DFWs.
- Responsible for issuance, maintenance, and enforcement of NCRs and other quality actions.
- Ensure that on-site and off-site inspections, testing, and sampling are performed in accordance with the plans, procedures, specifications, and applicable codes.
- Ensure that all required tests and inspections are performed and documented.
- Conduct required QC meetings, including the coordination and mutual understanding meeting, site survey visits, and other scheduled meetings.
- Coordinate and maintain the submittal register, photograph log sheet, request for information, and NCR log and other required logs or registers.
- Review and maintain records of approved submittals, Design Change Notices (DCNs), and Field Change Requests (FCRs) for construction activities.

- 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.
- Review project plans and procedures for quality issues.
- Confirm the removal or rework of material, equipment, or work activity that is not in compliance with plans and specifications.
- Maintain the Submittal Register Log.
- Perform daily QC safety inspections and logging in the QC logs (EM 385-1-1 01.A.12.b) (USACE 2008).

The PQCM will not be designated as the safety competent person.

2.12 SITE SAFETY AND HEALTH OFFICER

The SSHO is the TtEC representative who reports directly to the PESM and ensures all elements of the APP/SSHP are implemented and enforced on-site. The SSHO has full authority to issue stop work orders or evacuation orders when work operations or noncompliance(s) may threaten the health and safety of site workers or the public. The SSHO is responsible for the following:

- Ensure that all personnel understand the requirements of the TtEC EHS program and procedures through training and communication.
- Investigate with the Project Superintendent all incidents, accidents, injuries, illnesses, and near misses.
- Ensure project personnel are trained in the hazards of substances used on the project, maintain Material Safety Data Sheets and make them accessible to project personnel, and perform inspections and oversight to ensure the Waste Management Plan is being followed.
- Ensure tailgate safety meetings are conducted daily prior to start of work and are documented.
- Ensure project safety equipment is inspected and in good working order as required by the EHS program.
- Coordinate site health and safety requirements with the Project Superintendent and PjM.
- Ensure that all health and safety monitoring equipment and personal protective equipment are maintained and direct site-monitoring activities.
- Coordinate daily field activities with the Project Superintendent.
- Coordinate site safety and emergency response duties and verify site communications system with site personnel.
- Report incidents to the ROICC as required by EM 385-1-1 (USACE 2008).

- Report immediately to the PjM, RPM, and ROICC any fatal injury, persons admitted to a hospital, or damage to government property.
- Ensure all personnel have the required training and medical clearance prior to entering the exclusion zone at the site; inform the Project Superintendent of any site personnel with medical restrictions.
- Determine and post routes to medical facilities and telephone numbers for emergency transportation to medical facilities.
- Serve as the Project Hazard Communication Coordinator.
- Maintain training records and medical certifications for all on-site personnel, including subcontractors.
- Initiate revisions or changes to the APP/SSHP to support changing site conditions.
- Maintain site control procedures.
- Maintain current records of certification for first aid and cardiopulmonary resuscitation training for field personnel.
- Attend meetings, including the preconstruction conference, weekly QC meetings, pre- and post-construction site inspections, and other project meetings.

2.13 PROGRAM CHEMIST

The Program Chemist is the TtEC representative who oversees sample collection, handling, analysis, and analytical data reporting. The Program Chemist is responsible for the following:

- Develop the Sampling and Analysis Plan.
- Evaluate and select qualified subcontract laboratories.
- Implement data QC procedures and perform audits of field performance.
- Review chemical laboratory data prior to use.
- Ensure that a proper review of the radiological laboratory data is performed.
- Coordinate data validation of the Final Status Survey laboratory data.
- Review data validation reports.
- Prepare analytical reports and supporting project reports.

2.14 LICENSE RADIATION SAFETY OFFICER (CORPORATE HEALTH AND PHYSICS MANAGER)

The Corporate Health and Physics Manager, also referred to as the Radiation Safety Officer (RSO), is responsible for the following:

- Review and make recommended revisions to:

- The Radiation Protection Plan (RPP), Radioactive Material License (RML) procedures, radiation protection guidelines, and supporting documents
- Project plans involving the use or handling of radioactive materials, or access to areas of radiological concern to ensure compliance with RPP requirements and supporting guidelines

- Act as the Health Physics Resource Manager, also referred to as the corporate level or license RSO.
- Designate a Project Health Physicist, also referred to as the project-level RSO Representative (RSOR), to provide day-to-day guidance on radiological protection issues.
- Maintain compliance, as the license RSO, with the State of California Agreement State RML No. 7909-01, including the following responsibilities:
  - Serve as primary point of contact for all communications to the Nuclear Regulatory Commission (NRC) and CDPH.
  - Identify and train RML authorized users.
  - Assign project RSORs.
  - Coordinate investigations involving radiological occurrences to include review and approval of a resulting Corrective Action Plan.
  - Notify CDPH in advance in writing at least 14 days before initiating at a temporary job site under TtEC RML jurisdiction any activity, or change to scope involving new activities, in areas of radiological concern (excluding routine packaging or repackaging for purposes of transporting and not requiring a job- or site-specific work package, and characterization and/or final surveys where radioactive materials and/or radiation are not likely to be detected).
  - Refrain from taking ownership of licensed materials in excess of possession limits without prior notification and written CDPH approval.
  - Notify CDPH in advance in writing within 30 days of the temporary job site completion status involving decontamination and decommissioning activities, and disposition of any licensed material as related to RML jurisdiction.
  - Place reciprocity requests with applicable Agreement States, when necessary.
  - Maintain radiological exposure records.
  - Develop and/or obtain approval of radiation safety training materials and/or courses.
  - Perform program audits as detailed in corporate procedure NLP-08, Radiation Protection Program Audits.
  - Provide guidance on radiological protection issues.
  - Identify appropriate project staffing needs to implement RPP requirements.

- Assist with the development of site EHS plans and obtain approval of EHS plans for projects that involve the use or handling of radioactive materials or access to areas of radiological concern.
- Provide Resource Specialist review for Task Initiation Procedures for proposed projects involving exposure to radiation or radioactive materials.

- Delegate project responsibilities to other company health physicists (also referred to as RSORs) as necessary.

2.15 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 conform to TtEC's quality requirements including all approved procedures, technical specifications, and contract provisions.

The subcontractor is 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 whether the subcontractor's work is proceeding in accordance with TtEC's quality requirements.

Subcontractor personnel are responsible for maintaining a daily log of the project activities they perform and for providing information needed to complete the daily CQC Report. All inspection records, including inspection reports, deficiency reports, and reinspections of corrective actions, will be documented.

The following subcontractors and their services are anticipated to be used in support for the NTCRA:

- Radiological Survey & Remedial Services, LLC – Health physics support, data evaluation, and radiological instruments
- IO Environmental & Infrastructure – Data management
- Sterling Environmental – Lead and asbestos abatement
- Curtis & Tompkins, Ltd.– Radiological and chemical laboratory services
- TestAmerica-St. Louis (through IO Environmental & Infrastructure) – Radiological and chemical laboratory services
- S&S Trucking – Non-LLRW transport and disposal
- Precision Locating, LLC – Geophysical survey
- ESP Surveying, Inc. – Licensed land surveyor

- Tracer Environmental (through IO Environmental & Infrastructure) – Air monitoring analysis
- JRM – Heavy Equipment
- Geotechnical Analysis – Out to bid

2.16 POINTS OF CONTACT

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

Entity	Project Title	Contact Information
BRAC PMO West 1455 Frazee Road, Ste. 900 San Diego, CA 92108-4310	Lead RPM	Mr. Dave Clark (619) 532-0973 dave.j.clark2@navy.mil
BRAC PMO West 1455 Frazee Road, Ste. 900 San Diego, CA 92108-4310	RPM	Mr. Tony Konzen (619) 532-0924 anthony.konzen.ctr@navy.mil
NAVFAC SW 1455 Frazee Road, Ste. 900 San Diego, CA 92108-4310	Contract Specialist	Ms. Karen Barba (619) 532-0786 karen.barba@navy.mil
NAVFAC SW P.O. Box 68, Building 107 Moffett Field, CA 94035	ROICC	Mr. Gary Munekawa, PE (650) 603-9834 gary.munekawa@navy.mil
NAVFAC SW P.O. Box 68, Building 107 Moffett Field, CA 94035	ROICC	Mr. David Smtih (650) 603-9836 david.r.smith2@navy.mil
NAVSEA Detachment RASO Building 1971 NWS P.O. Box Drawer 260 Yorktown, VA 23691-0260	Environmental Protection Manager	Zachary Edwards (757) 887-7762 zachary.edwards@navy.mil
NAVFAC SW 1220 Pacific Coast Highway San Diego, CA 92132-5190	QAO	Mr. Joseph Michalowski (619) 532-4125 joseph.michalowski@navy.mil
Cal/EPA DTSC Office of Military Facilities 700 Heinz Ave., Building F, Ste. 200 Berkeley, CA 94710	Cal/EPA DTSC RPM	Remedios (Medi) Sunga (510) 540-3840 rsunga@dtsc.ca.gov
EPA, Region IX 75 Hawthorne Street San Francisco, CA 94105	EPA RPM	David Stensby (415) 972-3246 stensby.david@epa.gov

Entity	Project Title	Contact Information
California Water Board 1515 Clay Street, Ste. 1400 Oakland, CA 94612	Water Board RPM	Myriam Zech (510) 622-5684 mzech@waterboards.ca.gov
TtEC Hunters Point Naval Shipyard 200 Fisher Avenue San Francisco, CA 94124	Project Manager	Bill Dougherty (415) 216-2731 bill.dougherty@tetratech.com
TtEC Hunters Point Naval Shipyard 200 Fisher Avenue San Francisco, CA 94124	Laboratory Coordinator	Rick Weingarz (415) 216-2733 rick.weingarz@tetratech.com
TtEC Twin Oaks, Suite 309 5700 Lake Wright Dr. Norfolk, VA 23502	Certified Health Physicist/RSO	Erik Abkemeier (757) 944-0921 erik.abkemeier@tetratech.com
TtEC Hunters Point Naval Shipyard 200 Fisher Avenue San Francisco, CA 94124	RSOR	Mr. Adam Berry (713) 410-7928 adam.berry@tetratech.com
TtEC 1230 Columbia St., Ste. 750 San Diego, CA 92101-8536	QCPM	Mr. Greg Joyce (360) 780-0371 greg.joyce@tetratech.com
TtEC Hunters Point Naval Shipyard 200 Fisher Avenue San Francisco, CA 94124	PQCM	Mr. Rich Kanaya (415) 216-2759 rich.kanaya@tetratech.com
TtEC Hunters Point Naval Shipyard 200 Fisher Avenue San Francisco, CA 94124	Alternate PQCM	Mr. Adam Berry (713) 410-7928 adam.berry@tetratech.com
TtEC 1230 Columbia St., Ste. 750 San Diego, CA 92101-8536	PESM	Mr. Roger Margotto, CIH, CSP (619) 471-3503 roger.margotto@tetratech.com.
TtEC Hunters Point Naval Shipyard 200 Fisher Avenue San Francisco, CA 94124	SSHO	Mr. Daniel Keenan, ASP (415) 671-1990 daniel.keenan@tetratech.com
TtEC 17885 Von Karman Ave., Ste. 500 Irvine, CA 92614-5227	Program Chemist	Ms. Lisa Bienkowski (949) 923-7842 lisa.bienkowski@tetratech.com
TtEC 17885 Von Karman Ave., Ste. 500 Irvine, CA 92614-5227	Project Chemist	Ms. Sabina Sudoko (949) 809-5022 sabina.sudoko@tetratech.com

Entity	Project Title	Contact Information
TtEC 143 Union Blvd., Ste. 1010 Lakewood, CO 80228	Data Manager	Mr. Terry Sindelar (303) 980-3514 terry.sindelar@tetratech.com
TtEC 17885 Von Karmen Avenue, Suite 500 Irvine, CA 92614-6213	Regulatory Compliance Specialist	Ms. Jennifer Dessort (949) 809-5063 jennifer.dessort@tetratech.com

Abbreviations and Acronyms:

ASP – Associate Safety Professional
BRAC – Base Realignment and Closure
Cal/EPA – California Environmental Protection Agency
CDPH – California Department of Public Health
CIH – Certified Industrial Hygienist
CSO – Caretaker Support Office
CSP – Certified Safety Professional
DTSC – Department of Toxic Substances Control
EPA – U.S. Environmental Protection Agency
NAVFAC SW – Naval Facilities Engineering Command Southwest
NAVSEA – Naval Sea Systems Command
PE – Professional Engineer
PESM – Project Environmental Safety Manager
PMO – Program Management Office
PQCM – Project Quality Control Manager
QAO – Quality Assurance Officer
QCPM – Quality Control Program Manager
RASO – Radiological Affairs Support Office
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
RSO – Radiation Safety Officer
RSOR – Radiation Safety Officer Representative
SSHO – Site Safety and Health Officer
TtEC – Tetra Tech EC, Inc.
Water Board – Regional Water Quality Control Board

This page intentionally left blank.

3.0 DEFINABLE FEATURES OF WORK

A DFW is an activity or task separate and distinct from other activities that 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. Preparatory and initial inspections will be performed on all DFWs, with the exception of mobilization and site cleanup and final inspection (demobilization). Activities that will be covered by the PQCM during the inspections are listed in Table 3-1. The following DFWs have been identified for the project:

- Preconstruction environmental survey (Environmental Conditions Report)
- Site survey (prior to start of fieldwork) by licensed California land surveyor
- Clearing of vegetation and/or pavement
- Geophysical survey
- Asbestos abatement
- Radiological surveys
- Identification and removal of radioactive material
- Excavation and removal of soil
- FSS (including systematic and biased sampling)
- Backfill placement and compaction
- Building demolition
- Non-LLRW soil, building debris, and decontamination water waste characterization sampling
- Non-LLRW transport and disposal
- Site restoration
- Site survey (upon completion of fieldwork) by licensed California land surveyor

This page intentionally left blank.

4.0 SUBMITTALS

This section describes the review and approval process for submittals. TtEC will institute and maintain a submittal register (Appendix B) 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 Preconstruction Submittals
- SD-02 Shop Drawings
- SD-03 Product Data
- SD-04 Samples
- SD-05 Design Data
- SD-06 Test Reports
- SD-07 Certificates
- SD-08 Manufacturer's Instructions
- SD-09 Manufacturer's Field Reports
- SD-10 Operation and Maintenance Data
- SD-11 Closeout Submittals

Descriptions of the submittals listed above are provided in UFGS Section 014502 (NAVFAC 2009). Not all submittals listed above are necessarily 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 prior to acceptance. Approved submittals will be stamped, signed or initialed, and dated. During the preparatory phase of the QC inspections, the PQCM or designated representative 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 provided to project personnel as determined by the distribution schedule. Each submittal will be assigned a unique document control number.

A transmittal form will accompany each submittal. Each transmittal will be identified with:

- 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 register regularly.

4.3 REVIEW AND PROCESSING OF SUBMITTALS THAT DO NOT REQUIRE DON APPROVAL

Material submitted for review by the PQCM will indicate whether or not it conforms to established requirements. The PQCM will inform the submitter of the results of the review. The submittal log will be updated to indicate the status and will be submitted with the last CQC report of each month.

Conforming submittals will be transmitted to project and DON personnel as determined by the distribution schedule. A transmittal form will accompany all items sent to the DON and will list each item transmitted, the date it was reviewed by the PQCM, and its review status.

Nonconforming submittals will be returned to the submitter for correction, resolution of comments, and resubmitted.

4.4 REVIEW AND PROCESSING OF SUBMITTALS THAT REQUIRE DON APPROVAL

Submittals reviewed by the PQCM will be transmitted to the DON in accordance with the project distribution schedule for further 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 resubmitted, if required.

4.5 REVISED SUBMITTALS

Revised submittals will be logged, reviewed, and processed in a manner identical to the initial submittal. Revisions to a submittal will be identified using an alphabetic suffix to the original submittal number, e.g., submittal 18 will be revised to 18(a).

This page intentionally left blank.

5.0 TESTING

The PQCM or designated representative will verify the performance of all tests specified or required by the project-specific plans 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 NTCRA Work Plan, the Radiological Management Plan, and the Sampling and Analysis Plan (attachments to the NTCRA Work Plan). The type, number, and frequency of required tests are specified in the Test Plan and Log (Appendix B). 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 CQC 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 test reports will be available for review by the ROICC and transmitted with the Removal Action Completion Report.

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. TtEC intends to use Curtis & Tompkins, Ltd. and TestAmerica-St. Louis. Both laboratories are DoD and CDPH-accredited for radiological and chemical analyses. Copies of the accreditations are located in the on-site project files. QC for radiological and chemical analyses is addressed in the Sampling and Analysis Plan (Attachment 1 to the NTCRA Work Plan).

5.3 TESTING PLAN LOG

The Test Plan and Log (Appendix B) lists geophysical testing required by the project specifications and drawings. The Test Plan and Log will be submitted with the last CQC report of each month. Testing will be conducted to verify that control measures are adequate to provide a product conforming to contract specifications. General requirements for sampling and analysis procedures to be implemented for this project are included in the Sampling and Analysis Plan (Attachment 1 to the NTCRA Work Plan).

This page intentionally left blank.

6.0 QUALITY CONTROL MEETINGS

6.1 COORDINATION AND MUTUAL UNDERSTANDING MEETING

Prior to the start of site work, a coordination and mutual understanding meeting will be held to discuss the QC Program requirements. DON personnel attending the meeting will include the RPM, ROICC, 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 will include the PjM, Field Engineer, Project Superintendent, PQCM, and SSHO. 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. The meeting may be held in conjunction with the preconstruction 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 NAVSTA TI Caretaker Support Office (CSO) and will be attended by the ROICC, CSO, BRAC RPM (by conference call if necessary), Project Superintendent, SSHO, PQCM, Program QC Manager (by conference call), and Project Manager (by conference call if necessary). The PQCM will notify the ROICC at least 48 hours in advance of each meeting. The following will be covered 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, documentation required, and schedule for the three phases of control and testing:
  - Completion date to be established 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

- Identify deficient conditions.
- Resolve QC and production problems.
- Address items that may require revisions to the PCQC Plan.
- Address health and safety issues.
- Discuss other miscellaneous items.

7.0 INSPECTION

This section discusses the inspection process for the DFWs that will ensure compliance with the contract. The DFWs for this project are identified in Section 3.0 and listed in Table 3-1.

The PCQC Plan includes implementing the following three control phases for all aspects of the work specified:

- Preparatory phase
- Initial phase
- Follow-up phase

7.1 PREPARATORY PHASE INSPECTION

The PQCM will conduct preparatory phase inspections prior to starting the DFWs listed in Table 3-1 with the exception of mobilization and demobilization. These inspections shall include the following:

- Review the project-specific plans (e.g., Task-specific Plans, NTCRA Work Plan, Waste Management Plan).
- Ensure that all required procurement forms for supplies and services are approved.
- Ensure that provisions have been made to provide the required QC inspection.
- Ensure that all personnel have the required training and certifications needed to perform the work.
- Examine the work area to ensure that all required preliminary work has been completed and is in compliance with the approved project plans.
- Examine the required materials and equipment to ensure that they are properly delivered to the site, conform to specifications, and are properly stored.
- Review the appropriate AHAs to ensure that safety requirements are met.
- Discuss procedures for performing the work, including potential repetitive deficiencies.
- Document workmanship standards for the particular phase of work.
- Ensure that the PCQC Plan for the work to be performed has been accepted by the DON.

The PQCM will conduct frequent internal inspections of mobilization and demobilization. The PQCM is not required to notify the DON or the PjM prior to these inspections.

The PjM, DON RPM, CSO, and ROICC will be notified at least 2 working days in advance of each preparatory phase activity. This phase will include a meeting conducted by the PQCM and attended by the Project Superintendent and any personnel involved in performing the DFW.

When a subcontractor will accomplish a DFW, that subcontractor foreman shall attend the preparatory phase meeting.

The issues discussed during the preparatory phase meetings will be documented on the Preparatory Inspection Checklist (Appendix B). The PQCM will explain the acceptable level of workmanship required to personnel performing work activities.

7.2 INITIAL PHASE INSPECTION

An initial inspection will be performed at the beginning of a DFW and will include the following:

- Check preliminary work to ensure that it is in compliance with contract requirements.
- Review the Inspection Checklist documenting results of the preparatory meeting.
- Verify full contract compliance, including required control inspections.
- Establish the required level of workmanship, testing, and inspection to ensure that work meets minimum acceptable standards.
- Resolve all differences.
- Check safety requirements to include compliance with and upgrading of the APP/SSHP and AHAs.

The PjM, DON RPM, CSO, and ROICC will 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 Phase Inspection Checklist (Appendix B) and attach it to the daily CQC Report. The location of the initial phase inspection and documentation will be identified for future reference and comparison with follow-up inspections.

The initial phase inspection will be reviewed each time a new crew arrives on-site or when DFWs change.

7.3 FOLLOW-UP PHASE INSPECTION

During the completion of a particular DFW, follow-up inspections will be conducted to ensure compliance with contract requirements. The frequency of the follow-up inspections will depend on the extent of the work being performed. Each follow-up inspection will be documented on the daily CQC Report. A Follow-up Inspection Checklist will be generated for any deficient conditions identified during the initial inspection and attached to the daily CQC Report when all items are resolved. A final follow-up check will be conducted on any completed work phase prior to the commencement of a subsequent phase.

7.4 RECEIPT INSPECTION

The PQCM will conduct inspections of materials prior to their use and installation. These inspections will be documented on a receipt inspection form and maintained on-site. Any material(s) that does not meet design specifications will be rejected and returned to the vendor. Nonconforming material will be segregated and marked accordingly, to prevent inadvertent use. The PQCM will record on the daily CQC Report that a material inspection was performed.

7.5 ADDITIONAL INSPECTIONS

The PQCM may conduct additional inspections on the same DFWs under the following circumstances:

- If the quality of ongoing work is unacceptable as determined by the PQCM, PjM, Project Superintendent, DON RPM, CSO, or ROICC
- If the quality of the work is suspected of being below the established criteria of acceptance
- If work on a DFW is resumed after a substantial period of inactivity
- If other problems develop

7.6 COMPLETION INSPECTION

Completion inspections will be performed as summarized in this section.

7.6.1 Construction Quality Control Completion Inspections

The PQCM will conduct a detailed inspection prior to the prefinal 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 and specifications, workmanship, and completeness. The PQCM will prepare an itemized list of work that does not conform to plans and specifications, inferior workmanship, or incomplete work. 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.

7.6.2 Prefinal Inspection

The PjM or designated representative will conduct the prefinal inspection. The DON RPM, CSO, ROICC, PQCM, Project Superintendent, and other primary management representative(s), as applicable, will attend. The PjM will schedule the prefinal inspection when notified by the PQCM that the work is ready for inspection. 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 date scheduled for the prefinal inspection. If incomplete

or unacceptable work is found during the prefinal inspection, a punch list will be generated by TtEC in consultation with the ROICC and CSO. A copy of the punch list will be forwarded to the ROICC and CSO, the on-site Navy representatives for the Contracting Officer, and the RPM. The original punch list will be maintained by the PQCM.

7.6.3 Final Acceptance Inspection

The PjM will schedule the final acceptance inspection based on notification from the PQCM of readiness. The DON RPM, Project Superintendent, CSO, 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.

7.7 INSPECTION DOCUMENTATION

The PQCM is responsible for maintaining the inspection records. Inspection records will be legible and clearly provide all information necessary to verify that the items or activities inspected conform to the specified requirements. In the case of nonconforming conditions, the PQCM will 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.

8.0 DOCUMENTATION

Preparation, review, approval, and issuance of documents affecting quality will be controlled to the extent necessary to ensure compliance to specified requirements. Project documents that will be controlled, if issued, 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
- Deficiency Notices (DNs)
- DCNs
- NCR log
- FCRs
- FCR/DCN log
- Rework Items List
- Photograph log
- Field logbooks

8.1 DAILY CONTRACTOR QUALITY CONTROL REPORT

The PQCM is responsible for maintenance of current records of QC operation, activities, inspections, 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 CQC Report will be completed to document site activities covered by the PCQC 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 and/or 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 and/or 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, reviewer, and action taken
- Off-site surveillance activities, including actions taken

The records will describe both conforming and nonconforming features and include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The daily CQC Report attached to the Contractor Production Report will be furnished to the ROICC by 10:00 a.m. on the first work day following the date covered by the report, or as agreed to by the ROICC. The report need not be submitted for days in 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 submitted on the last work day of each month will include the Rework Items List, Submittal Register, and Test Plan Log. Copies of the reports will be maintained on-site and will be available for review during business hours.

The daily CQC Report will be signed and dated by the PQCM and contain the following statement: "On behalf of the Contactor, 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 and noted in this report." Other appropriate personnel, including subcontractors responsible for completion of activities, will sign and date the report as required. The report will include copies of test reports.

8.2 CONTRACTOR PRODUCTION REPORT

The Contractor Production Report will be prepared for each day work is performed and will be attached to the daily CQC Report prepared for the same day. The Contractor Production Report will be prepared, signed, and dated by the Project Superintendent or designated representative, and will contain the following information:

- Contractor and subcontractor(s) and their area of responsibility
- 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, including location, description, weather conditions, and who did the work
- Any delays encountered
- Site visitors and the purpose of the visit
- Job safety evaluations stating what was checked, results, and instructions or corrective actions
- A list of instructions given and/or received and conflicts in plans and/or specifications
- Contractor's verification statement

8.3 LOGBOOKS

The PQCM will maintain a logbook to document QC activities. The information in the logbook is intended to serve as a phone log and memory aide in the preparation of the daily CQC Report and in addressing follow-up questions that may arise.

8.4 PHOTOGRAPHS AND PHOTOGRAPH LOGS

The PQCM will maintain photographs and a photograph log to document site activities. Each photograph will have a date and time stamp on it or the photograph will show a sign board documenting the date and time clearly and legibly in the photograph. The photograph log will identify each photograph by date, time, location, and activity.

8.5 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 of 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, titled Confirmation Notices, will be numbered sequentially and will fully identify participating personnel, subject discussed, and any conclusions reached. The PjM or designated representative will forward a reproducible copy of the confirmation notices to the DON RPM and ROICC within 5 working days.

This page intentionally left blank.

9.0 CHANGE MANAGEMENT

This section describes the DCN and FCR, the two main vehicles to document project changes.

9.1 DESIGN CHANGE NOTICES

The following sections detail the identification, preparation, and review and approval process for DCNs.

9.1.1 Identification

Any member of the Project Team may identify the need for a change to the design specifications or drawings. The Project Team member will notify the Field Engineer, who will evaluate the request and initiate a DCN, if determined necessary.

9.1.2 Preparation

The Field Engineer will generate a DCN form (Appendix B) and submit it to the Design Engineer for review and disposition. The DCN will identify the specification requirements, the proposed change, and the reason for the change.

9.1.3 Review and Approval

The PjM, Project Superintendent, and PQCM will review and approve the DCN. It is the responsibility of the PjM to notify the DON for approval of the DCN prior to making any changes identified on the DCN.

9.1.4 Implementation of Approved DCNs

The Project Superintendent is responsible for the implementation of approved DCNs.

9.1.5 Records

Each approved DCN will be sequentially numbered as follows:

DCN-CTO X-YY

Where:

X is the task order number and YY is the DCN number, beginning with 01.

A DCN log shall be maintained by the PQCM that provides the DCN number, date of DCN, and brief description of contents.

Each DCN will be copied to all the management signatories, the Project Superintendent, PQCM, SHSS, and other personnel as deemed appropriate by the PjM.

Copies of the approved DCN should be posted or otherwise included in daily site briefings as appropriate to ensure that all site personnel are aware of the changes to the task order program. Copies of DCN will be issued to all holders of controlled copies. The DCNs will be required to be maintained with the controlled copy of the document that has been changed.

9.2 FIELD CHANGE REQUEST

Site personnel will document changes to the approved plans (except the design specifications and drawings) in the field through the FCR form (Appendix B). 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, Project Superintendent, PQCM, PESM, and QCPM and concurrence from the RPM or ROICC

9.3 DISTRIBUTION OF DCN AND FCR FORMS

Approved DCN and FCR forms will be distributed to the CTO file record, all CTO personnel that received the original document, and the ROICC and RPM. The DON may request DCNs or FCRs be submitted to the Contracting Officer or their designee.

10.0 NONCONFORMANCE

All deficiencies or nonconforming conditions discovered during inspections or other QC functions will be noted on either a DN or an NCR, as appropriate.

A DN is used to document the failure to develop, document, or implement effectively any applicable element of approved plans or to follow established procedures. A deficiency could lead to a nonconformance.

An NCR is used to document a nonconforming condition that renders the quality of an item, process, or product that has been defined in the specifications or drawings as unacceptable or indeterminate.

Copies of these forms are provided in Appendix B along with the logs used for tracking these documents. All deficiencies and nonconforming conditions will be resolved prior to completion of the project and in the timeliest manner possible. The DN will be used for all conditions that do not affect the final work product. An NCR will be used when a condition may affect the final work product.

The PQCM will be notified of all deficiencies and nonconforming conditions identified during the course of the field activities to ensure that each of these occurrences is documented, reported, and tracked; and that corrective actions are taken and follow-up verification is conducted.

The PQCM will also document deficiencies and nonconforming conditions in the daily CQC Report, noting the items found to be deficient or nonconforming; the date; time, and location; the person who identified the deficiency or nonconformance; and the status of the item to which the deficiency or nonconformance applies.

The PQCM will update the status of the deficiency when it changes. Before the work activities of the day begin, the PQCM will note the deficiencies or nonconforming conditions that require follow-up verification that day. New or changed status will be entered into the file at the end of each day. The daily CQC Report will document completion of the corrective action for each deficiency or nonconformance for that day. Nonconforming conditions or deficiencies that require rework for resolution will be noted on the Rework Items List included in Appendix B.

10.1 ROOT CAUSE ANALYSIS

The DN and the NCR forms both include space to enter information regarding the cause of the problem and the proposed resolution. The determination of the root cause of a deficiency or nonconformance is an integral part of the QC process. Root cause analysis will be made by the

PQCM in conjunction with other appropriate site personnel such as the Project Superintendent and the SHSO. Criteria considered in the analysis will include:

- Staff qualifications and training
- Adequacy of procedures and methods
- Adequacy of equipment
- Adequacy of QC measures

Input will be obtained, as necessary, from field staff and technical advisors in order to identify the factors that led to the problem.

10.2 CORRECTIVE ACTION

Following the root cause analysis, the PQCM will evaluate potential solutions (corrective actions) to determine which remedy is most effective in correcting the problem. This process will include all appropriate staff. Potential remedies considered will include:

- Supplemental staff training
- Changes of equipment or modification of equipment currently in use
- Acquisition of supplemental equipment
- Implementation of new procedures or modification of existing procedures
- Changes in QC procedures

Final approval of all remedies will be the responsibility of the PjM.

Successful implementation of corrective action will be documented by the PQCM in the appropriate areas of the DN or NCR. This documentation will be supported by changes to the inspection procedures or schedule as warranted (i.e., the PQCM will not certify that corrective action has been taken until inspection of the actions and the resulting changes in the program are complete).

10.3 CONDITION REQUIRING STOP WORK

If corrective actions are insufficient, resolution cannot be reached, or results of prior work are indeterminate, work may be stopped. The PQCM will direct the PjM to suspend work associated with the nonconformance until corrective action is complete. If there is a disagreement between the PQCM and the PjM, the difference will be brought to the attention of the QCPM until resolution is achieved.

The conditions of the suspension of work will be described in detail on the daily CQC Report and on the Rework Items List, if corrective action is not completed by the end of the working day. Work will not continue until directed by the individual who authorized it.

This page intentionally left blank.

11.0 QUALITY MANAGEMENT

In addition to the required QC field inspections, the TtEC Quality Program 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 provided to the PjM for corrective action.

Inspections will be performed and checked for the following:

- Conformance with the NTCRA Work Plan and associated plans
- Thoroughness of performance
- Identification and completeness of documentation generated during performance

The PQCM will maintain the Rework Item List. This is a list of work items that do not comply with the contract and identify each item that needs rework, the date the item was discovered, the date the item will be corrected, and the date the item was corrected.

The PQCM will ensure that as-built drawings are kept current on a daily basis. The PQCM (or designee) will initial each revision. At the end of the project, updated as-built drawings will be submitted.

This page intentionally left blank.

12.0 REFERENCES

CDPH (California Department of Public Health). 2011. Treasure Island, Site 12 Gamma Survey Report, Survey Dates: April 5–7, 2011. September 23.

NAVFAC (Naval Facilities Engineering Command). 2009. Unified Facilities Guide Specifications (UFGS) 014502, Submittal Procedures. February.

USACE (United States Army Corps of Engineers). 2008. Safety – Safety and Health Requirements. EM-385-1-1. September 15.

This page intentionally left blank.

TABLES

This page intentionally left blank.

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Preconstruction environmental survey (Environmental Conditions Report)	• Review survey areas as identified in the Non-Time-Critical Removal Action (NTCRA) Work Plan and Demolition Work Procedure. • Verify that RPM, CSO, and ROICC have been notified about the environmental survey. • Review AHAs. • Verify that a project kickoff meeting was held. • Verify that project kickoff meeting minutes were prepared, reviewed, and distributed. • Inspect record for radiation general awareness training for all workers.		• Inspect environmental survey documentation. • Verify that qualified SSHO is present at active work areas. • Verify that site activities are being photographed.		• Verify that environmental survey is conducted in all areas where field activities will take place and adjacent areas. • Verify that qualified SSHO is present at active work areas. • Verify that radiological survey is being conducted in accordance with the NTCRA Work Plan. • Verify that site activities are being photographed. • Verify that photographs are logged and stored. • Verify that results of survey have been submitted in accordance with applicable Contract Data Requirements List.	
Site survey by Licensed California land surveyor (prior to start of fieldwork)	• Review survey areas as identified in the NTCRA Work Plan and Demolition Work Procedure. • Verify that RPM, CSO, and ROICC have been notified about the site survey. • Verify that land surveyor is a licensed land surveyor in the state of California. • Review AHAs. • Review boundaries and extent of survey. • Inspect record for radiation general awareness training for all workers.		• Inspect site survey documentation (survey is accurate to 0.1 foot vertically and surveyed to the State Plane Coordinate System, North American Vertical Datum (NAVD 88) relative to mean sea level and 0.1 foot horizontally and referenced to the California State Plane Coordinate System Zone 3, North American Datum (NAD 83). • Verify that qualified SSHO is present at active work areas.		• Verify that site survey is conducted in all areas where field activities will take place. • Verify that qualified SSHO is present at active work areas. • Verify that site survey is being conducted in accordance with the NTCRA Work Plan and Demolition Work Procedure. • Verify that boundaries of survey have been met.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Site survey by Licensed California land surveyor (Continued)			• Verify that surveyor has correct control point information.			
Clearing of vegetation and/or pavement	• Verify that RPM, CSO, and ROICC have been notified. • Verify that management of cleared vegetation and/or pavement protocol is established based on the results of environmental survey. • Review AHAs. • Verify that PPE is available and meets requirements of the SSHP. • Verify that the area has been walked/visually inspected for items that could interfere with clearing (utilities, rebar, etc.). • Verify that radiation awareness training has been completed and that training is documented. • Verify that traffic schedule has been approved by CSO and ROICC.		• Verify that qualified RCT and SSHO are present at active work areas. • Verify that vegetation and/or pavement is removed throughout the excavation area. • Verify that waste vegetation and/or pavement is being managed as required. • Verify that vegetation removed from radiologically impacted sites is stockpiled at the site of origin. • Verify that the activity is photographed.		• Continue to inspect ongoing activities. • Verify that qualified RCT and SSHO are present at active work areas. • Verify that vegetation and/or pavement stockpiles are maintained per the NTCRA Work Plan requirements. • Verify that vegetation and/or pavement are disposed of in accordance with the NTCRA Work Plan requirements, and that the stockpile locations are cleaned up. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	
Geophysical survey	• Verify that RPM, CSO, and ROICC have been notified. • Verify that survey instrument certification is current and in good condition. • Verify that sensitive locations at the site are delineated and work crews are aware of restricted areas. • Review control points. • Review AHAs.		• Verify that qualified RCT and SSHO are present at active work areas. • Verify that the geophysical survey is performed over areas of known or suspected subsurface utilities. • Verify boundaries and extent of survey. • Verify that site activities are being photographed.		• Verify that qualified RCT and SSHO are present at active work areas. • Verify that utility locations are marked in the field and identified to the equipment operators. • Verify that boundaries of survey have been met. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Geophysical survey (Continued)	• Review the NTCRA Work Plan, Demolition Work Procedure, and drawings for this activity. • Review boundaries and extent of survey. • Verify that radiation awareness training has been completed and training is documented. • Verify that designated personnel have assigned dosimeters and completed NRC Form 4.					
Asbestos abatement	• Verify that RPM and NTR have been notified. • Review the Subcontractor Asbestos Abatement Plan, including the AHAs. • Verify that radiation awareness training has been completed and training is documented, as appropriate. • Verify that designated personnel have assigned dosimeters and completed the NRC Form 4, as appropriate. • Verify that PPE is available and meets the requirements of the Contractor Asbestos Abatement Plan. • Verify that the RWP is in place and that all workers have read the requirements, as appropriate.		• Verify that RCT and SSHO are present in an active work area, as appropriate. • Verify that required dosimetry is being worn, as appropriate. • Verify that air monitoring is being performed in accordance with the Contractor Asbestos Abatement Plan. • Verify that all personnel have signed the RWP(s), as appropriate. • Verify that the abatement activities are performed in accordance with the Contractor Asbestos Abatement Plan.		• Verify that RCT and SSHO are present in an active work area, as appropriate. • Verify that required dosimetry is being worn, as appropriate. • Verify that daily safety briefings discuss status of RWP(s), as appropriate. • Verify that RWP is available at the work location. • Verify that RWP is modified in the event of changes to the conditions, as appropriate. • Verify that modified RWP was concurred with by RASO and concurrence is documented, as appropriate. • Verify that tools, material, and equipment are cleaned, wiped down, and surveyed prior to removal, as appropriate. • Verify that air monitoring is being performed in accordance with the Contractor Asbestos Abatement Plan	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Asbestos abatement (Continued)					• Verify that the abatement activities are performed in accordance with the Contractor Asbestos Abatement Plan. • Inspect field documentation. • Verify that personnel surveys are performed for all personnel leaving the Radiologically Controlled Area, as appropriate.	
Radiological surveys	• Verify that RPM, RASO, CSO, and ROICC have been notified. • Verify that an approved RWP is available and has been read and signed by assigned personnel. • Verify that NTCRA Work Plan, TSPs, and AHAs have been reviewed. • Verify that assigned personnel are trained and qualified. • Verify that training record documentation is being maintained. • Verify that personnel have been given an emergency notification procedure. • Verify that workers assigned dosimetry have completed NRC Form 4. • Verify that relevant SOPs and/or manufacturers' instructions are available and have been reviewed for equipment to be used for radiological surveys. • Verify that limits and boundaries of surveys have been established and are understood. • Verify background check. • Verify that calibration of survey instrument is within 1 year.		• Verify that radiological instruments are as specified in the NTCRA Work Plan and TSPs. • Verify that qualified RCT and SSHO are present at active work areas. • Verify that site activities are being photographed. • Verify that the reference area measurements have been obtained using the procedure described in the NTCRA Work Plan and TSPs. • Verify that daily checks are performed on all portable survey instruments. • Verify that required dosimetry is being worn. • Verify that RWP is available at work site.		• Verify that site is properly posted and secured, if necessary. • Conduct ongoing inspection of material and equipment. • Verify that qualified RCT and SSHO are present at active work areas. • Verify that required dosimetry is being worn. • Verify that any suspected material location is marked, flagged, and documented. • Verify that daily instrument checks and background measurements are obtained and documented. • Verify that survey results are documented. • Verify that RWP is available at work site. • Verify that personnel have read and signed the revised RWP, if revision is required. • Verify that survey data and sample analysis results are reviewed as required by the SOPs.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Radiological surveys (Continued)	• Verify that equipment is on site. • Verify that traffic schedule has been approved by CSO and ROICC.		• Verify that field logbooks and proper forms are in use. • Verify that measurements are being collected in accordance with the NTCRA Work Plan, TSPs, and relevant SOPs. • Verify that limits and boundaries of survey are being met.		• Verify that survey activities conform to the NTCRA Work Plan, TSPs, and SOPs. • Verify that boundaries of the survey have been met. • Verify that survey instrument is recalibrated after repairs or modifications. • Verify that personnel surveys are performed for all personnel leaving a radiological controlled area. • Verify that RASO is notified of discovered radioactive material. • Verify that area known or suspected to contain radioactive material is isolated. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	
Identification and removal of radioactive material	• Verify that RPM, CSO, and RASO have been notified. • Review procedures. Verify background activity and what constitutes a deviation. • Review AHAs. • Verify that equipment, instruments, and materials are on-site, calibrated, and in working order. • Verify that required stockpile and staging areas are established.		• Verify that qualified RCT and SSHO are present at active work areas. • Verify that required dosimetry is being worn. • Verify PPE of all workers. • Verify that RSOR has evaluated radiological impact of the material prior to any action for each material.		• Verify that qualified RCT and SSHO are present at active work areas. • Verify that required dosimetry is being worn. • Verify that removal of radioactive material is conducted in accordance with the procedures and project plans. • Verify that an additional 1 foot of soil in every direction is excavated after removal of material.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Identification and removal of radioactive material (Continued)	• Review the NTCRA Work Plan, TSPs, and RPP. • Verify that PPE is available and meets requirements of the SSHP. • Verify that radiation awareness training has been completed and training is documented. • Verify that designated personnel have assigned dosimeters and completed NRC Form 4. • Verify that a log and database are established for identified material. • Verify that traffic schedule has been approved by CSO and ROICC. • Verify that personnel have been given an emergency notification procedure.		• Verify that radiological safety instruction specific to each material has been reviewed by RCT and RSOR. • Verify that RCT is present during removal of any source. • Verify that a surface survey is completed for the initial surface area and each subsequent 1-foot excavation. • Verify that all boxes and drums have been surveyed and surface radiation measurements are collected. • Verify that site activities are being photographed. • Verify that proper logging, recording, and photography of found point sources are being done. • Verify that traffic schedule has been approved by CSO and ROICC.		• Verify that RCT scanned the excavated area after radioactive material removal. • Verify that personnel surveys are performed for all personnel leaving a radiological controlled area. • Review radiological logbook for completeness of documentation. • Inspect contaminated material handling procedure. • Verify that removed point source has unique identification, documented in the logbook and the drum inventory sheet. • Verify that removed point source storage and management procedure is in accordance with the NTCRA Work Plan and RPP. • Verify that all bags and drums are marked with a unique identification and information is recorded in the logbook. • Verify that filled drums are stored in approved storage areas. • Verify that liner remains in good condition. • Verify that the log of radioactive material is routinely reviewed by the CHP. • Verify that traffic schedule has been approved by CSO and ROICC. • Verify that site activities are being photographed.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Identification and removal of radioactive material (Continued)					• Verify that photographs are logged and stored.	
Excavation and removal of soil	• Verify that the RPM, CSO, and ROICC have been notified. • Verify that Cal-OSHA has been notified 5 days prior to excavation. • Verify that USA has been notified 72 hours prior to excavation. • Verify that an assignment letter for competent person is on file. • Verify that training requirements are met for all personnel. • Verify that OSHA excavation permit is on site. • Verify that OSHA excavation regulations are reviewed. • Verify that equipment and material are surveyed for radiation and survey results are documented. • Verify that final excavation configurations have been reviewed with the DON and regulators. • Verify that initial background air sampling has been conducted. • Verify that electrical lines are de-energized, if necessary. • Verify that existing utilities and structures are removed, if necessary. • Verify that proper equipment is on-site to perform work.		• Verify that the RCT and SSHO are present in an active work area. • Verify that a spotter trained in recognizing underground utilities is present at all times. • Verify that airborne concentrations do not exceed the established levels. • Verify that air monitoring and initial baseline sampling are being performed per SSHP. • Verify that required dosimetry is being worn. • Verify that all personnel have signed the RWP(s). • Verify that the excavation protocol, as described in the NTCRA Work Plan, is being followed. • Verify that dust control is used as necessary. • Verify that site activities are being photographed. • Verify that permit conditions are followed.		• Verify that RCT and SSHO are present in an active work area. • Verify that a spotter trained in recognizing underground utilities is present at all times. • Verify that airborne concentrations do not exceed the established levels. • Verify that air and soil samples are collected as required. • Verify that excavation is performed in accordance with the NTCRA Work Plan.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Excavation and removal of soil (Continued)	• Review the NTCRA Work Plan. • Review the AHAs. • Verify that PPE is available and meets the requirements of the SSHP. • Verify that radiation awareness training has been completed and documented. • Verify that all personnel have assigned dosimeters and completed the NRC Form 4. • Verify that the RWP is in place and that all workers have read the requirements. • Verify that the Traffic Control Plan is in place and reviewed. • Verify that traffic schedule has been approved by the CSO and ROICC.		• Verify sediment control per the NTCRA Work Plan. • Verify that traffic control procedures are being followed.		• Verify that required dosimetry is being worn. • Verify that daily safety briefings discuss status of RWP(s). • Verify that RWP is available at the work location. • Verify that RWP is modified in the event of changes to the conditions. • Verify that modified RWP was concurred with by RASO and concurrence is documented. • Verify that tools, material, and equipment are cleaned, wiped down, and surveyed prior to removal. • Verify that excavation protocol, as described in the NTCRA Work Plan, is being followed. • Verify that visually stained soil/material is segregated. • Verify that competent person is conducting daily inspection of the excavation and slope stability, and that the inspection is documented in a logbook. • Continue to inspect ongoing work. • Verify sediment control per the NTCRA Work Plan. • Verify that personnel surveys are performed for all personnel leaving a radiological controlled area. • Verify that site activities are being photographed.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Excavation and removal of soil/piping (Continued)					• Verify that photographs are logged and stored. • Verify that traffic control procedures are being followed.	
Final Status Survey (including systematic and biased sampling)	• Verify that RPM, CSO, and ROICC have been notified. • Review the TSP and NTCRA Work Plan. • Verify that radiation awareness training has been completed and training is documented. • Verify that designated personnel have assigned dosimeters and completed the NRC Form 4. • Verify that PPE is available.		• Verify that RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Review sample handling procedures.		• Verify that RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Verify that samples are collected in accordance with the sample handling procedures. • Inspect field documentation. • Verify that personnel surveys are performed for all personnel leaving the radiological controlled area. • Verify that site activities are being photographed. • Verify that photographs are logged and stored. • Verify that sample locations are surveyed. • Verify sample chain-of-custody form.	
Backfill placement and compaction	• Verify that RPM, CSO, and ROICC have been notified. • Verify that compaction equipment is available. • Review the NTCRA Plan and verify that adequate material is available for fill. • Verify that site has been surveyed prior to backfill.		• Verify that RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Verify that samples of proposed materials have been submitted and approved.		• Conduct ongoing inspection of backfilling and compaction operation. • Verify that backfill placement and compaction are completed in accordance with the plans and specifications. • Verify that site activities are being photographed.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Backfill placement and compaction (Continued)	• Review AHAs. • Review the NTCRA Work Plan. • Verify that PPE is available and meets requirements of SSHP. • Verify that radiation awareness training has been completed and that training is documented. • Verify that designated personnel have assigned dosimeters and completed NRC Form 4.				• Verify that photographs are logged and stored.	
Building demolition	• Verify that the RPM, CSO, ROICC, and NAVSTA TI Fire Department have been notified. • Verify that demolition procedure, schedule, names, and telephone numbers of responsible project staff have been given to the RPM, CSO, ROICC, and NAVSTA TI Fire Department. • Review requirements for establishing work zone. • Review Demolition Work Procedure, SSHP, and AHA • Review dust control procedure. • Review stockpiling procedure. • Review demolition safety procedure. • Review traffic control procedure.		• Inspect demolition activities. • Inspect dust control. • Verify that site activities are being photographed. • Inspect traffic control activities. • Verify work zone has been established. • Verify that air monitoring data are being collected in accordance with the plans. • Verify that demolition safety procedure is being followed. • Verify field documentation requirements.		• Continue inspection of demolition activities. • Verify that site activities are being photographed. • Inspect traffic control activities. • Verify work zone has been established. • Verify that air monitoring data are being collected in accordance with the plan. • Verify that demolition safety procedure is being followed. • Verify that equipment and tool decontamination is conducted prior to demobilization. • Inspect field documentation.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Non-LLRW soil, building debris, and decontamination water (waste characterization sampling)	• Verify that testing services will be available for the testing of the reuse soil samples. • Review the NTCRA Work Plan and AHAs. • Verify that PPE is available and meets requirements of the SSHP. • Verify that there are adequate equipment and materials to decontaminate sample equipment as necessary. • Inspect record for radiation general awareness training for all workers. • Verify that NRC Form 4 is completed for each worker. • Verify that all personnel have signed the RWP.		• Verify that RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Review sample collection and handling procedures		• Verify that RCT and SSHO are present in an active work area. • Verify that required dosimetry is being worn. • Verify that data have been collected in compliance with the SAP (attachment to NTCRA Work Plan). • Verify sample collection and labeling of samples. • Verify sample chain-of-custody form. • Continue to inspect ongoing work. • Verify that site activities are being photographed. • Verify that photographs are logged and stored.	
Non-LLRW transport and disposal	• Verify that all transporters are authorized to haul the particular type of waste being transported. • Verify that the CSO and ROICC have been notified. • Verify that waste profiles have been approved by disposal sites. • Verify that the waste manifest has been approved and signed by a DON representative. • Verify that locations of disposal with the ROICC have been confirmed. • Review submittal load tickets process from contractors. • Review the traffic pattern. •		• Verify that all transporters are authorized to haul the particular type of waste being transported. • Verify drivers sign manifest. • Verify that the contractor performs work as specified in the Waste Management Plan (attachment to NTCRA Work Plan). • Review load ticket record procedures.		• Verify DOT labeling based on sample results and waste characterization. • Verify manifests are signed and originals given to CSO. • Verify that the contractor has provided delivery logs. • Verify that disposal loads are in accordance with the standard requirements of the NTCRA Work Plan. • Verify that all load tickets are accounted for.	

TABLE 3-1

DEFINABLE FEATURES OF WORK

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOW-UP	DONE
Non-LLRW transport and disposal (Continued)	• Review the traffic plan with CSO and ROICC. • Review signage requirements with CSO and ROICC. • Review truck decontamination requirements. • Review the AHA for this activity.					
Site restoration	• Verify that the ROICC and CSO have been notified. • Verify that training requirements are met for all personnel. • Verify that proper equipment is on-site to perform work. • Verify proper supplies are on-site. • Review the NTCRA Work Plan. • Review the AHAs. • Verify that PPE is available and meets the requirements of the APP/SSHP. • Verify that radiation awareness training has been completed and that training is documented. • Verify that designated personnel have assigned dosimeters • Verify California licensed surveyors have been procured for the work.		• Verify that site demobilization procedures have concurrence from RPM and CSO. • Inspect site restoration activities. • Verify that site activities are being photographed (before/after photographs).		• Conduct ongoing inspection of site restoration activities. • Verify that site activities are being photographed. • Verify that photographs are logged and stored. • Verify that radiological survey is being conducted in accordance with the NTCRA Work Plan. • Verify that construction-related damages are repaired.	
Site survey by Licensed California land surveyor (upon completion of fieldwork)	See Site survey by Licensed California land surveyor (prior to start of fieldwork) (1st page of this table)					

TABLE 3-1

DEFINABLE FEATURES OF WORK

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
Cal-OSHA – California Occupational Safety and Health Administration
CHP – Certified Health Physicist
CSO – Caretaker Site Office
DON – Department of the Navy
NAVSTA TI – Naval Station Treasure Island
NRC – Nuclear Regulatory Commission
NTCRA – non-time-critical removal action
OSHA – Occupational Safety and Health Administration
PPE – personal protective equipment
RASO – Radiological Affairs Support Office
RCT – Radiological Control Technician
ROICC – Resident Officer in Charge of Construction
RPM – Remedial Project Manager
RPP – Radiation Protection Plan
RSOR – Radiation Safety Officer Representative
RWP – Radiation Work Permit
SAP – Sampling and Analysis Plan
SOP – Standard Operating Procedure
SSHO – Site Safety and Health Officer
SSHP – Site Safety and Health Plan
TSP – Task-specific Plan
USA – Underground Service Alert

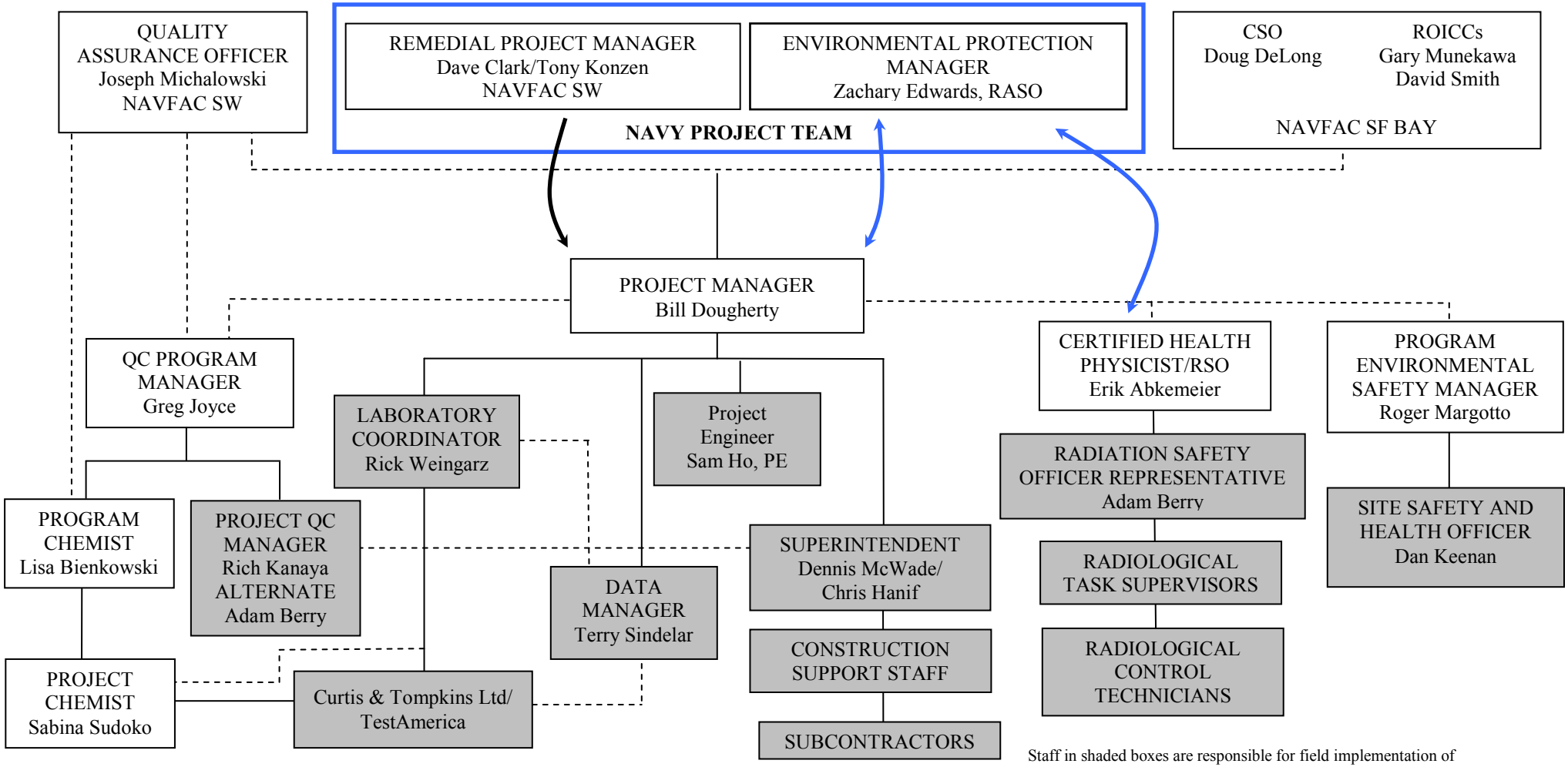
This page intentionally left blank.

FIGURES

This page intentionally left blank.

FIGURE 2-1

PROJECT ORGANIZATION CHART



Staff in shaded boxes are responsible for field implementation of activities under the NTCRA Work Plan.

The Construction Manager (Jeff Bray) has overall responsibility for coordinating the activities of on-site technical staff.

Abbreviations and Acronyms:
CSO – Contractor Site Office
NAVFAC SW – Naval Facilities Engineering Command Southwest
NTCRA – Non-Time-Critical Removal Action
RASO – Radiological Affairs Support Office
ROICC – Resident Officer in Charge of Construction
RSO – Radiation Safety Officer
QC – quality control
SF – San Francisco

Legend

Formal reporting relationship

Supporting relationship

Primary lines of technical communication

Line of technical direction (alternate where dashed)

APPENDIX A

DELEGATION OF AUTHORITY LETTERS AND RESUMES

This page intentionally left blank.

TETRA TECH EC, INC.

September 26, 2012

Mr. Richard Kanaya
Tetra Tech EC, Inc.
1230 Columbia St., Suite 750
San Diego, CA 92101

Subject: Project Quality Control Manager

Reference: Program Construction Quality Control Management Plan, March 11, 2010, Radiological Environmental Multi-award Contract (RAD EMAC), Contract Task Orders (CTOs) at Naval Station Treasure Island, San Francisco, California

Dear Mr. Kanaya:

In accordance with the RAD EMAC Program Construction Quality Control Management Plan, March 11, 2010, this letter notifies you of your appointment as the Project Quality Control Manager for CTO 013 at Naval Station Treasure Island, San Francisco, California issued under the above contract as directed by the Program QC Manager.

As the designated Project Quality Control Manager, you will be responsible for managing the site-specific quality control requirements in accordance with the approved plan. 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.

Gregory D Joyce

Gregory D Joyce, ASQ CQM
Quality Control Program Manager

cc: Bill Dougherty
Richard Kanaya

1230 Columbia Street, Suite 750, San Diego, CA 92101
Tel 619.234.8690 Fax 619.234.8591
www.tteci.com

EXPERIENCE SUMMARY

Worked 13 months at Hunters Point Shipyard, serving as a quality engineer/inspector, project manager assistant, project engineer/back-up superintendent and as the Project Quality Control Manager. QC responsibilities have included: performing surveillances and inspections; audits; record keeping; photographing activities; generating daily reports; leading and assisting quality investigations; processing FCR's, leading Preparatory and Initial Phase meetings, facilitating CQC Meetings and staff meetings, managing staff and creating the quality program for Hunters Point Shipyard. PM Assistant responsibilities have included generating: the Hunters Point Shipyard TCRA report, the Base Closure Team Presentation (PowerPoint), the CTO-72 Monthly Progress Report, CTO-72 Weekly Progress Reports, tracking inventory, providing support to the Wetlands Mitigation Project at MSA, providing support to the sand monitoring project at MDR and attending various client meetings. Project Engineer and superintendent responsibilities have included generating daily engineering reports, providing site data for management or clients (Navy), providing guidance to construction crew, leading safety meetings and facilitating sites when necessary. Became Hunters Point PQCM in January 2007 and performed all duties as described below, as well as continuing those of Project Manager Assistant and Field Engineer. In April 2007, became Radiological Screening Yard Manager; responsibilities included coordinating subcontractor activities (taking soil samples, scanning soil filled pads for radioactive contamination, COC tracking, remediating contaminated pads/filling intermodels/roll-off bins with Low Level Radioactive Waste, decontaminating equipment/vehicles) providing oversight for craft personnel (supervising and training operating engineers and laborers performing soil movement activities in the RSY relative to MARSSIM standards) and performing quality control checks on RSY activities. In March 2008, resumed the position of Project Quality Control Manager.

EDUCATION

Christian Leadership, [redacted]
Financial Accounting, [redacted]
Certificate, General Education, [redacted]

REGISTRATIONS/CERTIFICATIONS

Certified Nuclear Gauge Operator, CA, [redacted] Earned 4/8/99

TRAINING

40-Hour OSHA Hazardous Waste Health and Safety Training – 2006
Radiation Safety for Hazardous Material Workers – 2006
Construction Quality Management For Contractors – 2006
American Red Cross Standard First Aid – 2006
American Red Cross Adult CPR – 2006
TtEC Superintendents' Training – 2007
8-Hour Hazwoper Refresher Training – 2007
Confined Space Supervisor's Training – 2007
Defensive Driving Certification – 2007
Loss Control Certification – 2007
HIPAA Training – 2007

CORPORATION PROJECT EXPERIENCE

Quality Engineer/Inspector, March 2006 – November 2006
Department of the Navy, Hunters Point Shipyard, San Francisco, CA
Quality Engineer responsible for quality control of Metal Debris Reef And Metal Slag Area (time critical removal action to remove metal slag and debris associated with radiological contamination, and to address any non-radiological chemical contamination incidental to the removal, and to restore the sites),

Building 813 Characterization Survey (survey to assess if residual radioactivity above the established release criteria is present in the area) and Building 142 Scoping Survey (survey to determine if residual radioactivity is present at this site).

Led investigation as requested by Client (Navy) into device with elevated readings being detected at the portal monitor in a truck exiting site. Interviewed over 40 individuals, from management to craft/labor; inspected related equipment (conveyor belt systems, with radiation detector arrays) and generated a report with recommendations to assist in preventing incident from occurring again. The client was satisfied with the findings, report and recommendations and allowed soil processing activities to resume at sites using conveyor belt systems, upon implementation of recommendations.

Generated and performed surveillances; performed SWPPP Inspections, audits, photo documentation, and supported QIR investigations as required by the project.

Project Manager Assistant, June 2006 – December 2006
Department of the Navy, Hunters Point Shipyard, San Francisco, CA
Responsibilities included movement of infrastructure from Contract Task Order (72) to Contract Task Order (06). Attended staff, client and contractor meetings. Helped facilitate progress of Metal Slag Area Wetlands Mitigation Plan. Generated progress reports for CTO-72 and put together Base Closure Team PowerPoint Presentations and Weekly TCRA Excavation Summaries for Client. Performed assorted administrative duties.

Project Engineer, June 2006 – December 2006
Department of the Navy, Hunters Point Shipyard, San Francisco, CA
Responsibilities included generating daily progress reports and facilitated sites during weekly superintendent home leaves or whenever necessary. Tracked project progress and documented daily production data, including soil volume processed and where it was staged.

Project Quality Control Manager, January 2007 – April 2007
Department of the Navy, Hunters Point Shipyard, San Francisco, CA
PQCM is responsible for overall management of project QC and will report to the QCM (Quality Control Program Manager). The PQCM will be on-site at all times during field activities.

Responsibilities included: monitoring activities to ensure conformance with the Base-wide Plan and that policies, procedures, contract specifications, and sound practices are followed; preparing Daily QC Reports, Ensuring that the three phases of inspection (preparatory, initial and follow-up) are implemented for all the definable features of work; ensuring that required tests and inspections are performed and the results reported; facilitating weekly QC meeting; attending required meetings (including the pre-construction conference, pre- and post-construction site inspections and other scheduled and unscheduled meetings; issuing and maintaining Field Change Requests and Nonconformance Reports for project activities; maintaining and NCR and FCR log; ensuring that planning documents are current and controlled; maintaining the Submittal Register and a Submittal Log; stopping work that is not in compliance with the contract.

Organized and moderated CQC Meetings. Developed checklists and surveillances for critical activities for CTO-06 & TO-70—provided oversight for their implementation. Scope of project work activities were to perform remediation of radiologically impacted sewer and storm drain piping components. This process involved the excavation, surveying and disposal of piping components and excavated material.

Radiological Screening Yard Manager, April 2007 – March 2008
Department of the Navy, Hunters Point Shipyard, San Francisco, CA
Provided oversight for the handling of excavated soil being removed above and around piping components, potentially contaminated with low level radioactive waste. Tracked the status of excavated material from excavation to backfill or disposal, overseeing lay down, surveying, sampling, remediation and off-haul. Responsibilities included development of field checklists for critical activities in the yard and helping craft personnel understand the specifications for compliance under MARSSIM. Coordinated yard activities, including: filling, scanning, sampling, remediating and clearing of excavated soil placed on lay down pads. Acted as field engineer when necessary, marking pad areas to be sampled or remediated and then tracking and documenting material volume as it's removed and disposed. Worked closely with all levels of craft, as well as subcontractors to insure job quality. Trained project personnel from Alameda Naval Air Station (Nathan Smith, Rad Supervisor and Bob Wells, Site Superintendent) to familiarize them with RSY operations for their project. Managed the RSY for CTO-06 and TO-70.

Project Quality Control Manager, March 2008 – Present
Department of the Navy, Hunters Point Shipyard, San Francisco, CA
PQCM is responsible for overall management of project QC and will report to the QCM (Quality Control Program Manager). The PQCM will be on-site at all times during field activities.

Responsibilities include: monitoring activities to ensure conformance with the Base-wide Plan and that policies, procedures, contract specifications, and sound practices are followed; prepare Daily QC Reports, ensure that the three phases of inspection (preparatory, initial and follow-up) are implemented for the definable features of work; ensure that required tests and inspections are performed and the results reported; facilitate weekly QC meeting; attend required meetings (including the pre-construction conference, pre- and post-construction site inspections and other scheduled and unscheduled meetings; issue and maintain Field Change Requests and Nonconformance Reports for project activities; maintain an NCR and FCR log; ensure that planning documents are current and controlled; maintain the Submittal Register and a Submittal Log; stop work that is not in compliance with the contract.

Organize and moderate CQC Meetings. Developed checklists and surveillances for critical activities for CTO-06, TO-70, CTO-72X and the EMAC—provided oversight for their implementation. Developed correction notice system of accountability; implemented it in the field to reduce errors and mistakes. Mentored new QC staff personnel; demonstrated effective use of deficiency notices for project quality. Scope of project work activities were to perform remediation of radiologically impacted sewer and storm drain piping components and the surveying and remediation of impacted buildings. The sewer and storm drain projects involved the excavation, surveying, sampling and disposal of piping components & excavated material. The building surveys and remediation involved: radiological scanning; sampling; demolition; soil, asbestos and structural remediation; and stage by stage mapping & documentation.

PREVIOUS EXPERIENCE

Public Works Inspection Consultant, March 1999 – June 2003
City of Newark
Assignments included inspection of nationwide fiber optic installations passing through the city (directional boring and open trenching) city wide pipeline installations, multiple trenching and backfill projects and assorted paving and concrete projects.

Responsibilities included: attendance of pre-job, daily, weekly, and project closing meetings; inspection of projects to insure compliance with all City/CalTrans specifications, as well as supporting other public agencies in specification compliance; detailed documentation of job progress, accidents, complaints and

comments; punch list generation and inspection to completion, insuring any/all facilities affected by the project are restored to as good or better than pre-existing conditions. Performed trench backfill inspection and testing using a nuclear gauge. Enforced approved traffic control plans, erosion control measures and inspected and closed an assortment of utility permits. Established and maintained working relationships with contractors, developers, utilities, business owners and residents to foster open communication, to insure job progress and completion.

Vickers Concrete Sawing, Technician, 1998 - 1999
Responsibilities included core drilling, concrete demolition, estimating, sales, admin., and customer service.

Metals Technician, 1997 – 1998
Endovascular Technologies/Guidant Corporation
Primary responsibility was supporting laser welding, testing and design of elgiloy metal frames in a controlled environment room, for medical devices to treat abdominal aortic aneurisms. Performed laser welding, elgiloy frame fabrication, quality testing, quality control, document control, operator training and data entry.

Lab Technician, 1989 -1997
Bear Testing Lab
Responsibilities included testing & inspecting construction materials and collecting field data for engineering reports. Performed: concrete demolition for rebar studies/inspections; various concrete anchor pull tests for earthquake retrofit projects; core drilling for samples; testing on concrete/asphalt samples; testing on weld samples; masonry sheer wall tests on existing structures; friction tests; and documentation for tasks performed. Clients included The San Francisco-Moscone Convention Center, San Francisco International Airport, The Clorox Corp., Stanford University, The Nikko Hotel and others.

1978 – 1988
Kanaya Construction Inc.
Worked as laborer, carpenter, superintendent, bid representative, etc…for family owned general contracting firm, specializing in commercial and industrial concrete building construction.

Associate Pastor, 1998 – 2001
Pathway Community Church
Responsibilities included sermons, men's support groups, youth ministry & mentoring, marriage & family counseling, officiating weddings, funerals and assorted services.

Youth Pastor, 1988 – 1994
Sturge Presbyterian Church,
Responsibilities included sermons, young adult/college/high school/jr. high ministry, staffing and training personnel for youth programs, youth counseling and mentoring.

PUBLICATIONS & PRESENTATIONS

PROFESSIONAL ACCOMPLISHMENTS

PROFESSIONAL AFFILIATIONS

American Society for Quality-Member

DISCIPLINE CODES

02 Administrative, N
16 Construction Manager, N
15 Construction Inspector, Y
Technician/Field Supervisor, N

SKILL SET

Community Relations
Community Survey
Compliance Monitoring
Erosion Control
Field Sampling
Sampling - Soil
Low Level Radioactive Waste
Sediment Control
Soils
Storm Water

TECHNICAL EXPERTISE

LANGUAGE SKILLS

Knowledge Level:

PROFESSIONAL REFERENCES

Bill Dougherty, RMPM/CSQ, TtEC, 415-216-2731, Bill.Dougherty@tteci.com
Greg Joyce, Quality Control Program Manager, TtEC, 360-780-0371, Greg.Joyce@tteci.com
Gerard Slattery, PG, RMPM/CSQ, TtEC, 415-862-1689, Gerard.L.Slattery@usace.army.mil
Phil Bartley, CIH CSP, VP Environmental Safety and Quality Services, 509-732-5818, Philip.Bartley@tteci.com
Jamshid Sadeghipour, RMPM/CSQ, TtEC, 949-756-7519, Jamshid.Sadeghipour@tteci.com
Ajay Kurup, Public Works Inspector Supervisor, City of Newark, 510-790-7260, jay.kurup@newark.org
Soren Fajeau, P.E., Associate Civil Engineer, City of Newark, 510-790-7243, Soren.Fajeau@newark.org
Kevin Jow, Manufacturing Engineer, Guidant Corp., 650-903-1106, kjow@guidant.com
Neal Kanaya, Civil Engineer/Principal, Bear Testing Lab, 650-964-1107, office@beartest.com

RELATED COMPANY INFORMATION

Payroll Number: [redacted]
Employment Status: Full
Preferred First Name: Rich
Office Location:
Hire Date: 3/13/06
Years with Other Firms: 24
Years with Current Firm: 2
Total Years Experience: 26
Supervisor: Gregory D. Joyce, Program Quality Control Manager
Office Phone: (415) 216-2759
Cell Phone: (415) 516-9583
Fax: (415) 671-1995
E-mail Address: rich.kanaya@tteci.com
Other E-mail Address (if any): [redacted]
Resume Last Revised: 2008-10-17

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
U.S. ARMY Corps of Engineers

US Army Corps of Engineers®

San Diego Chapter, Inc.
"Building Your Quality of Life"

NAVFAC

PRESENTS THIS CERTIFICATE TO

Richard Kanaya

WHO HAS SUCCESSFULLY COMPLETED

January 18-19, 2011

U.S.A.C.E. Construction Quality Management for Contractors

Kugan Panchadsaram PE, PMP
CQM Facilitator
Kugan & Associates Inc.

Dennis Chung
US Army Corps of Engineers
San Francisco District

This Certificate is valid for 5 years from the date above

TETRA TECH EC, INC.

September 26, 2012

Mr. Adam Berry
Tetra Tech EC, Inc.
1230 Columbia St. , Suite 750
San Diego, CA. 92101

Subject: Alternate Project Quality Control Manager

Reference: Program Construction Quality Control Management Plan, March 11, 2010, Radiological Environmental Multi-award Contract (RAD EMAC), Contract Task Orders (CTOs) at Naval Station Treasure Island, San Francisco, California

Dear Mr. Berry:

In accordance with the RAD EMAC Program Construction Quality Control Management Plan, March 11, 2010, this letter notifies you of your appointment as the Alternate Project Quality Control Manager for CTO 013 at Naval Station Treasure Island, San Francisco, California issued under the above contract as directed by the Program QC Manager.

As the designated Alternate Project Quality Control Manager, you will be responsible for managing the site-specific quality control requirements in accordance with the approved plan as directed by the Quality Control Program Manager, when Mr. Richard Kanaya is not available. 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, if Mr. Kanaya cannot perform these functions. 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.

Gregory D Joyce

Gregory D Joyce, ASQ CQM
Quality Control Program Manager

cc: Bill Dougherty
Richard Kanaya

1230 Columbia Street, Suite 750, San Diego, CA 92101
Tel 619.234.8690 Fax 619.234.8591
www.tteci.com

[redacted]

ADAM BERRY

EXPERIENCE

Mr. Berry specializes in a spectrum of radiological program responsibilities, including the supervision of radiological technicians at remediation work sites, management of radiation safety and remediation instrumentation laboratory, operation of a gamma spectroscopy laboratory, and radioactive materials shipping.

His radiological experience includes air sample and dosimetry database management; air sample compliance reporting; portable radiation measurement instrumentation calibration, maintenance and repair; continuous field surveying and sampling during large-scale earth moving remediation operations; job coverage and access control of remediation work in radioactive material areas; routine radiological surveys for clearance of materials; operation of a high-throughput on-site gamma spectroscopy laboratory.

In addition to Mr. Berry's experience, his formal training includes OSHA 40-Hour Safety Training, Current 8-Hour Refresher ;OSHA First Responder Operations, OSHA Excavation Safety, Ludlum Measurements Inc., 40-hour Instrumentation Training; Radioactive and Hazardous Waste Management and Transportation Training; Radworker Training current certification; ORTEC Gamma Spectroscopy, System Management, and Algorithms Training; Canberra ISOCS Advanced System Operation Training.

EMPLOYMENT

7/9/07 – 9/9/07: Cabrera Services Inc.

Radiation Safety Officer

Mr. Berry was contracted to provide radiological oversight/management during characterization and remediation of an aged army depot where uranium tailings and other hazardous materials were stored. Duties included conducting daily safety meetings, air sample database management, dosimetry tracking, sample log generation, daily heath and safety inspections. In addition, Mr. Berry lead a surgical excavation which generated only 600 yards of waste material from a five acre plot. This plot was free released based on a MARRSIM suvvey.

8/15/05 – 8/29/06: Professional Radiation Consulting, Incorporated

Senior Health Physics Technician /Radiation Safety Office//Lead Instrumentation Technician / Gamma Spectroscopy Technician

Mr. Berry was contracted to execute company and project specific radiological oversight, while maintaining various databases and programs. Mr. Berry's responsibilities included but were not limited to: instrumentation program management, generating company and site specific standard operating procedures, creation of radiological programs, and radiological materials license package support for clients. Mr. Berry's field duties include: Supervision of radiological technicians at remediation work sites, site characterization with sampling support, waste characterization via gamma spectroscopy to support shipping documentation and waste acceptance criteria, air sampling with database

maintance, field instrumentation repairs and calibrations, general health physics surveys and MARRSIM based release surveys.

1/22/03 – 7/31/05: URS Corporation, Hicksville, NY

Lead Excavation Technician/Lead Instrumentation Technician/ Assistant Radiation Safety Officer/ Health Physics Technician.

GTEOSI Soil Remediation Project

Mr Berry was contracted to participate in initial project efforts by developing radiological operations procedures, implement instrumentation tracking, maintenance, repairs (down to surface component level) and to perform daily response checks. Upon project ramp-up added responsibilities included leading a radiological and geological excavation team to discover, define and sample various uranium and thorium contaminated soil and debris media for on/off site lab analysis while tracking all anomalies via a state plane laser positioning system and/or global positioning system, working with on/off site engineers to achieve excavation depths of 24'-40', escorting various state and government department officials within controlled areas, performing radiological surveys on persons, equipment and soils and performing job coverage.

10/10/02 – 11/20/02 US Ecology/Field Services, Oak Ridge, TN

Subproject Operations Manager/Health Physics Technician

Manufacturing Sciences Corporation waste stream processed at US Ecology Recycle Center

Mr. Berry was contracted to actively oversee and participate in the sorting and segregation of 2.3 million pounds of waste from the MSC/BNFL decommissioning project. Daily activities included but were not limited to: daily instrument response checks, waste survey for restricted release, daily written surveys for all process areas and container storage areas, waste packaging for disposal, decontamination and release of various designed waste containers, incoming and release surveys, incoming/outgoing waste tracking, on-site procurement, process and waste cost tracking, Assisted in the implementation of the Bulk Survey For Release (BSFR) program which reduced unprocessed waste volume designated for Envirocare to less than 5% of the total waste stream.

8/27/02 – 10/9/02: US Ecology/Field Services, Oak Ridge, TN

Decommissioning Team Lead/ Health Physics Technician

Manufacturing Sciences Corporation/BNFL

Mr. Berry was contracted to actively lead a decontamination team to meet stringent contractual deadlines for final survey and license termination of a metal recycle center. Scope of work included the removal, by pneumatic equipment, of various building media (concrete, epoxy and various other high temperature/endurance finishes.

7/18/02 – 8/26/02 US Ecology/Field Services Festus, MO

Project Site Manager/ Health Physics Technician

Westinghouse/Hematite Nuclear Fuel Fabrication Facility

Mr. Berry was contracted to actively manage and participate in the sorting and segregation of a DAW waste stream and conduct a characterization of soil from an aged nuclear fuel fabrication facility. Waste stream contained enriched uranium and TCLP metals. Daily operations consisted of performing waste surveys for process segregation, collecting daily smear samples around and in work/process area, assisting with incoming and release surveys, collected, packaged and delivered all analytical samples to various labs, tracking and controlling project finances/costs, on site procurement, change order negotiations, document control and the implementation of the Bulk Survey For Release (BSFR) program which allows for decreased disposal costs and increased disposal options.

1/9/02 – 7/6/02 US Ecology/Field Services Webster, TX

Assistant Project Manager/Decontamination Technician

Gulf Nuclear Incorporated D&D – EPA Superfund

Mr. Berry was contracted to assist in the broad spectrum of responsibilities involved with the emergency response remediation of a dilapidated source manufacturing facility. Daily activities included but were not limited to: on/off site procurement, project finance/cost tracking, weekly invoice generation and submittal for approval, count room assistant, instrumentation response checks, dosimetry tracking (both whole body and appendage), daily written boundary surveys, daily large area and standard smear collection with field and lab analyzation, collected and packaged all analytical samples for shipment, document control, client relations, large component decontamination and source packaging for both transportation and disposal.

12/5/00 – 1/4/02 Natural Data Knoxville, TN

Eastern Regional Manager

Mr. Berry was promoted and transferred to the Knoxville, Tn location to penetrate the Eastern region market. Startup process consisted of staff selection/training, implementation of information technology systems and the creation of contract employee logs in accordance with federal and state regulation. Day to day operations consisted of maintaining client/vendor relationships through personal selling techniques, presentation solicitation and various after-hours and weekend activities spawned for the purpose of building strong business relationships. Competitive bidding and proposal production was required for authorized business to occur as a sub-contractor to various radiological industry clients including the Department of Energy. Contract negotiations occurred often to define/gather work scopes, deadlines and purchase orders. Areas of staff augmentation included but were not limited to: environmental engineering, radiological and/or chemical decommissioning and electro-mechanical engineering.

4/5/00 – 11/15/01 Natural Data Phoenix, AZ

Head Recruiter

Co-founder and recruiter for the Engineering Services Group (ESG). Daily routine consisted of verifying client needs, prospecting various candidate pools, interviewing qualified candidates, both on phone and on a face to face basis, conducting criminal/credit background surveillance and submitting all state and federal documentation in accordance to mandated hiring practices. Other activities included recruiter/management training, scheduling client meetings with ESG sales staff and employee timecard verification and submittal for payrolling services.

EDUCATION

[redacted] [redacted] [redacted]

Bachelor of Interdisciplinary Studies

- Degree of focus was based on business and psychology studies with minor and audited emphasis in mechanical engineering

QUALIFICATIONS

- Ortec Gamma Spectroscopy Theory and Operation (24 hours)
- Canberra ISOCS Advanced System Operation (40 hours)
- Ludlum Instrument Calibration and Repairs (24 hours)
- DOT Hazardous Materials Shipment Training (40 hours)
- Trimble/Arc Second Laser Positioning System Operation (16 hours)
- Multi-Rae 3/5 gas environ monitoring systems (3 hours)
- RADēCO Air Sampler Theory, Calibration and Repairs (8 hours)

- OSHA HAZWOPER certified (40 hours with current 8 hour refresher)
- OSHA Excavation Training for Competent Persons (4 hours)
- OSHA First Responder Operations (8 hours)
- DOT Hazardous Material Shipment Training/General Worker (4 hours)
- AHA First Aid/CPR Provider with Heartsaver AED (8 hours)
- MS Office Suite

U.S. ARMY CORPS OF ENGINEERS

PROFESSIONAL DEVELOPMENT SUPPORT CENTER
HUNTSVILLE, ALABAMA

CERTIFICATE

This is to certify that

ADAM BERRY

has completed the Corps of Engineers Training Course

CONSTRUCTION QUALITY MANAGEMENT FOR CONTRACTORS

Given at TACOMA, WA (Location) By SEATTLE (Instructional District) April 9, 2009 (Date)

Facilitator

Chief, USACE Professional Development Support Center

THIS CERTIFICATE EXPIRES FIVE YEARS FROM DATE OF ISSUE

APPENDIX B

CONTRACTOR QUALITY CONTROL FORMS

This page intentionally left blank.

TETRA TECH EC, INC.

CONTRACTOR PRODUCTION REPORT

Contract No. N62473-10-D-0809	**Title & Location:**	**Date:**
		Report No.

Contractor:	**Superintendent:**
AM Weather:	**PM Weather:**

Work Performed Today

Work Location & Description	Employer	Number	Trade	Hours

Was a job safety meeting held this date? (If yes, attach a copy of meeting minutes.)	Yes:		Total work hours on site this date:	0.0
	No:			
Were there any lost time accidents this date? (If yes, attach a copy of completed OSHA report.)	Yes:			
	No:		Cumulative work hours from previous report:	
Was trenching/scaffolding/HV electrical/high work done this date? (If yes, attach statement or checklist showing inspection performed.)	Yes:			
	No:			
Was hazardous material/waste released to the environment? (If yes, attach description of incident and proposed action.)	Yes:		Cumulative work hours since start of work:	
	No:			

List safety actions taken today/safety inspections conducted:

Remarks:

Contractor Superintendent

Date

CONTRACTOR PRODUCTION REPORT

Date:

Contract No.	Title & Location:	Report No.
N62473-10-D-0809		0

Rental Equipment	Vendor	PO/MOA#	Charge #	Start Date	Rate	Daily Hrs	P.O.P. Expires

Materials	Vendor	PO #	Charge #	QTY REC'D	ACCUM QTY	P O QTY	P.O.P. Expires

Contractor Superintendent _______________ Date _______________

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

DEFICIENCY NOTICE

TASK ORDER # _____ DN # _____ DATE _____
LOCATION: _____ ROICC / RPM

1. Plan, Procedure, Specification, or Drawing (Clearly state the requirement)

2. Description of Deficiency

QC verification of corrective action required: **Yes** _____ **No** _____

Prepared by: _____ **Approved by:** _____

3. Corrective Action

Organization _____ Signature _____ Date _____

4.
Corrective action verified by: _____ Date _____

Comments:

Program Quality Control Manager _____ Date _____

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

DESIGN CHANGE NOTICE (DCN)

TASK ORDER # _____ DCN # _____ DATE _____

LOCATION _____ NTR / RPM _____

1. Document to be changed. Identify revision, date, section, drawing, etc.

2. Description of Change (Items involved, submit sketch, if applicable): **(Use continuation sheet if necessary)**

Engineering "HOLD" placed on all activities in area defined herein pending receipt of formally revised document(s) and / or DCN.
Released for construction basis of modifications prescribed by this DCN.

3. Reason for Change (Attach additional information if needed)

4. Originator (Print name and sign)		Title	Date
Reviewed by: (Print name and sign)		Title	Date
Task Order Manager (Print name and sign)	Date	Program Quality Manager (Print name and sign)	Date
NTR Acknowledgement (Print name and sign)	Date	RPM Approval (Print name and sign)	Date

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

DESIGN CLARIFICATION REQUEST

TASK ORDER # _____ **DC#** _____ **DATE** _____

Submitted to: _____

1. Document reference. Identify revision, date, section, drawing, etc.

2. Clearly state requirement or describe drawing as shown. (Attach additional info if needed)

3. Information requested or proposed change. (Attach additional information if needed)

4. Response

Does response require an FCR or DCN **YES** ☐ **NO** ☐

FCR ☐ **DCN** ☐

Task Order Manager (Print name and sign)	**Date**

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULITPLE AWARD ACTION CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

FIELD CHANGE REQUEST (FCR)

TASK ORDER # _____ FCR # _____ DATE _____
LOCATION: _____ NTR / RPM _____

1. Document to be changed. Identify revision, date, section, drawing, etc.

2. Description of existing requirement and proposed change (Attach sheet if necessary)

3. Reason for Change (Attach sheet if necessary)

4. Originator: (print name and sign)		**Title**	**Date**
Reviewed by: (print name and sign)		**Title**	**Date**
Site Superintendent (Print name and sign)	**Date**	**Task Order Manager (Print name and sign)**	**Date**
TtEC Program QC Manager (Print Name and Sign)	**Date**	**NTR Acknowledgement (Print name and sign)**	**Date**

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

Initial Phase Inspection Checklist

Task Order No.: _____ Date: _____
Definable Feature: _____ Spec Section: _____

I. Personnel Present:

	Name	Position	Company / Government
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

(List additional personnel on reverse side)

II Identify full compliance with procedures identified at preparatory inspection. Coordinate plans, specifications, and submittals.
Comments:

III Preliminary Work. Ensure preliminary work is complete and correct. If not, what action is taken?
Actions:

IV Establish Levels of Workmanship

1. Where is the work located? _____
2. Is a sample panel required? Yes _____ No _____
3. Will the initial wok be considered as a sample? Yes _____ No _____
   (If yes, maintain in present condition as long as possible.)

V Resolve any differences.
Comments:

VI Check Safety
1. Review job conditions using Site Health and Safety Plan and job hazard analysis.
2. Review job conditions using using EM-385-1-B151.

Initial Phase Inspection Checklist

Comments:

_____
Site CQC Representative

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

MONTHLY REWORK ITEMS LIST

Task Order Number: _____ Project: _____ Date: _____

Number	Identification of item requiring rework	Date Identified	Date Corrected	Remarks

_____
Site CQC Representative Date

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

NONCONFORMANCE REPORT

TASK ORDER # _____ **NCR#** _____ **DATE** _____
LOCATION: _____ **ROICC/RPM**

1. Plan, Procedure, Specification, or Drawing (Clearly state the requirement)

2. Description of Nonconforming Item or Condition

Did nonconforming condition require suspension of work activities Yes ☐ No ☐
If yes, explain requirement to restart work activities: _____

Prepared by: _____ Title _____ Date _____

3. Corrective Action

- ☐ use-as-is
- ☐ repair
- ☐ rework to specificaion
- ☐ other - specify: _____

Comments:

Organization _____ Signature _____ Date _____

NONCONFORMANCE REPORT

4. Evaluation of Proposed Disposition

Evaluator _____ Title _____

Accept	
Accept with comments	
Reject	
Reject with comments	

Comments:

Signature _____ Date _____

Evaluator _____ Title _____

Accept	
Accept with comments	
Reject	
Reject with comments	

Comments:

Signature _____ Date _____

5. Verification

Verification required Yes ☐ No ☐

Verified by: _____ Signature _____ Title _____ Date

Approved by: _____ Program QC Manager _____ Date

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

Preparatory Inspection Checklist

Task Order No.: _____ Date: _____
Definable Feature: _____ Spec Section: _____
NAVFAC SW notification _____ 48 Hours in Advance Yes ____ No ____

I Submittals

1. Review submittals and/or submittal register. Have all applicable submittals been approved?
   Yes _____ No _____

   If No, what items have not been submitted?
   Comments

2. Are all materials on hand? Yes _____ No _____

   If No, what items are missing?
   Comments

3. Check approved submittals against delivered materials. (This should be done as materials arrive.)
   Comments

II Material Storage

Are materials stored properly? Yes _____ No _____

If No, what actions is taken?

III Specifications

1. Review each paragraph of Specification

Preparatory Inspection Checklist

2. Discuss procedure for accomplishing the work.

3. Clarify any differences.

IV Preliminary Work and Permits

Ensure preliminary work is correct and permits are on file. Yes _____ No _____

If No, what action is taken?

V Testing

1. Identify test to be performed, frequency, and by whom.

2. When required?

3. Where required?

4. Review testing play.

5. Has test facilities been approved?

Preparatory Inspection Checklist

VI Safety

1. Review applicable portion of the Task Order Site Health and Safety Plan.
2. Review applicable portion of EM385-1-1.

Comments

3. Activity Hazard Analysis approved? Yes _____ No _____

VIII Navy comments during meeting.

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

Preparatory Inspection Checklist

I. Personnel Present:

	Name	Position	Company / Government
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

(List additional personnel on reverse side)

Site CQC Representative

TETRA TECH EC, INC	REPORT NO:	
NAVFAC SW RADIOLOGICAL EMAC CONTRACT NO. N62473-10-D-0809 SAN DIEGO, CA	PROJECT:	
	PROJECT NO:	
	SUBCONTRACTOR:	
	LOWER TIER SUB:	
CONTRACTOR QUALITY CONTROL REPORT	DATE:	
	TASK:	
	LOCATION	

SEE CONTRACTOR DAILY PRODUCTION SUMMARY REPORT FOR INFORMATION ON SAFETY, WEATHER, SUBCONTRACTOR HOURS AND AREAS OF RESPONSIBILITY:

SUMMARY OF CONSTRUCTION PROGRESS AND QUALITY CONTROL ACTIVITIES PERFORMED:

Tests Performed and Results:

Materials Received:

Deficiencies Noted with Proposed or Implemented Corrective Action:

JOB SAFETY: (LIST OBSERVATIONS)

COMMENTS: ADDRESS ANY CHANGES (FCR/DCN), MEETING RESULTS OR OTHER INFORMATION

Contractor's Verification: On behalf of the Contractor, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications to the best of my knowledge, except as may be noted above.

NAME:	TITLE/COMPANY: PQCM
SIGNATURE:	DATE:

SUBMITTAL REGISTER

Contract Number: N62473-10-D-0809

Task Order: 0013
Project Title: NTCRA for SWDA - Radiological Hot Spot Removal and Building Demolition, IR Site 12

Location: Naval Station Treasure Island
San Francisco, California

Contractor: Tetra Tech EC, Incorporated

								Contractor Action			Approving Authority Action				Contracting Officer / Contractor	
	Specification Section Number	SD No and Type of Submittal Material or Product	Specification Paragraph Number	Classification/ Approval By CO*	Govt. or A/E Reviewer	Transmittal Control No.	Planned Submittal Date	Action Code	Date of Action	Date FWD to Approving Authority Date recd. from Contractor	Date FWD to other Reviewer	Date Received from other Reviewer	Action Code	Date of Action	Mailed to Contractor/ Received from Approving Authority	Remarks
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
1	Base Contract	As-Built Records	5.13.4		NAVY		Upon completion of work									to be included in RACR
2	Base Contract	Combined Contractor Production Report / Contractor Quality Control Report	5.13.1/5.13.2		ROICC		10 a.m. next working day									
3	Base Contract	Testing Plan and Log	5.4		ROICC		Last working day of month									
4	Base Contract	Monthly Summary Report of Field Tests	5.4		ROICC		Last working day of month									
5	Base Contract	Weekly QC Meeting Minutes	6.4.4		NAVY		Two working days after each meeting									
6	Base Contract	Rework Items List	5.13.3		ROICC		With Weekly QC meeting minutes									
7	Base Contract	Contractor Quality Control Report Certification	5.12.1		ROICC		Daily - Included on Daily CQC Report									
8	Base Contract	Invoice Certification	5.12.2		NAVY		End of month concurrent with Invoice									
9	Base Contract	Completion Certification	5.12.3		NAVY		Project Completion									
10	Task Order Contract	Monthly Progress Reports and Sched Updates	SOW 2.1		NAVY		End of month concurrent with Invoice									
11	Task Order Contract	Kick Off Meeting Minutes	SOW 1.5		NAVY		10 days after meeting									
12	Task Order Contract	Community Relations Presentations	SOW 2.2.1		NAVY		As requested									Agendas submitted 48 hours to meeting; minutes within 10 days of meeting
13	Task Order Contract	Regulatory Interaction Presentation	SOW 2.2.2		NAVY		As requested									Agendas submitted 48 hours to meeting; minutes within 10 days of meeting
14	Task Order Contract	Non-Time Critical Removal Action (NTCRA) Work Plan - Internal Draft Draft Final	SOW 2.4.1		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Includes SAP, PCQC Plan, WMP, RPP, RMP as attachments

SUBMITTAL REGISTER

Contract Number: N62473-10-D-0809
Task Order: 0013
Project Title: NTCRA for SWDA - Radiological Hot Spot Removal and Building Demolition, IR Site 12
Location: Naval Station Treasure Island, San Francisco, California
Contractor: Tetra Tech EC, Incorporated

								Contractor Action			Approving Authority Action				Contracting Officer / Contractor	
	Specification Section Number	SD No and Type of Submittal Material or Product	Specification Paragraph Number	Classification/ Approval By CO*	Govt. or A/E Reviewer	Transmittal Control No.	Planned Submittal Date	Action Code	Date of Action	Date FWD to Approving Authority Date recd. from Contractor	Date FWD to other Reviewer	Date Received from other Reviewer	Action Code	Date of Action	Mailed to Contractor/ Received from Approving Authority	Remarks
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
15	Task Order Contract	Sampling and Analysis Plan - Internal Draft Draft Final	SOW 2.3.7		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Attachment to NTCRA Work Plan
16	Task Order Contract	Radiological Protection Plan - Internal Draft Draft Final	SOW 2.3.2		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Attachment to NTCRA Work Plan; called out as a Radiological Safety Plan in SOW
17	Task Order Contract	Contractor Quality Control Plan - Internal Draft Draft Final	SOW 2.3.3		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Attachment to NTCRA Work Plan
18	Task Order Contract	APP/SSHP - Internal Draft Final	SOW 2.3.2		NAVY		60 days after contract award 14 days after Navy comments									
19	Task Order Contract	Environmental Protection Plan- Internal Draft Draft Final	SOW 2.3.5		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Includes SWMP and Dust Mitigation Plan; incorporated into text of NTCRA Work Plan
20	Task Order Contract	Traffic Control Plan - Internal Draft Draft Final	SOW 2.3.10		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Part of NTCRA Work Plan

SUBMITTAL REGISTER

Contract Number: N62473-10-D-0809	Task Order: 0013 Project Title: NTCRA for SWDA - Radiological Hot Spot Removal and Building Demolition, IR Site 12	Location: Naval Station Treasure Island San Francisco, California	Contractor: Tetra Tech EC, Incorporated

								Contractor Action			Approving Authority Action				Contracting Officer / Contractor	
	Specification Section Number	SD No and Type of Submittal Material or Product	Specification Paragraph Number	Classification/ Approval By CO*	Govt. or A/E Reviewer	Transmittal Control No.	Planned Submittal Date	Action Code	Date of Action	Date FWD to Approving Authority Date recd. from Contractor	Date FWD to other Reviewer	Date Received from other Reviewer	Action Code	Date of Action	Mailed to Contractor/ Received from Approving Authority	Remarks
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
21	Task Order Contract	Data Management Plan - Internal Draft Draft Final	SOW 2.3.11		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Part of NTCRA Work Plan
22	Task Order Contract	Demolition Work Procedure - Internal Draft Draft Final	SOW 2.3.4		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Survey of the hot spots included in the NTCRA Work Plan; as buildings less than 35 feet in height, demolition plan not required.
23	Task Order Contract	Data Management Plan - Internal Draft Drarft Final	SOW 2.3.11		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Part of NTCRA Work Plan
24	Task Order Contract	Radiological Management Plan - Internal Draft Draft Final	SOW 2.3.4		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Attachment to NTCRA Work Plan; called out as Radiological Survey Plan in SOW
	Task Order Contract	Waste Management Plan - Internal Draft Draft Final	SOW 2.3.9		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Attachment to NTCRA Work Plan

SUBMITTAL REGISTER

Contract Number: N62473-10-D-0809
Task Order: 0013
Project Title: NTCRA for SWDA - Radiological Hot Spot Removal and Building Demolition, IR Site 12
Location: Naval Station Treasure Island, San Francisco, California
Contractor: Tetra Tech EC, Incorporated

								Contractor Action			Approving Authority Action				Contracting Officer / Contractor	
	Specification Section Number	SD No and Type of Submittal Material or Product	Specification Paragraph Number	Classification/ Approval By CO*	Govt. or A/E Reviewer	Transmittal Control No.	Planned Submittal Date	Action Code	Date of Action	Date FWD to Approving Authority Date recd. from Contractor	Date FWD to other Reviewer	Date Received from other Reviewer	Action Code	Date of Action	Mailed to Contractor/ Received from Approving Authority	Remarks
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
25	Task Order Contract	TSP - Buildings 1121 and 1323 - Internal Draft Draft Final	SOW 2.3.4		NAVY		60 days after contract award 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									Demolition Plan provided under separate cover; TSP called out as a Final Status Survey Plan in SOW
26	Task Order Contract	FSS Report - Hot Spot Removals - Internal Draft Draft Final	SOW 2.5		NAVY		60 days after FSS confirmation sample results are received 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									
27	Task Order Contract	RACR Internal Draft Draft Final	SOW 2.6		NAVY		60 days after building demolition completed 14 days after Navy comments 14 days after receiving Regulator Agencies/public concurrence on draft RTCs									

* Approved by: G - Contracting Officer, Blank - CQC Manager, FI - For Informational Use Only

Action Code: NR - Not Reviewed, AN - Approved as Noted, A - Approved, RR - Disapproved: Revise and Resubmit

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

TEST PLAN and LOG

Task Order Number: CTO 0013 Task Order Manager: Bill Dougherty
Project NTCRA for SWDA Radiological Hot Spot Removal & Building Demolition, IR Site 12 Location: Naval Station Treasure Island

Spec. Section	Paragraph No.	Test Procedure	Test Name	Test Frequency	Test Responsibility	Tested By	Date Completed	Remarks
NTCRA Work Plan	2.3.3.2	ASTM D 6938-10	In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)	1 compaction sample every 50 feet of trench	Physical Laboratory			required each 1 foot lift within 3 feet of final grade
NTCRA Work Plan	2.3.3.2	ASTM D 1556	Optimum Moisture Content and Maximum Density	1 sample every 5000 CYs and per source of backfill material	Physical Laboratory			
NTCRA Work Plan	2.3.3.2	ASTM D 422-63	Grain Size Distribution	1 sample per source of backfill material	Physical Laboratory			
NTCRA Work Plan	2.3.3.1	Visual Inspection	Visual Inspection of Visible Barrier	Visual Inspection upon arrival	PQCM			Material to be permeable, resist deterioration
NTCRA Work Plan	2.3.3.3	Visual Inspection	Visual Inspection of Top Soil	Visual Inspection upon arrival	PQCM			Topsoil to be relatively even mix of clay, silt, and sand, and is free of gravel and large pieces of organic matter (sticks and leaves)
NTCRA Work Plan	2.3.3.3	Visual Inspection	Visual Inspection of Supplier Clean Certification	Visual Inspection upon arrival	PQCM			Topsoil to be certified clean by the supplier.
NTCRA Work Plan	2.3.3.3	Visual Inspection	Visual Inspection of Top Soil Placement	Upon completion of placement	Project Engineer			Approximatelty 2 inches of topsoil to be placed and raked smooth

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

TEST PLAN and LOG

Task Order Number: CTO 0013 Task Order Manager: Bill Dougherty
Project NTCRA for SWDA Radiological Hot Spot Removal & Building Demolition, IR Site 12 Location: Naval Station Treasure Island

Spec. Section	Paragraph No.	Test Procedure	Test Name	Test Frequency	Test Responsibility	Tested By	Date Completed	Remarks
NTCRA Work Plan	2.3.3.3	Visual Inspection	Visual Inspection of Sod (or equivalent) Placement	Upon completion of placement	Project Engineer			Installed over topsoil and thoroughly watered
NTCRA Work Plan	2.3.3.4	Visual Inspection	Visual Inspection of Gravel Material	Visual Inspection upon arrival	Project Engineer			Verify gravel material conforms to Caltrans specfiications and is clean and free of organic matter.
NTCRA Work Plan	2.3.3.4	Visual Inspection	Visual Inspection of Supplier's Certification that Gravel Meets Caltrans Specifications	Visual Inspection upon arrival	Project Engineer			Supplier to certify that gravel material conforms to Caltrans specfiications
NTCRA Work Plan	2.3.3.4	Visual Inspection	Visual Inspection of Gravel Material Placement	Upon completion of placement	Project Engineer			Minimum 4-inch layer of gravel material placed over compacted import fill material
NTCRA Work Plan	2.3.3.5	Visual Inspection	Visual Inspection of Road Base Material	Visual Inspection upon arrival	Project Engineer			Verify road base material conforms to Caltrans specfiications and is clean and free of organic matter.
NTCRA Work Plan	2.3.3.5	Visual Inspection	Visual Inspection of Road Base Placement	Upon completion of placement	Project Engineer			Minimum 6-inch layer of road base material placed over compacted import fill material

TETRA TECH EC, INC.
NAVY RADIOLOGICAL ENVIRONMENTAL MULTIPLE AWARD CONTRACT (Rad EMAC)
CONTRACT NO. N62473-10-D-0809

TEST PLAN and LOG

Task Order Number: CTO 0013 Task Order Manager: Bill Dougherty
Project NTCRA for SWDA Radiological Hot Spot Removal & Building Demolition, IR Site 12 Location: Naval Station Treasure Island

Spec. Section	Paragraph No.	Test Procedure	Test Name	Test Frequency	Test Responsibility	Tested By	Date Completed	Remarks
NTCRA Work Plan	2.3.3.5	Visual Inspection	Visual Inspection of Asphalt	Visual Inspection upon arrival	Project Engineer			Verify asphalt conforms to Caltrans specfiications and is clean and free of organic matter.
NTCRA Work Plan	2.3.3.5	Visual Inspection	Visual Inspection of Supplier's Certification that Road Base Meets Caltrans Specifications	Visual Inspection upon arrival	Project Engineer			Supplier to certify that road base material conforms to Caltrans specfiications
NTCRA Work Plan	2.3.3.5	Visual Inspection	Visual Inspection of Supplier's Certification that Asphalt Meets Caltrans Specifications	Visual Inspection upon arrival	Project Engineer			Supplier to certify that asphalt conforms to Caltrans specfiications
NTCRA Work Plan	2.3.3.5	Visual Inspection	Visual Inspection of Asphalt Placement	Upon completion of placement	Project Engineer			Minimum 4-inch layer of asphalt material placed over road base material

FCR / DCN LOG

Task Order Number: _____

Task Order Name: _____

FCR# / DCN#	DESCRIPTION OF CHANGE	Date Initiated	Status

NONCONFORMANCE REPORT LOG

Task Order Number: _____

Task Order Name: _____

NCR #	DESCRIPTION OF CONDITIONS / ITEMS AFFECTED	DATE				REMARKS
		ISSUE	DISPOSITION / APPROVAL	RE-INSPECTION	CLOSURE	

ATTACHMENT 3

RADIATION PROTECTION PLAN

This page intentionally left blank.

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

CONTRACT NO. N62473-10-D-0809
CTO NO. 0013

ATTACHMENT 3

FINAL

RADIATION PROTECTION PLAN
April 2013

NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

DCN: RMAC-0809-0013-0007

Prepared by:

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

Erik Abkemeier, CHP, PE, CSP, CHMM
Corporate Health Physics Manager

TABLE OF CONTENTS

PAGE

ABBREVIATIONS AND ACRONYMS v

1.0 PURPOSE/INTRODUCTION 1-1
- 1.1 POLICY 1-1
- 1.2 PROJECT-SPECIFIC RADIATION PROTECTION PLAN 1-1
- 1.3 AS LOW AS REASONABLY ACHIEVABLE 1-2
- 1.4 AUTHORIZATION TO STOP WORK 1-2
- 1.5 SCOPE OF WORK 1-2
- 1.6 QUALITY CONTROL AND AUDITING 1-3
  - 1.6.1 Self-Assessment, Management Reviews, and Audits 1-3
  - 1.6.2 Responses and Corrective Actions 1-3
  - 1.6.3 Daily Instrumentation Check 1-3

2.0 RADIATION PROTECTION PERSONNEL 2-1
- 2.1 VICE PRESIDENT FOR ENVIRONMENTAL SAFETY AND QUALITY SERVICES 2-1
- 2.2 LICENSE RADIATION SAFETY OFFICER (CORPORATE HEALTH PHYSICS MANAGER) 2-1
- 2.3 PROJECT RADIATION SAFETY OFFICER REPRESENTATIVE (PROJECT HEALTH PHYSICIST) 2-2
- 2.4 PROJECT MANAGER 2-4
- 2.5 CONSTRUCTION MANAGER/PROJECT SUPERINTENDENT 2-4
- 2.6 RADIOLOGICAL TASK SUPERVISOR 2-5
- 2.7 RADIOLOGICAL CONTROL TECHNICIANS 2-5
- 2.8 RADIATION WORKERS (FIELD PERSONNEL) 2-6
- 2.9 STOP WORK AUTHORITY 2-7

3.0 TASK-SPECIFIC HAZARD ANALYSIS/CONTROLS 3-1
- 3.1 IDENTIFICATION OF RADIATION RISKS 3-1
- 3.2 CONTROLLING DOCUMENTS 3-1
- 3.3 EVALUATION OF POTENTIAL EXPOSURE TO WORKERS 3-1
- 3.4 EVALUATION OF PUBLIC DOSE 3-2
- 3.5 TRAINING PROGRAM 3-2
  - 3.5.1 Site Briefing 3-2
  - 3.5.2 Radiation Worker Training 3-3
  - 3.5.3 Radiological Control Technician Training Qualification 3-3
- 3.6 DECLARED PREGNANT FEMALE WORKER 3-3
- 3.7 AS LOW AS REASONABLY ACHIEVABLE PROGRAM 3-4
- 3.8 EXTERNAL EXPOSURE CONTROL 3-4
- 3.9 INTERNAL EXPOSURE CONTROL 3-4
- 3.10 MONITORING AND MEASURING EXTERNAL EXPOSURE 3-4
- 3.11 MONITORING AND MEASURING INTERNAL EXPOSURE 3-5
- 3.12 SURVEYS AND MONITORING 3-5
  - 3.12.1 Surveys of Equipment and Materials 3-5

TABLE OF CONTENTS
(Continued)

PAGE

3.13 ACTION LEVELS 3-5
3.14 RADIOLOGICALLY CONTROLLED AREAS AND POSTING 3-6
3.14.1 Controlled Area 3-6
3.14.2 Access Control Point 3-6
3.14.3 Radiologically Controlled Area 3-6
3.14.4 Contaminated Area 3-7
3.14.5 High Contamination Area 3-7
3.14.6 Radiation Area 3-8
3.14.7 High Radiation Area 3-8
3.14.8 Airborne Radioactivity Area 3-8
3.15 CONTAMINATION CONTROL 3-9
3.15.1 Physical Boundary 3-9
3.15.2 Entry 3-9
3.15.3 Exit 3-9
3.15.4 Limitations on Entry 3-9
3.15.5 Control of Items 3-9
3.16 INSTRUMENTATION 3-9
3.17 CONTROL OF RADIOLOGICAL WORK 3-10
3.17.1 Radiation Work Permits 3-10
3.17.2 Task-specific Work Instructions 3-10
3.18 CREDENTIALING OF STAFF 3-10
3.19 PROCUREMENT, RECEIPT, AND INVENTORY OF SEALED RADIOACTIVE SOURCES 3-10
3.19.1 Leak Testing 3-11
3.19.2 Transport of Sources 3-11
3.19.3 Reporting Lost, Damaged, or Stolen Sources 3-11
3.20 SHIPPING AND TRANSPORTATION OF RADIOACTIVE MATERIALS 3-11
3.21 CONTROL OF RADIOACTIVE WASTE 3-11
3.22 RADIATION PROTECTION RECORDS 3-12
3.23 REPORTS AND NOTIFICATIONS 3-12
3.24 LICENSES 3-12
3.25 REVIEW AND APPROVALS OF RADIATION PROTECTION PLANS 3-12
3.26 PLANNED SPECIAL EXPOSURES 3-13

4.0 PERSONAL PROTECTIVE EQUIPMENT 4-1
4.1 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT 4-1
4.2 DONNING AND DOFFING OF PERSONAL PROTECTIVE EQUIPMENT 4-1

5.0 DECONTAMINATION PROCEDURES 5-1

6.0 SHIPPING AND TRANSPORTATION OF RADIOACTIVE MATERIALS 6-1

7.0 REFERENCES 7-1

TABLE OF CONTENTS
(Continued)

APPENDICES

Appendix A Radiation Protection Plan Acknowledgement Form

This page intentionally left blank.

ABBREVIATIONS AND ACRONYMS

ALARA	as low as reasonably achievable
APP	Accident Prevention Plan
CDPH	California Department of Public Health
CFR	*Code of Federal Regulations*
CHPM	Corporate Health Physics Manager
DAC	derived air concentration
DON	Department of the Navy
DOT	U.S. Department of Transportation
EHS	environmental health and safety
HRA	Historical Radiological Assessment
MOU	Memorandum of Understanding
NRC	U.S. Nuclear Regulatory Commission
PjM	Project Manager
PPE	personal protective equipment
QC	quality control
Ra-226	radium-226
RASO	Radiological Affairs Support Office
RCA	Radiologically Controlled Area
RCT	Radiological Control Technician
RMA	Radioactive Materials Area
RML	Radioactive Materials License
RPG	Radiation Protection Guidance
RPP	Radiological Protection Plan
RSO	Radiation Safety Officer
RSOR	Radiation Safety Officer Representative
RTS	Radiological Task Supervisor
RWP	Radiation Work Permit
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
TEDE	total effective dose equivalent

ABBREVIATIONS AND ACRONYMS
(Continued)

TIP	Task Initiation Procedure
TtEC	Tetra Tech EC, Inc.
VPESQ	Vice President for Environmental Safety and Quality Services

1.0 PURPOSE/INTRODUCTION

The purpose of this Radiation Protection Plan (RPP) is to detail Tetra Tech EC, Inc's. (TtEC's) requirements for activities conducted under State of California Agreement State Radioactive Materials License (RML) No. 7909-01. The following activities are subject to this RPP: project activities that involve the use and/or handling of licensed by-product, source, and/or special nuclear material (hereafter referred to as radioactive material); tasks with the potential for radioactive material to be present based on available data and historical records; and work in locations posted and controlled because of radioactive material. Project activities will incorporate the requirements within to maintain compliance in parallel with the current version of corporate procedure RP1-1, Radiological Protection Program.

Project activity performance steps are detailed in site-specific Work Plans, e.g., Standard Operating Procedures (SOPs), Work Instructions, and Task-specific Plans. (Agencies that may have jurisdiction or an interest in project activities are also identified in such documents.) Project staff tasked to perform assignments involving the presence of radioactive material (i.e., those identified in the applicable portions of Section 2.0) will complete a review of this RPP and indicate an understanding of all requirements by completing a Radiation Protection Plan Acknowledgement Form (Appendix A).

1.1 POLICY

It is TtEC's policy that work with radioactive material be purposeful and performed in a manner that protects project staff, members of the general public, and the environment. Radiologically oriented work may not begin unless it can be performed in a safe and reliable manner that is compliant with the exposure reduction rules, regulations, and principles described in Section 1.3.

1.2 PROJECT-SPECIFIC RADIATION PROTECTION PLAN

Corporate procedure RP1-1, Radiological Protection Program, provides the foundation for the RPP and its use for any project or activity that involves the possession or use of radioactive materials, including the subsequent potential for exposure to ionizing radiation. Content provided within this RPP reflects corporate policy and provides the guidance needed for project management to execute the scope of work in a safe manner.

Site-specific guidance for radiological safety and control is further detailed in the site-specifc SOPs, which are provided in Appendix A to the Sampling and Analysis Plan. This plan may be revised separately from the RPP. A current copy of the SOPs for each viable project is available upon request. SOPs are subject to approval by the Radiation Safety Officer (RSO) or designee and the Corporate Health Physics Manager (CHPM). The RSO is also the company's CHPM.

1.3 AS LOW AS REASONABLY ACHIEVABLE

Work involving radioactive material and any corresponding exposure to ionizing radiation must be purposeful and performed in a manner sufficient to ensure the protection of staff, members of the public, and the environment. TtEC applies industry recognized principles to radiological work so that exposure to ionizing radiation is maintained in accordance with corporate procedure NLP-01, As Low As Reasonably Achievable (ALARA) Program.

1.4 AUTHORIZATION TO STOP WORK

In accordance with corporate procedure RP1-1, Radiological Protection Program, and as detailed in Section 2.9, employees are authorized to stop work if an unsafe condition exists or safety protocol is being violated, and immediately report the condition to project management.

Work performed under a Radiation Work Permit (RWP) will stop, and the Navy Radiological Affairs Support Office (RASO) will be notified if any of the following atypical work site conditions are encountered:

- An individual total effective dose equivalent (TEDE) exceeding 500 millirems
- The collective TEDE for the job exceeding 1 rem
- Individual airborne exposures exceeding 10 derived air concentration (DAC) hours in a 7-day period
- General area exposure rates exceeding the limits of current radiological posting
- Contamination levels exceeding 100 times the limits requiring classification of an area as a Contaminated Area

In cases where the Department of the Navy (DON) must be notified, the license RSO, with concurrence from the RASO's Radiological Environmental Protection Manager, must approve the RWP prior to restarting work.

1.5 SCOPE OF WORK

The scope of work involves the following activities:

- Task-specific training of personnel
- Site controls and establishment of work zones at sites with, or having the potential for, radioactive commodities or contaminants
- Handling and management of collected radioactive commodities, radiologically contaminated soil, construction and building materials, or other associated radiologically contaminated material
- Site investigation and remediation including characterization surveys and sampling; excavation; demolition; screening for and removal of commodities and building and construction materials; and surveys and sampling to document final conditions

1.6 QUALITY CONTROL AND AUDITING

To maintain continued compliance and evaluate overall RPP effectiveness, quality control (QC) measures including self-assessment and management reviews will be used. Formal audits, including those conducted at field projects, will be coordinated and tracked to completion by the RSO as will any need for adjustments to audit frequencies.

1.6.1 Self-Assessment, Management Reviews, and Audits

A self-assessment and management review of RPP use, as detailed in corporate procedure NLP-08, Radiation Protection Program Audits, will be conducted. Project personnel including the Project Manager (PjM), project Radiation Safety Officer Representative (RSOR), and on-site personnel will support and cooperate with any audit conducted.

1.6.2 Responses and Corrective Actions

Radiological deficiencies must be responded to in a timely fashion. Deficiencies that represent an imminent threat to radiological control or safety (e.g., compromise of procedural protocol) will be immediately reported to the RSOR, RSO, and PjM or designee(s). Subsequent corrective actions will be tracked to completion by the RSO or designee. Radiological deficiencies, including corrective actions, will be promptly reported by the RSO to the DON. Responses to findings will be submitted to the RSO or designee for review, approval, and final disposition.

1.6.3 Daily Instrumentation Check

As addressed in Section 3.16, survey instruments procured for field use will have proof of current calibrations in accordance with the manufacturers' procedures, employing applicable standards and sources traceable to the National Institute of Standards and Technology. Copies of instrument calibration certificates will be maintained on-site for reference. Instruments will be response-checked daily in accordance with applicable SOPs. (In addition to the manufacturers' instruction manuals, typical project instruments and their performance characteristics are identified in site-specific controlling documents such as a site-specific Radiological Management Plan.)

This page intentionally left blank.

2.0 RADIATION PROTECTION PERSONNEL

This section details the radiological safety responsibilities vested with key personnel within the project. (Nonradiological safety responsibilities are detailed in a separate project-specific Accident Prevention Plan [APP]/Site Safety and Health Plan [SSHP]. Reporting relationships between TtEC support personnel and the DON will be referenced in a site-specific controlling document as well (e.g., site-specific Work Plan).

2.1 VICE PRESIDENT FOR ENVIRONMENTAL SAFETY AND QUALITY SERVICES

The Vice President for Environmental Safety and Quality Services (VPESQ) has overall responsibility for TtEC's safety operations. The VPESQ is responsible for:

- Ensuring proper maintenance of the RPP consistent with applicable regulatory mandates, TtEC corporate policy, and recognized industry practice
- Establishing and maintaining all necessary management oversight specific to the RPP
- Implementing a management review process to ensure applicable use of RPP requirements

2.2 LICENSE RADIATION SAFETY OFFICER (CORPORATE HEALTH PHYSICS MANAGER)

The CHPM (also referred to as the RSO) is appointed by the VPESQ as the senior health physicist and the Health Physics Resource Manager for TtEC. The CHPM is responsible for:

- Reviewing and making recommended revisions to:
  - The RPP, RML procedures, radiation protection guidelines, and supporting documents
  - Project plans involving the use or handling of radioactive materials or access to areas of radiological concern to ensure compliance with RPP requirements and supporting guidelines
- Acting as the Health Physics Resource Manager, also referred to as the corporate-level or license RSO
- Designating a Project Health Physicist, also referred to as the project-level RSOR, to provide day-to-day guidance on radiological protection issues
- Compliance, as the license RSO, with RML No. 7909-01 including:
  - Primary point of contact for all communications to the Nuclear Regulatory Commission (NRC) and California Department of Public Health (CDPH)
  - Identification and training of RML authorized users

- Assignment of project RSORs
- Coordination of investigations involving radiological occurrences to include review and approval of a resulting Corrective Action Plan
- Advance CDPH notification in writing at least 14 days before initiating at a temporary job site under TtEC RML jurisdiction any activity, or change to scope involving new activities, in areas of radiological concern (excluding routine packaging or repackaging for purposes of transporting and not requiring a job- or site-specific work package, and characterization and/or final surveys where radioactive materials and/or radiation are not likely to be detected)
- Refrain from taking ownership of licensed materials in excess of possession limits without prior notification and written CDPH approval
- Advance CDPH notification in writing within 30 days of the temporary job site completion status involving decontamination and decommissioning activities, and disposition of any licensed material as related to RML jurisdiction
- Placement of reciprocity request with applicable Agreement States when necessary
- Maintenance of radiological exposure records
- Development and/or approval of radiation safety training materials and/or courses
- Performance of program audits as detailed in corporate procedure NLP-08, Radiation Protection Program Audits
- Providing guidance on radiological protection issues
- Identification of appropriate project staffing needs to implement RPP requirements
- Assistance with the development of site Environmental Health and Safety (EHS) plans and approval of EHS plans for projects that involve the use or handling of radioactive materials or access to areas of radiological concern
- Resource Specialist review for Task Initiation Procedures (TIPs) for proposed projects involving exposure to radiation or radioactive materials

• Delegating project responsibilities to other company health physicists (also referred to as RSORs), as necessary

2.3 PROJECT RADIATION SAFETY OFFICER REPRESENTATIVE (PROJECT HEALTH PHYSICIST)

The project RSOR, also referred to as the Project Health Physicist, is assigned by the RSO and vested with corporate-level authority to implement the RPP and the TtEC RML at a project site. Whenever radiological work is actively ongoing under the TtEC RML, the RSOR or designee identified as an authorized user will be present at the project site. The RSOR is vested with the following responsibilities at projects subject to jurisdiction involving the TtEC RML:

- Providing health physics guidance on an as-needed basis
- Conducting required radiological safety training
- Reviewing and approving project field procedures that involve the handling of radioactive materials or access to areas of radiological concern
- Conducting radiation incident investigations and project inspections
- Maintaining a project site file that details radiological protection training provided, dosimetry records generated, radiological surveys performed, and other documentation pertinent to the RPP, RML procedures, radiation protection guidelines, and supporting documents; copies of these will be provided to the CHPM at the conclusion of the project
- Arranging for and assisting in program radiation protection audits as detailed in the most current version of corporate procedure NLP-08, Radiation Protection Program Audits
- Assisting in the development and approval of the site EHS plan
- Helping in the identification of project radiological analysis needs and selection of analytical support contractors
- Coordinating required ALARA reviews
- Ensuring appropriate staff work practices are employed to maintain occupational radiation exposures ALARA
- Ensuring items needed to perform work in accordance with the RPP, RML, and supporting documents are available, such as appropriate instrumentation, protective devices, dosimetry, etc.
- Directing the preparation of, and performing the review and approval of, RWPs
- Stopping work if necessary to ensure radiological safety
- Communicating with the PjM and RSO as needed to ensure the RPP is implemented correctly
- Ensuring proper operation of radiation-measuring equipment, including the performance of daily function and QC tests, and removing out-of-compliance instruments from service
- Maintaining radiation-measuring equipment in accordance with manufacturers' recommendations
- Directing and supervising the performance of radiological surveys and sampling in accordance with the most current version of this RPP and supporting TtEC SOPs
- Reviewing survey reports and instrument performance data for accuracy, completeness, and compliance with project, procedural, and regulatory requirements
- Ensuring work is performed in accordance with current versions of project plans, procedures, and the RPP

The project RSOR reports to and receives technical direction from the RSO, advises the PjM on radiation protection and radiological operation matters, coordinates with the PjM on day-to-day project activities, and communicates and coordinates radiation protection and radiological operation activities with the RSO and the client. Company Health Physicists (also referred to as RSORs) may delegate project responsibilities to other staff members deemed qualified for the task assigned.

2.4 PROJECT MANAGER

The PjM is responsible for:

- Ensuring implementation of and compliance with the RPP requirements and current versions of the following support documents applicable to the project:
  - TtEC RML procedures (i.e., applicable State of California Agreement State Procedures)
  - TtEC Radiation Protection Guidance (RPG) documents
- Forwarding any TIP or modified TIP involving exposure to ionizing radiation or radioactive material to the RSO or designee for input and review (involvement includes the use of subcontractors who may use radioactive materials or radiation-generating devices in the course of corresponding work such as field radiography, soil density gauges, well logging, etc.)
- Determining with the assistance of the RSO or designee if the project is required to use the TtEC RML or other license
- The safe conduct of work in compliance with all permits, client contracts, and other controlling documents that apply
- Exposure to radiation ALARA by project staff
- Adequate resources and staffing to develop and implement this RPP in compliance with applicable regulations and requirements

The PjM reports to the TtEC Program Manager.

2.5 CONSTRUCTION MANAGER/PROJECT SUPERINTENDENT

Responsibilities for the Construction Manager/Project Superintendent include:

- Ensuring assigned personnel comply with radiological requirements
- Supplying relevant information to the RSOR regarding planned work activities and proposed applications necessary to maintain occupational radiation exposures ALARA
- Timely RSOR and PjM notification of radiological problems or issues encountered
- Verifying staff is sufficiently prepared for assigned tasks (e.g., appropriate tools and equipment needed to minimize the time spent in areas of radiological concern)

- Confirming that escorted visitors accessing areas of radiological concern are properly supervised and exhibiting safe work practices in accordance with RPP protocol

The Construction Manager/Project Superintendent reports to the PjM.

2.6 RADIOLOGICAL TASK SUPERVISOR

The Radiological Task Supervisor (RTS) is the TtEC representative responsible for Radiological Control Technician (RCT) oversight and corresponding field operations conducted in areas of radiological concern. Designated as an authorized user at projects subject to jurisdiction under the TtEC RML, the RTS is vested with the following responsibilities:

- Supporting required ALARA reviews
- Coordinating plans for field activities with the Construction Manager/Project Superintendent to ensure exposure to radiation is maintained ALARA and in accordance with corresponding RWPs
- Supervising the preparation of, and performing review of, RWPs
- Stopping work if necessary to ensure radiation safety
- Maintaining communication with the RSO, RSOR, PjM, Construction Manager, and Project Superintendent as needed to ensure the RPP is fully implemented
- Confirming proper operation of radiation survey instruments, including the validation of daily function and QC checks, and removing noncompliant instruments from service
- Ensuring radiation survey instruments are maintained in a way that complies with manufacturer instructions and recommendations
- Directing and supervising the performance of radiological survey and sampling practices in accordance with the RPP, current versions of applicable SOPs, and corresponding RWPs
- Validating field survey reports and instrument performance data for accuracy, completeness, and compliance with the RPP, applicable SOPs, and corresponding RWPs
- Participating in periodic internal and external reviews of RPP content and implementation
- Supporting self-assessments and management reviews as needed and correcting identified deficiencies within the allotted time frame

The RTS reports to and receives technical direction from the RSOR.

2.7 RADIOLOGICAL CONTROL TECHNICIANS

The RCTs are responsible for:

- Ensuring occupational exposure to radiation is maintained ALARA

- RWP preparation, use, and adherence
- Stopping work if necessary to ensure radiological safety
- Performing radiation surveys and other radiological safety tasks in accordance with the RPP, applicable SOPs, and corresponding RWPs
- Confirming proper operation of assigned radiation survey instruments prior to field use to include verification of daily function and QC performance checks, and removing noncompliant instruments from service
- Using radiation survey instruments in accordance with the RPP, applicable SOPs, and corresponding RWPs and maintaining the instruments in a way that complies with manufacturers' instructions and recommendations

The RCTs report to and receive technical direction from the RTS.

2.8 RADIATION WORKERS (FIELD PERSONNEL)

Project staff (including the general labor force associated with TtEC and subcontractors) who have the potential to receive occupational exposure to radiation while on the job site, and who are expected to work under the requirements of this RPP as radiation workers, will:

- Receive sufficient training, prior to beginning work, in accordance with the most current version of corporate document RPG 2-5, Radiation Safety Training.
- Report to the RTS or RCT non-occupational radiation exposures that result from the use of medical or dental applications more aggressive than a standard X-ray.
- Comply with requirements of all procedures and guidelines applicable to the project.
- As required, exercise stop work authority and report radiological safety issues or concerns, including incidents and unplanned events, immediately to project management and Environmental Safety and Quality staff in writing, verbally, or with a Zero Incident Performance® slip; respond promptly to any stop-work and/or evacuate orders.
- Display use of industry recognized radiological work practices when inside areas of radiological concern, and conform promptly to instructions when provided by RCTs.
- Strictly adhere to radiological control procedures, guidelines, and postings including information provided in RWPs.
- Immediately report lost dosimetry devices to the RCT.
- Report planned medical radiation treatments in advance to supervision and the project RSOR and prior to entering areas of radiological concern or wearing dosimetry.
- Periodically confirm personal radiation exposure status and ensure that administrative dose guidelines are not exceeded.
- Notify the RCT of faulty or alarming radiological protection equipment.

When in areas of radiological concern, workers report to the RTS.

2.9 STOP WORK AUTHORITY

Company and subcontractor personnel will have the responsibility and authority to stop work when controls are inadequate or imminent danger exists.

In any situation in which stop work authority is used, the following requirements will apply:

- Exercise stop work authority in a justifiable and responsible manner.
- Once work is stopped, do NOT resume until proper controls have been established.
- Resumption of work will require concurrence by the PjM or designee.

This page intentionally left blank.

3.0 TASK-SPECIFIC HAZARD ANALYSIS/CONTROLS

A task-specific hazard analysis is performed on a daily basis to allow for risk identification associated with site work, including physical, chemical, and radiological components. (Radiation exposures that result from naturally occurring background sources and medical applications conducted under the care of a physician are examples of dose that is independent of occupational monitoring requirements but considered when planning task assignments. In instances of verifiable therapeutic applications, employee-furnished notifications will be used as an informational reference and included as part of a corresponding radiation exposure file.) Risk-based hazards and controls are defined in a site-specific Activity Hazard Analysis. Anticipated physical and chemical risks are described in detail in the project-specific APP/SSHP. Radiological risk controls are categorized in the sections to follow, and protective measures apply as defined in task-specific RWPs and corresponding SOPs.

3.1 IDENTIFICATION OF RADIATION RISKS

Project tasks subject to RPP protocol indicate a known or suspected likelihood of activities occurring in radiologically impacted areas (e.g., locations with sources of radium-226 [Ra-226], areas with similar radionuclides of concern as identified in a site-specific Historical Radiological Assessment [HRA]).

3.2 CONTROLLING DOCUMENTS

Unless indicated otherwise in Section 1.0, work conducted under the RPP will be subject to requirements detailed in TtEC RML No. 7909-01 and in accordance with any project-specific Memorandum of Understanding (MOU) criteria and applicable radiological control work documents (e.g., site-specific Radiological Management Plan, SOPs). TtEC will incorporate site-specific versions of SOPs as needed to implement and satisfy license commitments. Title 10 of the *Code of Federal Regulations* (CFR) Section 20 applies to the RPP standards used. In parallel, industrial safety requirements and U.S. Environmental Protection Agency regulations detailed in 29 and 40 CFR also have applicability for a variety of regulatory subjects including Comprehensive Environmental Response, Compensation, and Liability Act; the Resource Conservation and Recovery Act; and the National Emission Standards for Hazardous Air Pollutants.

3.3 EVALUATION OF POTENTIAL EXPOSURE TO WORKERS

RPP dose limits for the control of occupational exposure to ionizing radiation are listed in 10 CFR 20.1201 to 1208. Dose limits for individual members of the pubic are detailed in 10 CFR 20.1301 to 1302. In accordance with company policy, all exposures will be minimized to the extent practical. Administrative guidelines, established below the federal limits, will be used as detailed in the current version of corporate procedure NLP-01, As Low As Reasonably

Achievable (ALARA) Program. Occupational exposures for project personnel will be maintained below TtEC administrative values for annual TEDE.

Occupational dose, if any, is expected to originate from external sources (e.g., Ra-226,). Dose resulting from internal exposures is not anticipated. External exposure controls are addressed in Section 3.8, and controls to prevent or limit internal exposures are detailed in Section 3.9. Dose rates for general area work sites are expected to reflect naturally occurring background values.

3.4 EVALUATION OF PUBLIC DOSE

Based on the scope of planned work, the limited activity of radionuclides expected, and low concentration of naturally occurring radioactive material anticipated, public dose associated with tasks performed under this RPP is not projected. To validate the maintenance of public dose goals, TtEC will implement necessary survey and sampling protocol in areas of intrusive work, conspicuously post and restrict access to intrusive work locations that require monitoring (e.g., areas where soil excavations and/or handling may disturb sources of radioactive material), and validate survey and sampling results and frequencies with the RASO, RSO, RSOR, and RTS representatives to ensure established controls are effective.

3.5 TRAINING PROGRAM

Site personnel tasked to conduct project-oriented activities must satisfy corresponding APP/SSHP training requirements. Persons subject to assignments involving a known or suspected potential for occupational radiation dose will receive additional training commensurate with radiological awareness requirements as defined in 10 CFR 19.12, Instructions to Workers. Visitors and escorted persons must receive a site briefing and will be assigned to a qualified radiation worker aide when in an area of radiological concern.

3.5.1 Site Briefing

An RPP site briefing is designed for an escorted person and is presented when access is needed to radiologically impacted locations. Specific to the area(s) of concern where access is needed, the RPP brief will cover at a minimum:

- Applicable portions of 10 CFR 19, 10 CFR 20, the RPP, RWPs, site-specific reference documents (e.g., HRA), and supporting SOPs
- A description of radiation exposure risks and monitoring requirements
- Access and egress protocol specific to the radiologically impacted location(s) requiring entry
- Radiation exposure reduction techniques for an embryo/fetus
- Completion of applicable briefing/exposure monitoring documentation
- Notification of contacts as needed to complete training requirements

3.5.2 Radiation Worker Training

RPP training for the radiation worker is provided when unescorted access is needed to impacted site locations subject to radiological control. Inclusive of material that may be required by project-specific Work Plans and documents (e.g., APP/SSHP, Task-specific Plans), training may be presented as a group overview, video presentation, or other format, with use of printed handouts approved by the RSOR. Training will address at a minimum:

- Applicable portions of 10 CFR 19, 10 CFR 20, the RPP, site-specific reference documents (e.g., the HRA), and supporting SOPs specific to task performance
- A description of radiation exposure risks, monitoring requirements, and techniques
- Access and egress protocol specific to radiologically impacted locations
- Required contacts and expected actions in the event of an emergency (in accordance with the current version of corporate procedure NLP-06, Managing Radiological Emergencies)
- Expected actions and contacts if radioactive material is discovered in an area where it is not expected
- Understanding "hands and feet" and "whole body" monitoring requirements
- Risks with radioactive material and radiation-producing devices unique to the site
- ALARA work principles and techniques
- Understanding the requirements for and compliance with RWPs including protocol for dosimetry and personal protective equipment (PPE)
- Radiation exposure reduction techniques for the embryo/fetus
- Completion of applicable training and exposure monitoring documentation
- Notification of contacts as needed to complete training requirements

3.5.3 Radiological Control Technician Training Qualification

As coordinated between the RSO and RSOR, TtEC will evaluate and ensure acceptable qualification of RCTs. When selected for project assignment, RCT qualifications are evaluated between the RSO and RSOR in accordance with the requirements detailed in California Agreement State RML No. 7909-01. Project-specific training is provided to RCTs commensurate with anticipated duties and assignments.

3.6 DECLARED PREGNANT FEMALE WORKER

To maintain embryo/fetus radiation exposure ALARA, female employees who are pregnant or attempting to become pregnant are encouraged to declare this information to project management in writing to allow for criteria to be exercised as detailed in:

- 10 CFR 20.1208, Dose Equivalent to an Embryo/Fetus

- NRC Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure, Revision 3, Washington, DC (NRC 1999)
- NRC Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure, Revision 1, Washington, DC (NRC 1996)

Because of the small anticipated annual dose for workers associated with project activities (i.e., less than 10 millirems/year) it is unlikely in instances of pregnancy that separate dose tracking for the embryo/fetus will be necessary. Managing occupational exposures for all staff within annual TtEC administrative TEDE guidelines is expected to satisfy maintenance of less than 500 millirems total dose for any pregnant female worker over the course of an entire gestation period.

3.7 AS LOW AS REASONABLY ACHIEVABLE PROGRAM

TtEC is committed to maintaining radiation exposure to workers and the public as far below company guidelines and regulatory limits as practical. RPP requirements are established for field operations in an effort to meet that commitment in accordance with the current version of corporate procedure NLP-01, As Low As Reasonably Achievable Program.

3.8 EXTERNAL EXPOSURE CONTROL

The following steps will be taken to control external radiation exposure to levels that are ALARA:

- Employ basic dose reduction strategies as detailed in corporate procedures and site-specific SOPs using the ALARA concepts of time, distance, and shielding.
- Use instruments at frequencies sufficient to accurately determine the level and extent of radiation fields.
- Present adequate staff training to ensure the ability to recognize situations involving objects that might be radioactive, to be wary of objects that are unfamiliar, and to rely on valid instrument readings to limit and safely manage external exposure.

3.9 INTERNAL EXPOSURE CONTROL

Internal exposure is expected to be below all the recognized DAC values as specified in 10 CFR 20. Should the potential for internal dose be confirmed during fieldwork (e.g., due to the nature of the planned activity such as remediation efforts), the activity will be temporarily suspended and the work area secured pending determination and use of corrective protocol as decided among the RSO, RSOR, and PjM.

3.10 MONITORING AND MEASURING EXTERNAL EXPOSURE

A vendor accredited by the National Voluntary Laboratory Accreditation Program will be used to provide project-related dosimetry services. Dosimetry applications and considerations will apply to field staff designated as radiation workers (i.e., personnel needing unescorted access to

impacted site locations subject to radiological control). Prior to dosimetry issue, a radiation worker will have satisfactorily completed requirements as detailed in Section 3.5.2.

3.11 MONITORING AND MEASURING INTERNAL EXPOSURE

The monitoring of work practices conducted in areas of radiological concern will be coordinated among the RCTs, RTSs, and members of project management designated as radiation workers using frequencies necessary to confirm the application of correct techniques and PPE to minimize potential transfer of external contaminants inside the body.

Air sampling will be performed during intrusive activities conducted in areas of radiological concern. Air sample results will be reviewed and tracked among the RSO, RSOR, RTS, and designated RCTs to determine whether trends (e.g., concentrations greater than 10 percent of DAC) exist that require work stoppage and/or re-engineering of task-specific contamination controls.

3.12 SURVEYS AND MONITORING

A project-based summary of historic survey and monitoring information is typically available in site-specific documentation (e.g., an HRA or Work Plan). Protection of workers, the public, and the environment depends on accurate assessment and interpretation of past historical information as compared to present-day survey data collected in accordance with prescribed procedures and project support documents.

In situations subject to this RPP, guidance for determining survey frequency and technique is detailed in applicable portions of corporate procedures NLP-04, Radiological Entry Control Program; NLP-05, Radioactive Contamination Control; RPG 2-9, Radiological Surveys and Operational Checks; and SOP 001, Radiation and Contamination Surveys.

3.12.1 Surveys of Equipment and Materials

Equipment and material passing through areas controlled for radiological concern will be subject to survey criteria and techniques detailed in applicable portions of corporate procedure NLP-05, Radioactive Contamination Control, and SOP 003, Release of Materials and Equipment from Radiologically Controlled Areas.

3.13 ACTION LEVELS

Action levels represent transition points at which concentrations of radioactivity require additional response and/or investigation (e.g., PPE upgrades or increased work technique controls). Action levels for radiological controls are detailed in corporate procedure NLP-01, As Low As Reasonably Achievable (ALARA) Program; NLP-04, Radiological Entry Control Program; and SOP 012, Radiologically Controlled Areas Posting and Access Control. Modification to project-specific action levels requires concurrence from the DON.

3.14 RADIOLOGICALLY CONTROLLED AREAS AND POSTING

Site structures, outdoor locations, and/or perimeter boundaries posted with yellow and magenta markings are established to identify areas designated for radiological control, prevent (to the extent practical) access by unauthorized persons, and protect members of the public from exposure to radiation. A description of scenarios and postings employed for control purposes are detailed in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program, and SOP 012, Radiologically Controlled Areas Posting and Access Control.

3.14.1 Controlled Area

A Controlled Area may be established where access to impacted portions of a work site requires specialized qualification and approval. A Controlled Area (which may also be called a Restricted Area) is intended to serve as the outermost boundary around planned and established work zones.

Controlled Area access requires prior authorization and use of PPE as defined in a project specific APP/SSHP. Visitors must have requisite training as specified in an SSHP. Personnel who enter a Controlled Area may not cross into more restrictive areas posted within unless prior authorization is obtained.

Where the perimeter to a Controlled Area is first encountered for radiological purposes, posting applications will have the wording "Caution Controlled Area" (or Restricted Area) and provide a contact phone number. (Supplemental information as specified by the RSOR or designee may also be included as magenta [preferred], purple, or black markings on a yellow [preferred] or white background). A minimum of one sign will be posted on each straight run of the Controlled Area (or Restricted Area) boundary. Note that areas not typically accessed by pedestrians (e.g., windows) need not be posted. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.2 Access Control Point

When used, an Access Control Point is part of a Controlled Area (or Restricted Area) boundary. Intended to serve as a transition corridor, an Access Control Point allows for the accountability of personnel, tools, and equipment that pass through. When established as a radiological control mechanism, an Access Control Point RCT will be present any time activities within are ongoing. During periods of inactivity, control point gates (part of the contiguous area boundary) are closed and locked.

3.14.3 Radiologically Controlled Area

A Radiologically Controlled Area (RCA) represents an area containing radioactive materials in excess of the levels provided in Table 1 of SOP 012, Radiologically Controlled Areas Posting and Access Control. An RCA is an area to which access is controlled to protect individuals from

exposure to ionizing radiation. It is intended to include (for posting purposes) the nearest boundary or perimeter associated with the affected area. RCA restrictions and corresponding access protocol can be found in SOP 012, Radiologically Controlled Areas Posting and Access Control.

When used, a minimum of one sign will be posted on each straight run of the RCA boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary. For waterfront areas, signs should be posted at areas accessible by watercraft.

3.14.3.1 Radioactive Materials Area

A Radioactive Materials Area (RMA) identifies any designated area where radioactive materials are stored or used. An RMA is intended to warn of the potential for occupational dose. A description of RMA scenarios and postings employed for control purposes can be found in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program, and SOP 012, Radiologically Controlled Areas Posting and Access Control.

When used, a minimum of one sign will be posted on each straight run of the RMA boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.4 Contaminated Area

A Contaminated Area is any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed the removable surface contamination values specified in Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors (AEC 1974), but do not exceed 100 times those values. Contamination is radioactive material that is deposited on a surface where it is unwanted. Subject to license control, a description of Contaminated Area scenarios and postings employed for control purposes can be found in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program, and SOP 012, Radiologically Controlled Areas Posting and Access Control.

When used, a minimum of one sign will be posted on each straight run of the RCA boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.5 High Contamination Area

A High Contamination Area is any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed 100 times the removable surface contamination values specified in Regulatory Guide 1.86 (AEC 1974).

When used, a minimum of one sign will be posted on each straight run of the High Contamination Area boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.6 Radiation Area

A Radiation Area means any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates. A description of Radiation Area scenarios and postings employed for control purposes can be found in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program, and SOP 012, Radiologically Controlled Areas Posting and Access Control.

When used, a minimum of one sign will be posted on each straight run of the Radiation Area boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.7 High Radiation Area

A High Radiation Area means any area, accessible to individuals, in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.1 rem (0.001 sievert) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates. A description of High Radiation Area scenarios and postings employed for control purposes can be found in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program, and SOP 012, Radiologically Controlled Areas Posting and Access Control.

When used, a minimum of one sign will be posted on each straight run of the High Radiation Area boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.14.8 Airborne Radioactivity Area

An Airborne Radioactivity Area is a room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations:

- In excess of the DACs specified in Appendix B to 10 CFR 20.1001–20.2401, or
- To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake or 12 DAC hours.

As an example, for Ra-226, the most likely airborne contaminant at Navy radiological remediation projects, the applicable DAC value is 3.0E-10 microcuries/milliliter. A description of Airborne Radioactivity Area scenarios and postings employed for control purposes can be found in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program, and SOP 012, Radiologically Controlled Areas Posting and Access Control.

When used, a minimum of one sign will be posted on each straight run of the Airborne Radioactivity Area boundary. Additional signs should be placed at approximately 30-meter intervals on long runs of any boundary.

3.15 CONTAMINATION CONTROL

Contamination control practices are established to preclude the spread of contaminants into uncontrolled areas. Recognized applications are detailed in corporate procedure NLP-05, Radioactive Contamination Control.

3.15.1 Physical Boundary

A physical boundary will be established using criteria referenced in Section 3.14.4 to fully enclose a location established as a Contaminated Area.

3.15.2 Entry

Entry into a Contaminated Area will be compliant with pre-established requirements as detailed on a job-specific RWP. In such instances, an RCT will be present to assist in radiological control and support. (See Section 3.17.1 for details related to RWP use.)

3.15.3 Exit

Exit from a Contaminated Area will be compliant with pre-established requirements as detailed on a job-specific RWP. In such instances, an RCT will be present to assist in radiological control and support. (See Section 3.17.1 for details related to RWP use.)

3.15.4 Limitations on Entry

Personnel with open wounds or sores are not generally granted access into a Contaminated Area. Entry may be authorized by the RSOR or designee, on a case-by-case basis, if appropriate protection of the wound or sore is verified, planned work activities are unlikely to compromise the protection, and there is no other medical reason to restrict entry.

Jewelry and personal items are not allowed in Contaminated Areas; only project furnished tools, materials, and equipment necessary to accomplish the planned task are acceptable. Container wrappings, packing, and similar materials must be segregated from essential items prior to entry.

3.15.5 Control of Items

Items such as equipment and tools to be removed from a Contaminated Area must meet unconditional release criteria as detailed in applicable portions of corporate procedure NLP-05, Radioactive Contamination Control, and SOP 003, Release of Materials and Equipment from Radiologically Controlled Areas.

3.16 INSTRUMENTATION

As detailed in applicable portions of corporate procedure RPG 2-9, Radiological Surveys and Operational Checks, field survey instruments will be calibrated annually at a minimum in

accordance with the manufacturers' specifications. Instruments will be removed from service on or before calibration due dates and returned to the supplier for recalibration.

3.17 CONTROL OF RADIOLOGICAL WORK

All radiological work activities will be planned in consultation with the RSOR, the PjM, and other project personnel tasked with oversight responsibilities. Work performed in areas of radiological concern require establishment of an RWP, which details radiologically based requirements and protective measures.

3.17.1 Radiation Work Permits

RWPs detail the protective measures and controls needed to perform tasks in areas of radiological concern. Information considered during RWP development is detailed in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program, and SOP 010, Issue and Use of Radiation Work Permits.

3.17.2 Task-specific Work Instructions

Task-specific work instructions are used to supplement RWP requirements and address in greater detail corresponding activities planned while personnel are inside areas of radiological concern. These instructions are required for tasks scheduled to occur in locations as determined by the PjM, RSO, RSOR, or the Construction Manager. The RSO or designee will finalize, control, and issue radiologically based work instructions.

3.18 CREDENTIALING OF STAFF

Qualification and training requirements for RCTs are provided in TtEC RML No. 7909-01 and as detailed in applicable portions of corporate procedure RPG 2-5, Radiation Safety Training. The RSO verifies qualifications and conducts required license-specific training with any RSOR designated on the license as an authorized user.

To supplement and validate the correct use and implementation of this RPP and TtEC RML No. 7909-01, a Health Physicist certified by the American Board of Health Physicists provides support to active field projects.

3.19 PROCUREMENT, RECEIPT, AND INVENTORY OF SEALED RADIOACTIVE SOURCES

It is not anticipated that field projects will receive radioactive material shipments other than exempt-quantity radioactive check sources. As detailed in corporate procedures NLP-02, Radioactive Material Accountability, and NLP-03, Sealed Radioactive Source Control, check sources are controlled, stored, posted, and managed as radioactive material.

3.19.1 Leak Testing

Radioactive sealed sources with quantities exceeding the licensable threshold will be leak-tested as detailed in applicable portions of corporate procedures NLP-02, Radioactive Material Accountability, and NLP-03, Sealed Radioactive Source Control.

3.19.2 Transport of Sources

Check sources will be used on field projects only for the period of time necessary to execute planned work, will not be introduced onto a project location prior to project initiation, and will be returned to the provider immediately following the completion of planned field activities.

Check sources will be maintained as detailed in applicable portions of corporate procedures NLP-02, Radioactive Material Accountability, and NLP-03, Sealed Radioactive Source Control.

3.19.3 Reporting Lost, Damaged, or Stolen Sources

As detailed in applicable portions of corporate procedures NLP-02, Radioactive Material Accountability, and NLP-03, Sealed Radioactive Source Control, if a check source is lost, damaged, or stolen, the event will be reported immediately to the RSOR or designee. The RSOR will immediately notify the RSO, the PjM, and the DON and initiate appropriate recovery actions. In consultation with the DON, a report will be filed by the RSO or designee with the appropriate law enforcement agency if it is determined that radioactive material was stolen. The RSO will make any necessary notifications to the NRC and the CDPH.

3.20 SHIPPING AND TRANSPORTATION OF RADIOACTIVE MATERIALS

Off-site shipment of radioactive materials other than exempt-quantity radioactive check sources by TtEC is not anticipated. Information pertinent to an authorized shipper for a field project is provided in Section 6.0.

3.21 CONTROL OF RADIOACTIVE WASTE

Radioactive waste will be minimized by compliance with contamination control practices (Section 3.15) combined with segregation and survey practices. A waste shipment provider contracted to the DON through the Army Joint Munitions Command will provide brokerage services including waste characterization sampling, waste containers, and transportation of radioactive materials/waste generated from a field project. Soil and used PPE will typically be processed for final disposition in disposal bins. When filled, bins will be transferred to the custody and control of the authorized shipper.

As detailed in corporate procedure NLP-02, Radioactive Material Accountability, and SOP 008, Control of Radioactive Material, commodities are stored in a locked radioactive materials storage area, controlled by the RSOR or designee, and will periodically be packaged and

transferred to the authorized shipper for disposal. Radioactive material will be packaged, stored, shipped, and disposed of as required by U.S. Department of Transportation (DOT) regulations.

3.22 RADIATION PROTECTION RECORDS

As detailed in the applicable portions of corporate procedure NLP-07, Radiological Protection Records, the RSO or designee is responsible for ensuring that airborne monitoring, contamination surveys, and exposure/dose rate surveys are reviewed for accuracy and completeness as an on-going process. Individual exposure records including dosimetry and bioassay reports for personnel are reviewed for results as generated.

3.23 REPORTS AND NOTIFICATIONS

Workers who have previous occupational work history with radiological environments will supply the RSO or designee with prior estimated or reported dose histories on an NRC Form 4 or equivalent as defined in 10 CFR 20.2104.

Records of radiation exposures to workers who have been issued external dosimetry monitoring devices will be maintained. Dosimetry monitoring results for workers will be reported to the RSO annually at a minimum. Annual occupational exposure greater than or equal to 100 millirems for the previous calendar year, or otherwise when requested, requires a summary of individual exposure to be reported to the employee monitored.

3.24 LICENSES

Entities subject to the use of this RPP will conduct radiological-based tasks with use of TtEC RML No. 7909-01. TtEC will ensure that the Radiological Control Program and work practices are implemented and performed in accordance with the California Agreement State license requirements and the RPP. (Any DON-designated waste shipment provider may implement its NRC-issued license to conduct waste characterization sampling of waste material in support of low-level radioactive waste shipment and disposal. An MOU between TtEC and a waste shipment provider will be developed, identifying interfaces and commitments for the transfer of radioactive materials. Active MOUs will be maintained by the RSO or designee.)

3.25 REVIEW AND APPROVALS OF RADIATION PROTECTION PLANS

The RSO or designee will prepare the RPP, which will then be reviewed for approval with subject matter experts (e.g., the PjM, RSOR). In addition, the DON will have an opportunity to review the draft content, provide input, and indicate acceptance of the plan. Changes to the RPP will be reviewed and accepted following the same process.

3.26 PLANNED SPECIAL EXPOSURES

No anticipated event within work scopes subject to this RPP will require use of a planned special exposure. In the event it is necessary to initiate such a need, an activity-specific work instruction including a formal ALARA review and an RWP will be prepared and submitted for acceptance following the same process as the RPP submittal in Section 3.25.

This page intentionally left blank.

4.0 PERSONAL PROTECTIVE EQUIPMENT

Minimum PPE requirements based on chemical contaminants are established by the Health and Safety Manager (in a project-/task-specific APP/SSHP). This primary level of PPE, Modified Level D, is historically sufficient for radiological work activities and is supplemented by activity-specific RWPs based on the radiological conditions and field tasks required to perform planned activities. Information considered for PPE during RWP development is detailed in applicable portions of corporate procedure NLP-04, Radiological Entry Control Program, and SOP 012, Radiologically Controlled Areas Posting and Access Control.

4.1 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT

Personnel must wear PPE commensurate with contamination hazards associated with both the work area and the planned activity. Activities that require heavy physical effort or that have an increased potential for damage to PPE may require additional layers or different PPE materials, even in areas of low contamination. Site- or task-specific PPE requirements beyond the minimum traditionally used will be detailed in a corresponding RWP and SOP 005, Radiological Protective Clothing Selection, Monitoring and Decontamination.

4.2 DONNING AND DOFFING OF PERSONAL PROTECTIVE EQUIPMENT

To prevent contamination of personnel or the spread of contamination, PPE must be donned and doffed in a specific manner. Directions for donning and doffing standard PPE ensembles are provided in the applicable sections of corporate procedure NLP-05, Radioactive Contamination Control, and SOP 005, Radiological Protective Clothing Selection, Monitoring and Decontamination. Additional instructions for non-standard site- or task-specific PPE requirements will be provided in the applicable RWP.

This page intentionally left blank.

5.0 DECONTAMINATION PROCEDURES

Contamination control when handling radioactively contaminated materials will be conducted in accordance with corporate procedure NLP-05, Radioactive Contamination Control. Decontamination of materials and equipment will be performed at a dedicated location (e.g., decontamination pad, room) in accordance with site-specific procedure SOP 007, Decontamination of Equipment and Tools.

This page intentionally left blank.

6.0 SHIPPING AND TRANSPORTATION OF RADIOACTIVE MATERIALS

Field projects subject to the use of this RPP will conduct radiological-based activities with use of TtEC RML No. 7909-01. The client-designated waste shipment provider associated with a field project may implement their NRC-issued or California Agreement State license to conduct waste characterization sampling of waste material in support of low-level radioactive waste shipment and disposal. An MOU between TtEC and a waste shipment provider will be used, identifying interfaces and commitments for the transfer of radioactive materials. In such instances, a current MOU will be maintained by the project RSOR for projects subject to the requirements of the RPP.

Environmental samples shipped for off-site analysis and exempt-quantity radioactive check sources are packaged and shipped in accordance with DOT regulations via commercial carriers.

This page intentionally left blank.

7.0 REFERENCES

AEC (Atomic Energy Commission). 1974. Regulatory Guide 1.86. Termination of Operating Licenses for Nuclear Reactors. June.

NRC (U.S. Nuclear Regulatory Commission). 1996. Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure, Revision 1, Washington, DC. February.

——————. 1999. Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure, Revision 3, Washington, DC. June.

This page intentionally left blank.

APPENDIX A

RADIATION PROTECTION PLAN ACKNOWLEDGEMENT FORM

This page intentionally left blank.

Radiation Protection Plan Acknowledgment Form

I have reviewed, understand, and agree to follow the Radiation Protection Plan for this project. Additionally, I understand that there are additional nonradiological health and safety requirements, which are presented in the Site Safety and Health Plan. I agree to abide by the requirements of the Radiation Protection Plan for the work that I will perform.

Printed Name	Signature	Representing	Date

This page intentionally left blank.

ATTACHMENT 4

RADIOLOGICAL MANAGEMENT PLAN

This page intentionally left blank.

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

CONTRACT NO. N62473-10-D-0809
CTO NO. 0013

ATTACHMENT 4

FINAL

RADIOLOGICAL MANAGEMENT PLAN
April 2013

NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

DCN: RMAC-0809-0013-0007

Prepared by:

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

Erik Abkemeier, CHP, PE, CSP, CHMM
TtEC Radiation Safety Officer

4/1/13
Date

Bill Dougherty
TtEC Project Manager

4/1/13
Date

TABLE OF CONTENTS

PAGE

ABBREVIATIONS AND ACRONYMS v

1.0 INTRODUCTION 1-1

2.0 BACKGROUND 2-1
2.1 NAVAL STATION TREASURE ISLAND LOCATION AND DESCRIPTION 2-1
2.2 IR SITE 12 HISTORY 2-1
2.3 RADIOLOGICAL HISTORY 2-2

3.0 KEY RADIOLOGICAL PERSONNEL AND WORK CONTROL PROCEDURES 3-1
3.1 KEY RADIOLOGICAL PERSONNEL 3-1
3.1.1 Radiation Safety Officer 3-1
3.1.2 Radiation Safety Officer Representative 3-2
3.1.3 Radiological Task Supervisor 3-3
3.1.4 Radiological Control Technicians 3-4
3.2 MINIMUM TRAINING REQUIREMENTS 3-4
3.3 WORK CONTROL PROCEDURES 3-4
3.3.1 Task-specific Plan 3-5
3.3.2 Radiological Health and Safety 3-5
3.3.3 Task-specific Work Instructions 3-6
3.3.4 Notifications 3-6

4.0 RADIOLOGICAL SURVEY TYPES, AREA CLASSIFICATION, AND SELECTION 4-1
4.1 SURVEY TYPES 4-1
4.1.1 Reference (Background) Area Survey 4-1
4.1.2 Scoping Survey 4-1
4.1.3 Characterization Survey 4-2
4.1.4 Remedial Action Support Survey 4-2
4.1.5 Final Status Survey 4-2
4.1.6 Personnel Surveys 4-3
4.1.7 Equipment and Materials Surveys 4-3
4.1.8 Truck Surveys 4-3
4.2 SURVEY AREA CLASSIFICATION 4-3
4.2.1 Class 1 Areas 4-3
4.2.2 Class 2 Areas 4-4
4.2.3 Class 3 Areas 4-4
4.3 CLASSIFICATION AND SURVEY UNIT SIZE 4-4
4.4 REFERENCE COORDINATE SYSTEMS 4-5
4.4.1 Square Grid 4-5
4.4.2 Triangular Grid 4-5
4.5 SURVEY TYPE SELECTION 4-6

5.0 SURVEY OVERVIEW 5-1

TABLE OF CONTENTS
(Continued)

PAGE

5.1 DATA LIFE CYCLE 5-1
5.2 SURVEY PLANNING 5-1
5.2.1 Survey Design Elements 5-2
5.2.2 Survey Strategy 5-2
5.2.3 Data Quality Objectives 5-3
5.3 SURVEYS 5-3
5.3.1 Scoping and Characterization Surveys 5-3
5.3.2 Remedial Action Support Surveys 5-3
5.3.3 Final Status Surveys 5-4
5.3.4 Error Control 5-5
5.4 ASSESSMENT OF SURVEY RESULTS 5-5
5.4.1 Scoping and Characterization Surveys 5-6
5.4.2 Remedial Action Support Surveys 5-6
5.4.3 Final Status Surveys 5-6
5.5 DECISION MAKING 5-7
5.5.1 Scoping and Characterization Surveys 5-7
5.5.2 Remedial Action Support Surveys 5-7
5.5.3 Final Status Surveys 5-8

6.0 RELEASE CRITERIA AND INVESTIGATION LEVELS 6-1
6.1 ASSESSING SMALL AREAS OF ELEVATED ACTIVITY 6-1
6.2 ASSESSING MULTIPLE RADIONUCLIDES 6-3
6.2.1 $DCGL_W$ for Multiple Radionuclides 6-4
6.2.2 Determination of LBGR for Multiple Radionuclides 6-4
6.2.3 Determination of Standard Deviation for Multiple Radionuclides 6-4
6.3 CONVERTING DCGL UNITS 6-5
6.4 INVESTIGATION LEVELS 6-5
6.4.1 Investigation Levels for Gamma Radiation Surveys 6-6
6.4.2 Investigation Levels for Alpha and Beta Radiation Surveys 6-6

7.0 INSTRUMENTATION 7-1
7.1 FIELD SURVEY INSTRUMENTS 7-1
7.1.1 Calibration 7-1
7.1.2 Daily Performance 7-1
7.1.3 Instruments for Surface Scan Surveys for Alpha Activity 7-2
7.1.4 Instruments for Surface Scan Surveys for Beta Activity 7-2
7.1.5 Instruments for Direct Measurement Static Surveys for Alpha Activity 7-2
7.1.6 Instruments for Direct Measurement Static Surveys for Beta Activity 7-2
7.1.7 Instruments for Scan Surveys for Gamma Activity 7-2

TABLE OF CONTENTS
(Continued)

PAGE

7.1.8 Instruments for Direct Measurement Static Surveys for Gamma Activity 7-3
7.1.9 Instruments for Direct Measurement Surveys for Beta Gamma Activity 7-3
7.1.10 Instrument for Exposure Rate Surveys 7-3
7.1.11 Instrument for Portal Monitor Truck Surveys 7-3
7.2 INSTRUMENTATION EQUATIONS 7-3
7.2.1 Instrument Efficiency 7-3
7.2.2 Surface Activity Measurements 7-4
7.2.3 Count Detection Probability for Alpha Scans (≤ 126-cm^2 Probe) 7-5
7.2.4 Count Detection Probability for Alpha Scans (582-cm^2 Probe) 7-6
7.2.5 Minimal Detectable Count Rate and Minimum Detectable Concentration for Beta Scans 7-6
7.2.6 MDC for Static Alpha and Beta Counts 7-8
7.2.7 Surface Efficiency (ε_s) for Surface Activity Measurements 7-9
7.2.8 MDC for Gamma Scans of Surface Areas 7-9
7.2.9 Minimum Detectable Count Rate for Static Gamma Counts 7-11
7.3 LABORATORY INSTRUMENTS 7-11
7.3.1 Quality Assurance Checks 7-11
7.3.2 Gross Alpha/Beta Loose Surface Contamination Surveys 7-12
7.3.3 Gamma Spectroscopy 7-12
7.3.4 Liquid Scintillation Analysis 7-12

8.0 SURVEY IMPLEMENTATION 8-1
8.1 REFERENCE (BACKGROUND) AREAS 8-1
8.2 SCAN SURVEYS 8-1
8.2.1 Scan Surveys for Alpha/Beta Radiation 8-1
8.2.2 Scan Surveys for Gamma Radiation 8-1
8.3 STATIC SURVEYS 8-2
8.3.1 Static Surveys for Alpha and Beta Surface Activity 8-2
8.3.2 Static Surveys for Gamma Radiation 8-2
8.4 EXPOSURE RATE MEASUREMENTS 8-2
8.5 SWIPE SAMPLE MEASUREMENTS 8-2
8.6 SURVEY AND SAMPLE LOCATIONS 8-2
8.7 EQUIPMENT AND MATERIAL SURVEYS 8-3
8.8 PERSONNEL SURVEYS 8-3
8.9 MEDIA SAMPLING 8-3
8.10 AIR SAMPLING 8-3
8.11 TRUCK SURVEYS 8-4
8.12 GLOBAL POSITIONING SYSTEM MEASUREMENTS 8-4

TABLE OF CONTENTS
(Continued)

PAGE

9.0 DECONTAMINATION, DISMANTLING, AND DISPOSITION 9-1
9.1 DECONTAMINATION.....9-1
9.2 DISMANTLING AND REMEDIATION.....9-1
9.3 DISPOSITION 9-2

10.0 RADIOACTIVE MATERIALS MANAGEMENT.....10-1

11.0 DOCUMENTATION AND RECORDS MANAGEMENT.....11-1
11.1 REQUIREMENTS 11-1
11.2 DOCUMENT QUALITY STANDARDS 11-1
11.3 DOCUMENTATION.....11-2
11.3.1 Data Management System 11-2
11.3.2 Field Operation Records 11-2
11.3.3 Laboratory Records.....11-3
11.3.4 Data Handling Records 11-3
11.3.5 Work Support Documents.....11-3

12.0 REFERENCES.....12-1

TABLES

Table 1-1 Naval Station Treasure Island Standard Operating Procedures

Table 4-1 Survey Unit Size

Table 5-1 Data Life Cycle Used to Support the Radiation Survey and Site Investigation Process

Table 5-2 Survey Strategies

Table 6-1 Release Criteria

Table 7-1 Portable Survey Instruments

Table 7-2 Examples of Field Radiological Survey Instrument Calculations

Table 8-1 Derived Air Concentration

FIGURES

Figure 2-1 Regional Location Map

ABBREVIATIONS AND ACRONYMS

μR/hr	microroentgens per hour
AEC	Atomic Energy Commission
ALARA	as low as reasonably achievable
AM	action memorandum
APP	Accident Prevention Plan
BRAC	Base Realignment and Closure
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm^2	square centimeter
cpm	counts per minute
CTO	Contract Task Order
DAC	derived air concentration
DCGL	derived concentration guideline level
$DCGL_{EMC}$	DCGL for elevated measurement comparison
$DCGL_W$	wide-area DCGL
DoD	Department of Defense
DON	Department of the Navy
dpm	disintegrations per minute
DQO	data quality objective
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
FSS	Final Status Survey
GPS	Global Positioning System
HRA	Historical Radiological Assessment
IR	Installation Restoration (Program)
ISO	International Organization for Standardization
LBGR	lower boundary of the gray region
m	meter
m^2	square meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual

ABBREVIATIONS AND ACRONYMS
(Continued)

MDA	minimum detectable activity
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
$MDCR_{SURVEYOR}$	MDCR calculated assuming a surveyor efficiency
MDER	minimum detectable exposure rate
MeV	megaelectron volt
min	minute
NaI	sodium iodide
NAVSTA TI	Naval Station Treasure Island
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
NTCRA	non-time-critical removal action
pCi/g	picocuries per gram
pCi/L	picocuries per liter
pCi/mL	picocuries per milliliter
PMO	Program Management Office
PPE	personal protective equipment
QC	quality control
Ra-226	radium-226
RASO	Radiological Affairs Support Office
RCA	radiologically controlled area
RCT	Radiological Control Technician
RML	Radioactive Materials License
RPM	Remedial Project Manager
RPP	Radiation Protection Plan
RSO	Radiation Safety Officer
RSOR	Radiation Safety Office Representative
RSSI	Radiation Survey and Site Investigation
RTS	Radiological Task Supervisor

ABBREVIATIONS AND ACRONYMS
(Continued)

RWP	Radiation Work Permit
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SWDA	solid waste disposal area
TSP	Task-specific Plan
TtEC	Tetra Tech EC, Inc.
WRS	Wilcoxon Rank-Sum (test)

This page intentionally left blank.

1.0 INTRODUCTION

This Radiological Management Plan (Management Plan) describes survey and decontamination procedures and methodologies that will be implemented in support of radiological release of buildings, sites, structures, areas, materials and equipment, and personnel at Naval Station Treasure Island (NAVSTA TI), San Francisco, California. Tetra Tech EC, Inc. (TtEC) was contracted by the Department of the Navy (DON) to prepare this Management Plan for these radiological activities at Installation Restoration (IR) Site 12 at NAVSTA TI for the Base Realignment and Closure (BRAC) Program Management Office (PMO) West under Naval Facilities Engineering Command Southwest. The methodologies and processes described in this Management Plan apply to operational radiological activities performed by TtEC in relation to its projects at IR Site 12 at NAVSTA TI and may guide the preparation of other work plans by radiological contractors as directed by the DON.

A 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 public and ensure that exposure is as low as reasonably achievable (ALARA). The ALARA principle will be considered during the course of the radiological work carried out under the Management Plan for survey activities.

The objective of this Management Plan is to provide the radiological procedures and methodologies for:

- Evaluating impacted sites, structures, buildings, areas, material and equipment, and other items that may contain residual radioactivity above the release criteria as a result of past activities at NAVSTA TI
- Removing identified radioactive contamination
- Confirming that the release criteria have been met

The radiological activities that support the objective of the Management Plan include:

- Reference (background) surveys
- Scoping surveys
- Characterization surveys
- Remedial action support surveys
- Final Status Surveys (FSSs)
- Personnel surveys
- Equipment and material surveys

- Truck surveys
- Decontamination and dismantling

Where applicable, radiological survey activities will be conducted in accordance with the guidelines in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Nuclear Regulatory Commission (NRC) NUREG-1575 (DoD et al. 2000), as incorporated into this Management Plan. Survey activities as well as activities not addressed by MARSSIM will be performed in accordance with this Management Plan and the Standard Operating Procedures (SOPs), which are located in Appendix A to the Sampling and Analysis Plan (SAP), provided in the Non-Time-Critical Removal Action (NTCRA) Work Plan, and applicable work instructions located at the project site office. Table 1-1 lists each of the TtEC field SOPs developed for performing radiological work at NAVSTA TI. Copies of the work instructions are available on-site at NAVSTA TI and can be provided to the DON and/or regulatory agencies for review upon request.

This Management Plan is organized as follows:

Section 1.0 Introduction – Section 1.0 provides an overview of the project scope, work objectives, and organization of the Management Plan.

Section 2.0 Background – Section 2.0 describes NAVSTA TI, provides a historical summary of the shipyard, and includes an overview of the radiological history of IR Site 12.

Section 3.0 Key Radiological Personnel and Work Control Procedures – Section 3.0 discusses the project organization, roles and responsibilities of key project personnel, personnel qualifications, and work control activities.

Section 4.0 Radiological Survey Types, Area Classification, and Selection – Section 4.0 identifies the types of surveys that will be conducted, and discusses survey area classification and survey type selection.

Section 5.0 Survey Overview – Section 5.0 presents an overview of survey planning, survey implementation, and data assessment.

Section 6.0 Release Criteria and Investigation Levels – Section 6.0 identifies the criteria for radiological release for unrestricted use.

Section 7.0 Instrumentation – Section 7.0 identifies field instrumentation that will be used to perform surveys.

Section 8.0 Survey Implementation – Section 8.0 presents the approach to implementing surveys that will be conducted as well as associated sampling activities.

Section 9.0 Decontamination, Dismantling, and Disposition – Section 9.0 discusses the survey and construction activities that will be implemented to perform remedial action at sites contaminated by radiation above release limits.

Section 10.0 Radioactive Materials Management – Section 10.0 describes how radioactive materials will be managed, including control of samples, work areas, and wastes.

Section 11.0 Documentation and Records Management – Section 11.0 presents procedures that will be used to manage records/documentation, as well as to assess, interpret, and report data.

Section 12.0 References – Section 12.0 presents references cited in this Management Plan.

This page intentionally left blank.

2.0 BACKGROUND

The following sections provide the location and description, a general site history, and a brief radiological history of NAVSTA TI.

2.1 NAVAL STATION TREASURE ISLAND LOCATION AND DESCRIPTION

NAVSTA TI is located in San Francisco Bay, midway between San Francisco and Oakland, California (Figure 2-1). The former naval station consists of two contiguous islands: Treasure Island, which is approximately 403 acres, and Yerba Buena Island, which is approximately 147 acres. Treasure Island is a manmade island constructed of materials dredged from the bay. Military activities at the former NAVSTA TI date back to 1866, before the construction of Treasure Island, when the U.S. government took possession of Yerba Buena Island for defensive fortifications. In 1993, NAVSTA TI was designated for closure under the Base Closure and Realignment Act of 1990. The naval station was closed on September 30, 1997, and is currently in the transfer process.

Environmental investigation and remediation activities are being conducted at NAVSTA TI under the Department of Defense IR Program in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Under Executive Order 12580, the DON is the lead agency responsible for implementation of the IR Program and the removal actions. The California Department of Toxic Substances Control is the lead regulatory agency. The California Department of Public Health (CDPH) and Regional Water Quality Control Board San Francisco Bay Region will provide additional state regulatory oversight.

2.2 IR SITE 12 HISTORY

IR Site 12 is located on the northwest portion of NAVSTA TI on a relatively flat 93-acre area. The site consists of multiplex housing units with private backyards and common area front yards, side yards, and surrounding greenbelts. The area was originally used as a parking lot during the 1939–1940 Golden Gate International Exposition. After Navy occupation of the island in 1940, the area was developed for bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields, and disposal or burning of solid waste. Beginning in the 1960s, areas of IR Site 12 were incrementally developed into housing for Navy personnel and their dependents. Former residential Buildings 1121 and 1323 are located within IR Site 12 near Westside Drive.

An NTCRA was implemented in May 2006 to remediate chemicals in soil associated with chemical/fuel storage and disposal or burning of solid waste in four Solid Waste Disposal Areas (SWDAs) (SWDA A & B, SWDA 1231/1233, SWDA 1207/1209, and SWDA Bigelow Court) located within IR Site 12. A Historical Radiological Assessment (HRA) (Weston 2006)

identified the radiological contamination potential for the SWDAs as "unlikely" and recommended radiation monitoring during excavation of identified SWDAs. During the initial stages of this NTCRA, a radiation survey and sample analysis identified radium-226 (Ra-226)-impacted debris and soil in some of the SWDAs. Subsequently, an Action Memorandum (DON 2007) summarizing the site characteristics identified the chemicals of potential concern (COPCs) and the horizontal extent of the SWDAs. Generally, the radiological contamination in IR Site 12 SWDAs is colocated with chemical contaminants. The NTCRAs at IR Site 12 determined that some of the SWDAs were contaminated with radiological items or soil containing Ra-226. Elevated gamma readings were also detected along the northern and southern fence lines (two areas) of SWDA A & B by the CDPH Radiologic Health Branch during a gamma survey conducted in April 2011. The current scope of work includes investigating and remediating these two areas with elevated gamma readings.

Based on past site history, results from ongoing NTCRAs, and other investigations, the DON determined that contamination present in soil and debris at the four SWDAs at IR Site 12 at NAVSTA TI required a response action. This decision was documented in the final Action Memorandum (AM) (DON 2007) and is consistent with the NCP requirements in Title 40 *Code of Federal Regulations*, Part 300.415(b)(2). The removal action objectives for remediation activities are to implement the AM Alternative 3 and protect public health and welfare and the environment by physically removing and disposing of contaminated soil and debris that exceeds the release criteria for the chemicals of concern presented in Section 2.1.4 of the AM (DON 2007) and the NAVSTA TI established release criteria for the radionuclide of concern, Ra-226.

The Westside Drive SWDA, also known as SWDA A & B, is an approximately 4.5-acre area on the west side of IR Site 12 abutting Perimeter Road. Two radiological hot spots were identified near the Westside Drive SWDA along the northern and southern fence lines during the 2011 CDPH survey of this area. The source of radioactivity is believed to be near-surface radiological commodities containing Ra-226 (deck markers, foils containing radium powder, instrument gauges) but may include limited pockets of soil contamination. Based on CDPH's report, there is one area of elevated activity north of the currently established Radiologically Controlled Area (RCA) (Northern Hot Spot) and four locations of elevated activity south of the RCA (Southern Hot Spot). This NTCRA focuses only on radiological contamination in the two radiological hot spots. The ongoing NTCRA activities in the center of SWDA A & B are currently being performed by another contractor under a separate contract.

2.3 RADIOLOGICAL HISTORY

The Historical Radiological Assessment (HRA) (Weston 2006) identified the radiological contamination potential for the SWDAs as "unlikely" and recommended radiation monitoring during excavation of identified SWDAs. Following results from ongoing NTCRAs and other investigations, the SWDAs were found to be contaminated with radiological items or contamination containing Ra-226.

Prior to demolition of Buildings 1121 and 1323, radiological surveys of the interiors and exteriors will be performed to determine whether radiologically impacted soil has been tracked into the buildings or whether the wind has deposited radiologically impacted soil onto the exterior surfaces.

This page intentionally left blank.

3.0 KEY RADIOLOGICAL PERSONNEL AND WORK CONTROL PROCEDURES

This section describes the responsibilities of key personnel necessary for management of radiological activities at NAVSTA TI. In addition, this section identifies the minimum training requirements for workers at NAVSTA TI and work control procedures including Task-specific Plans (TSPs), Radiation Work Permits (RWPs), and radiological notifications.

3.1 KEY RADIOLOGICAL PERSONNEL

Specific personnel are essential in performing radiological activities at NAVSTA TI. Qualified and experienced personnel will fulfill the necessary functions to ensure the consistent and successful implementation of radiological work activities at NAVSTA TI. All key radiological personnel are expected to have the requisite skills necessary to perform these functions. The key radiological personnel include the following.

3.1.1 Radiation Safety Officer

The Radiation Safety Officer (RSO) is responsible for implementing, directing, and supervising all radiological project-related activities. The RSO has the responsibility and authority to perform the following:

- Providing oversight of implementation and ensuring compliance with the State of California Agreement State Radioactive Materials License (RML) Number 7909-01
- Serving as contact for State of California site inspections
- Assisting DON representatives during site audits
- Controlling exposure conditions for site workers
- Implementing a dosimetry program for all site workers entering radiologically controlled areas
- Enforcing radiological controls
- Coordinating radiological activities with other NRC or Agreement State licensed contractors
- Ensuring all radiological work activities comply with RML requirements
- Identifying radiological analysis needs
- Providing health physics guidance on an as-needed basis
- Providing radiological control protection services, if required
- Directing and assisting radiological personnel in proper completion of radiological records

- Assisting the Radiation Safety Officer Representative (RSOR) to determine if an external dose is to be assigned to an individual who reported lost or damaged dosimetry devices
- Reviewing all changes to the SAP to ensure radiological requirements are met
- Ensuring that the required radiological safety training is provided
- Reviewing and approving project field procedures associated with the handling of radioactive materials or access to radiological areas
- Ensuring timely and thorough review of records, in accordance with corporate SOP NLP-07, Radiological Records, prior to approval
- Approving records with verifiable signature and date once records meet the quality standards as described in corporate SOP NLP-07, Radiological Records
- Conducting radiation incident investigations
- Conducting radiological inspections
- Conducting data assessments and evaluations

3.1.2 Radiation Safety Officer Representative

The RSOR will report directly to the RSO and will perform on-site duties as designated by the RSO. In accordance with DON requirements, the RSO or a qualified designee will be on-site during radiological work activities conducted under this Management Plan. The RSOR has the responsibility and authority to perform the following:

- Implementing, directing, and supervising on-site radiological activities
- Assisting in identifying radiological analysis needs
- Providing health physics guidance
- Assisting in establishment of radiological controls
- Overseeing preparation and approval of radiological documents and field procedures
- Establishing personnel monitoring requirements
- Establishing, implementing, and monitoring on-site radiological training programs
- Conducting assessments of field practices and procedures
- Reviewing and approving data from radiological investigations, surveys, and remediations
- Assisting the RSO in ensuring adequate radiological controls are in place at the work site
- Ensuring that specified radiological safety procedures are followed and that the radiological safety tests and inspections are complete and acceptable
- Conducting daily oversight and field safety inspections and tests required by the project technical specifications and applicable professional standards

- Attending required meetings, including the pre-construction conference, weekly quality control (QC) meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings
- Administering the on-site dosimetry program
- Verifying compliance with on-site RWPs and SOPs (including laboratory SOPs)
- Assisting the RSO in reviewing changes to the SAP to ensure radiological requirements are met
- Approving issuance of any work document pertaining to radiological safety issues
- Providing surveillance of radiological-related activities
- Assisting the RSO in directing the production of radiological work documents and reports
- Ensuring that a Radiological Task Supervisor (RTS) will be on-site during radiological activities
- Conferring with radiological personnel to provide technical advice and to resolve problems
- Preparing daily project status reports
- Notifying the RSO regarding radioactive anomalies
- Managing the storage of radioactive waste in accordance with the RML

3.1.3 Radiological Task Supervisor

The RTS will direct field survey personnel and health physics operations as assigned by the RSO, RSOR, or designee. The RTS has the responsibility and authority to perform the following:

- Overseeing task-specific radiological field activities for compliance with the RML and approved plans, work instructions, SOPs, instrument specifications, and state-of-the-art health physics practices
- Coordinating task-specific activities with the RSOR
- Preparing RWPs to outline field conditions, radiological control requirements, and personal protective equipment requirements in the field for RSO approval
- Being physically on-site when radiological operations are performed by field staff
- Ensuring all field staff are properly trained and comply with the RWP
- Supervising field staff during survey, site remediation, and decontamination activities, use of survey equipment and instrumentation, and support of other radiological activities
- Ensuring compliance with the applicable SOPs for safety program, survey, and/or remediation activities

- Interpreting and verifying task-specific data accumulated during surveys and monitoring activities
- Ensuring compliance with TSPs, as directed by the RSO and RSOR

3.1.4 Radiological Control Technicians

Radiological Control Technicians (RCTs) will support projects in the field and have the responsibility and authority for the following:

- Performing radiological field activities under the direction of the RTS or RSOR in accordance with approved work documents and RML requirements
- Documenting field survey activities in accordance with the Management Plan, TSPs, and SOPs
- Interpreting and verifying field data gathered during survey and monitoring activities
- Supporting dose assessments, and ensuring compliance with emergency plans and procedures
- Performing effluent monitoring and radioactive material inventories
- Performing survey equipment response checks, and daily checks of the survey instruments
- Conducting safety evaluations of health physics field and laboratory equipment
- Implementing use of RWPs, including being present at active work areas to ensure compliance in the absence of the RTS

3.2 MINIMUM TRAINING REQUIREMENTS

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

- Occupational Safety and Health Administration 40-Hour and Annual 8-Hour Refresher
- Radiation awareness and RWP training
- TSP training for the specific site or task
- Activity Hazard Analysis training for the specific site or task
- Training as required by the implemented Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) as identified in the project-specific NTCRA Work Plan

3.3 WORK CONTROL PROCEDURES

Prerequisites for the initiation of survey activities include review of the associated TSP, radiological evaluation of the designated work areas, and identification of any potential safety concerns. Work control procedures include the preparation and review of TSPs, RWPs, and work instructions, and appropriate notifications of anomalies or significant radiological events.

3.3.1 Task-specific Plan

The Management Plan provides the procedures and methodologies for performing radiological activities that will be implemented in support of radiological release of buildings, sites, structures, areas, materials and equipment, and personnel at NAVSTA TI. TSPs will be prepared for surveys and remediation performed under the Management Plan and will provide supplemental information. Each TSP will provide relevant location-specific data and identify variances and/or additions to the Management Plan. Substantial deviations from the Management Plan may result in the generation of a stand-alone, job-specific work plan. Where prepared, these stand-alone work plans will supersede this Management Plan but may utilize certain portions of the Management Plan where indicated.

At a minimum, each TSP will include the following information:

- Task description, including the specific location history, purpose of the task, and the radionuclides of concern
- Data quality objectives (DQOs) defined to a level sufficient to ensure that the data obtained will support the goals of the task
- An activities plan consisting of a survey description and discussion of additional activities necessary to support the survey, which will include a description of applicable specific construction or decontamination and decommissioning activities (as required)
- Specific identification of variations, if any, to the Management Plan, including the requirement and variations, and the technical justification for the variations
- Specific survey figures (as required) that provide sampling and survey data points and other figures necessary to support the activity
- Attachments (as necessary) to provide further description, information, or delineation of the task activities

Each TSP will be provided to the BRAC PMO and the Radiological Affairs Support Office (RASO) for review and approval.

3.3.2 Radiological Health and Safety

SOPs and work instructions will be used to address controls necessary for radiologically safe operations and referenced as necessary in appropriate TSPs. Table 1-1 lists each of the TtEC field SOPs developed for performing radiological work at NAVSTA TI. Copies of the SOPs are provided in the SAP, which is included in the NTCRA Work Plan. Work instructions are available on-site at NAVSTA TI and are available for review by the DON and/or regulatory agencies upon request.

Dose rate, contamination, and air monitoring, including initial baseline sampling to determine radiological background conditions, will be performed as necessary and in accordance with the

APP/SSHP included with the approved project-specific NTCRA Work Plan. Field activities will be performed in accordance with the approved RWP and APP/SSHP as required by the project-specific NTCRA Work Plan. RWPs will be prepared in accordance with the applicable Radiation Protection Plan (RPP) and SOP 010, Issue and Use of Radiation Work Permits. Personnel 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 APP/SSHP included in the approved project-specific NTCRA Work Plan and SOP 005, Radiological Protective Clothing Selection, Monitoring and Decontamination.

3.3.3 Task-specific Work Instructions

In limited situations involving ancillary radiological activities (e.g., monitoring well installation or destruction in radiologically impacted areas, or decontamination with a vacuum system), or to further augment TSPs or SOPs, radiological work instructions may be prepared to facilitate a specific activity. These radiological work instructions, when used, will be provided to the BRAC PMO and the RASO for review and approval. Copies of the current work instructions are available on-site at NAVSTA TI and can be provided to the DON and/or regulatory agencies for review upon request.

3.3.4 Notifications

During survey activities, radioactive anomalies may be identified and significant radiological events could occur. For the purposes of the Management Plan, an anomaly is described as a reading or result that appears to be an outlier in the professional judgment of the RSOR. When an anomaly is identified, the RSOR will notify the RSO and Supervising Project Manager who will notify the BRAC PMO Remediation Project Manager (RPM) and the RASO. If neither the RSO nor the Supervising Project Manager is available, the RSOR will leave a voice mail and confirmatory e-mail describing the anomaly and follow up with a call to the appointed designee, if any.

Significant events include regulatory visits (such as by the CDPH or other regulatory agencies), radiological issues, injuries, and breaches in security. All significant events will be disclosed to the RPM and RASO as described above. Any radiological issues will also be reported to the RSO.

4.0 RADIOLOGICAL SURVEY TYPES, AREA CLASSIFICATION, AND SELECTION

Several types of radiological surveys will be conducted at NAVSTA TI. Surveys will be used to support the release of materials, equipment, open areas, utilities, and/or buildings; support remedial actions; identify radionuclides and levels of contamination present; and support unforeseen work that may be necessary.

4.1 SURVEY TYPES

This section describes the types of surveys that may be performed at NAVSTA TI.

4.1.1 Reference (Background) Area Survey

The reference area is a geographical area or structure from which representative radioactivity measurements are performed for comparison with measurements performed in an impacted area. The reference area selected should have physical, chemical, radiological, and biological characteristics similar to the impacted area(s) being investigated. The reference area must not be identified as impacted by the HRA (Weston 2006). All on-site and off-site locations selected as reference areas will be approved by the RSO or RSOR. The same survey methods and equipment that will be used for conducting a survey in an impacted area will be used for the background area survey. Reference area data will normally be provided to the RSO prior to the start of a survey.

4.1.2 Scoping Survey

Scoping surveys provide site-specific information based on limited measurements. Scoping surveys are to be conducted as indicated by the HRA (Weston 2006) with guidance from MARSSIM (DoD et al. 2000) and will consist of judgment measurements based on applicable information in the HRA and professional experience. Sufficient information will be collected to identify situations that require immediate radiological attention or to support development of other project activities.

The primary objectives of scoping surveys are to:

- Perform a preliminary contamination assessment
- Identify radionuclide contaminants
- Assess radionuclide ratios
- Assess general levels and extent of radionuclide contamination, if present
- Support classification of impacted areas
- Evaluate whether the survey strategy can be optimized for use in a characterization survey or FSS

4.1.3 Characterization Survey

The characterization survey is performed to determine the nature and extent of radiological contamination at the site. This includes preparing a reference grid, collecting systematic as well as judgment measurements, and performing surveys of different media (e.g., surface soils, interior and exterior surfaces of buildings). The decision as to which media will be surveyed is a site-specific decision addressed throughout this Management Plan and each TSP.

Characterization surveys are planned based on the HRA (Weston 2006), MARSSIM (DoD et al. 2000) guidance, and/or scoping survey results. The primary objectives of characterization surveys are to:

- Assess the nature and extent of the contamination, if present
- Collect data to support evaluation of remedial alternatives and technologies
- Evaluate whether the survey strategy can be optimized for use in the FSS
- Provide input to the FSS design

4.1.4 Remedial Action Support Survey

Remedial action support surveys are performed to assess the effectiveness of the remedial action while remediation is being conducted, and to guide the cleanup in a real-time mode. The primary objectives of remedial action support surveys are to:

- Support remediation activities
- Assess when an area is ready for the FSS
- Provide site-specific information used for planning the FSS

4.1.5 Final Status Survey

The FSS provides data to demonstrate that radiological parameters satisfy the established guideline values and conditions for radiological release. Data from other surveys conducted during the course of site investigations at NAVSTA TI—such as scoping, characterization, and remedial action support surveys—can provide valuable information for planning an FSS. The primary objectives of FSSs are to:

- Verify classification
- Demonstrate that the potential dose or risk from residual activity is below the release criterion
- Demonstrate that the potential dose or risk from small areas of elevated activity is below the release criterion

4.1.6 Personnel Surveys

Surveys will be performed on personnel leaving a radiological area to ensure that individuals are free of radiological contamination as identified in the applicable RPP presented in the project-specific NTCRA Work Plan.

4.1.7 Equipment and Materials Surveys

Before being put into service or leaving a radiological work area, equipment and/or materials will be surveyed in an area of low background concentrations to ensure that the equipment and materials release criteria are not exceeded, using appropriate SOPs as identified in the project-specific NTCRA Work Plan.

- Equipment and/or materials being put into service in a radiological work area at NAVSTA TI that exceed the release criteria will be returned to the supplier for replacement or decontamination.
- Outgoing equipment and/or materials that do not meet the release criteria will be decontaminated before leaving the radiological work area or stored for disposal.

4.1.8 Truck Surveys

Surveys will be performed on vehicles leaving and arriving at NAVSTA TI that are loaded with noncontaminated material as a measure to protect against the inadvertent shipment or receipt of materials exhibiting elevated radiation levels. Surveys will be conducted per SOP 011, Gamma Screening of Trucks Using the Stationary Portal Monitor and Using Portable Survey Instrumentation.

4.2 SURVEY AREA CLASSIFICATION

The HRA has identified areas at NAVSTA TI that have been classified as impacted. Based on available information from previous surveys and the HRA (Weston 2006), each area will be given a classification. Impacted areas are divided into one of three classifications as described below.

4.2.1 Class 1 Areas

Class 1 areas have (or had prior to remediation) a potential for radioactive contamination. This potential is based on site operating history or known contamination based on previous radiation surveys above the wide-area derived concentration guideline level ($DCGL_W$). Examples of Class 1 areas include:

- Site areas previously subjected to remedial actions
- Locations where leaks or spills are known to have occurred
- Former burial or disposal sites

- Waste storage sites
- Areas designated as such in the HRA (Weston 2006)

4.2.2 Class 2 Areas

Class 2 areas have (or had prior to remediation) a potential for radioactive contamination or known contamination, but are not expected to exceed the $DCGL_W$. Examples of Class 2 areas include:

- Locations where radioactive materials were present in an unsealed form
- Potentially contaminated transport routes
- Areas downwind from stack release points
- Upper walls and ceilings of buildings or rooms subjected to airborne radioactivity
- Areas handling low concentrations of radioactive materials
- Areas designated as such in the HRA (Weston 2006)
- Buffer areas on the perimeter of Class 1 areas

4.2.3 Class 3 Areas

Class 3 areas are not expected to contain residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the $DCGL_W$, based on site operating history and previous radiation surveys. Examples of Class 3 areas include:

- Buffer zones around Class 1 or Class 2 areas
- Areas with very low potential for residual contamination but insufficient information to justify a non-impacted classification
- Areas designated as such in the HRA (Weston 2006)

4.3 CLASSIFICATION AND SURVEY UNIT SIZE

A survey unit is a physical area consisting of structures or land areas of specified size and shape for which a separate decision will be made as to whether or not that area exceeds the release criterion. This decision is made as a result of the FSS. As a result, the survey unit is the primary entity for demonstrating compliance with the release criteria.

Survey units will be limited in size based on classification, exposure pathway modeling assumptions, and site-specific conditions. The limitation on survey unit size for Class 1 and Class 2 areas ensures that each area is assigned an adequate number of data points. Table 4-1 lists the survey unit sizes.

4.4 REFERENCE COORDINATE SYSTEMS

A reference coordinate system will be laid out for each survey unit to identify survey/sample locations. Two different grid systems, as specified in MARSSIM (DoD et al. 2000), may be used. Although the preferred method is the triangle grid, the specific TSP will specify the grid system to be used.

4.4.1 Square Grid

A square grid system may be used for Class 1 and Class 2 survey units. For Class 3 survey units, a square grid system can be used, if specified in the TSP. The length, *L*, of a side of the square grid is determined by the total number of samples or measurements to be taken. The length of the square will determine the distance between survey data points. The length or spacing of the grids will be calculated for each of the survey units using the following equation:

Equation 4-1

$$L = \sqrt{\frac{A}{N}}$$

Where:

L	=	length of spacing (meters [m])
A	=	surface area of the survey unit (square meters [m^2])
N	=	number of data points

Grid locations are then positioned throughout the survey unit by first randomly selecting a start point and establishing a systematic pattern. Random numbers for the square grid method, between zero and 1, are determined for both the X and Y locations in each survey unit. The random number is then multiplied by the *L* (length of square grids) to determine both the starting X and Y locations in each survey unit. The length *L* is then used to determine all remaining data points based on this starting location.

4.4.2 Triangular Grid

A triangular grid system may be used for Class 1 and Class 2 survey units, but will not normally be used in Class 3 survey units. The length between triangular grid data points (*L*) is determined by the total number of samples or measurements to be taken, using the following equation:

Equation 4-2

$$L = \sqrt{\frac{A}{0.866 * N}}$$

Where:

L	=	length of spacing (m)
A	=	surface area of the survey unit (m^2)
0.866	=	constant factor from MARSSIM
N	=	number of data points

A second row of points is then developed, parallel to the first row, at a distance of $0.866 \times L$ from the first row. Survey points along that second row are midway (on the X-axis) between the points on the first row. This process is repeated to identify a pattern of survey locations throughout the survey unit. If identified points fall outside the survey unit or at a location that cannot be surveyed, additional points are determined using the random process described above, until the desired total number of points is identified.

The triangular grid system is generally more efficient for locating small areas of elevated activity. A more detailed discussion is provided in Statistical Methods for Evaluating the Attainment of Cleanup Standards, Volume 3: Reference Based Standards for Soils and Solid Media (EPA 1992).

4.5 SURVEY TYPE SELECTION

The type of survey selected for an area or survey unit will be specified by either the recommendations contained in the HRA (Weston 2006) or discussions and technical direction from the RASO. The exception will be remedial action support surveys, personnel surveys, equipment and material surveys, and truck surveys that will be used as necessary to assess the effectiveness of decontamination activities and to release personnel, equipment, and material.

The survey progression is reassessed typically when a survey unit fails to meet the release criterion during an FSS effort. If a Class 2 or 3 survey unit fails to meet the criterion for release, it will undergo decontamination or remedial actions, where necessary, and be reclassified as a Class 1 unit for the follow-up survey actions. If a Class 1 survey unit fails to meet the release criterion, decontamination and remedial action support surveys will be performed. A Class 1 survey will follow decontamination or remedial activities.

5.0 SURVEY OVERVIEW

This section provides an overview of survey planning, implementation, and data assessment. Survey details are given in later sections of this Management Plan. Additional details will be provided in the project-specific TSPs, as appropriate.

5.1 DATA LIFE CYCLE

Compliance demonstration is simply a decision as to whether or not a survey unit meets the release criterion. This decision is based on the results of one or more surveys. Positive actions must be taken to manage the uncertainty in the survey results so that sound, defensible decisions may be made. These actions include proper survey planning to control known causes of uncertainty, proper application of QC procedures during implementation of the survey plan to detect and control significant sources of error, and careful analysis of uncertainty before the data are used to support decision making. These actions describe the flow of data throughout each type of survey, referred to as the Data Life Cycle.

There are four phases of the Data Life Cycle:

- *Planning Phase.* The survey design is developed and documented using the DQO process, which is summarized in Section 5.2.3.
- *Implementation Phase.* The survey design is carried out in accordance with the TSPs resulting in the generation of raw data. In addition, quality assurance and QC measurements will generate data and other important information that will be used during the Assessment Phase.
- *Assessment Phase.* The data generated during the Implementation Phase are first verified to ensure that the TSPs were actually followed and that the measurement systems were performed in accordance with the criteria specified in this plan. Then the data are validated to ensure that the results of data collection activities support the objectives of the survey, as documented in the applicable TSP, or permit a determination that these objectives should be modified.
- *Decision-making Phase.* A decision is made, in coordination with the responsible regulatory agency, based on the conclusions drawn from the assessment process. The ultimate objective is to make technically defensible decisions with a specified level of confidence.

5.2 SURVEY PLANNING

The Radiation Survey and Site Investigation (RSSI) process includes a series of surveys that will be used at NAVSTA TI to demonstrate compliance with the release criterion. This process will be used as a framework for collecting the information required for scoping, characterization,

remediation, and FSS activities. The methodology used at NAVSTA TI to implement the RSSI process consists of the following six principal steps:

1. Site identification
2. Historical site assessment
3. Scoping survey
4. Characterization survey
5. Remedial action support survey
6. FSS

Table 5-1 provides a simplified overview of the principal steps in the RSSI process and how the Data Life Cycle can be used in an iterative fashion within the process.

Figure 2.4 of MARSSIM (DoD et al. 2000) illustrates the RSSI process in terms of area classification and lists the major decision to be made for each type of survey. The flow chart, illustrated in Figures 2.5 through 2.8 of MARSSIM, presents the principal steps and decisions in the site investigation process and shows the relationship of the survey types to the overall assessment process.

5.2.1 Survey Design Elements

Survey and sampling process design includes, but is not limited to, the following elements:

- The *types of samples and sampling matrices* for the survey; solid samples for outdoor surveys and fixed measurements for indoor surveys
- The *measurement frequency* for direct measurement locations for each survey unit and scan percentage of each survey unit
- The *sampling frequency* for solid sample collection locations in the survey unit(s)
- The *methods* for performing remedial action support surveys and other ancillary surveys

However, before these elements can be established, a general strategy must be determined.

5.2.2 Survey Strategy

Strategies for implementing the various survey types at NAVSTA TI are provided in Table 5-2. The selection of specific survey types for each area investigated under the Management Plan will be based on information in the HRA (Weston 2006) and will be identified in each corresponding TSP. For an FSS, the standard survey strategy will be based on using a MARSSIM (DoD et al.

2000) Scenario A approach, as described in Section 5.5.3. On a case-by-case basis, as identified in a TSP, the FSS design using the Scenario B approach will be considered.

5.2.3 Data Quality Objectives

MARSSIM recommends using the seven-step DQO process in the design of radiological surveys. This process tailors the survey to the particular conditions of each survey situation. DQO elements are applicable to all the surveys to be performed under this Management Plan. Specific DQOs for each survey will be established in the relevant TSP.

The seven steps in the DQO process are as follows:

1. State the problem
2. Identify the goal of the study
3. Identify information inputs
4. Define the boundaries of the study
5. Develop the analytical approach
6. Specify performance or acceptance criteria
7. Develop the plan for obtaining data

5.3 SURVEYS

Survey implementation for each type of survey to be conducted at NAVSTA TI is discussed below. While implementation requires instrumentation and survey techniques, this section will concentrate on the general approach. The instrumentation to be used is discussed in Section 7.0 and survey techniques are presented in Section 8.0. Other survey specifics will be presented in the TSP and/or project-specific NTCRA Work Plan.

5.3.1 Scoping and Characterization Surveys

These surveys will be implemented as described in their individual TSPs and/or project-specific NTCRA Work Plan. In practice, scoping and characterization survey data that indicate that the residual activity is below the derived concentration guideline level (DCGL) for the building/area will be used in the FSSs where possible.

5.3.2 Remedial Action Support Surveys

These surveys are implemented during the remedial activity. For example, surveys to support remediation would follow the decontamination work to assess progress.

5.3.3 Final Status Surveys

For the FSS, the data analysis framework is critical to survey development because it drives the sampling requirements. For contaminants present in background, the analysis uses the Wilcoxon Rank-Sum (WRS) test. For contaminants not present in background, the analysis uses the Sign test. In each case, the minimum number (*N*) of samples (or fixed measurements) is calculated as follows: the method to calculate any additional number of required data points is stated in Section 6.1, and grid spacing methods and requirements are listed in Section 4.4. The statistical tests are described in Section 5.4.

5.3.3.1 Determination of the Relative Shift

Using Equation 5-1, the value of the relative shift can be determined. For single radionuclide analysis, the values for the lower boundary of the gray region (LBGR) will be set at half the DCGL during the planning phase, and at the median concentration in a survey unit for the data assessment phase.

When analyzing multiple radionuclides, the values for the LBGR and σ are determined using Section 6.2:

Equation 5-1

$$\frac{\Delta}{\sigma} = \frac{DCGL_W - LBGR}{\sigma}$$

Where:

$DCGL_W$	=	$DCGL_W$ as appropriate
$LBGR$	=	lower boundary of the gray region, as appropriate
σ	=	standard deviation from the survey unit, as appropriate

The value of the relative shift is used with the appropriate random measurement probability presented in MARSSIM (DoD et al. 2000) Tables I.2a and I.2b.

5.3.3.2 Determination of the Number of Data Points

When the contaminant is present in background, Equation 5-2 is used with the WRS test:

Equation 5-2

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{3\left(P_r - 0.5\right)^2}(1.2)$$

When the contaminant is not present in background, Equation 5-3 is used with the Sign test:

Equation 5-3

$$N = \left(\frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{4\left(Sign\ p - 0.5\right)^2} \right)(1.2)$$

Where:

$Z_{1-\alpha}$	=	Type I decision error level
$Z_{1-\beta}$	=	Type II decision error level
P_r	=	random measurement probability
Sign p	=	random measurement probability
(1.2)	=	20% increase in number of samples over the minimum

During the data assessment phase, the 20 percent increase of samples is omitted for statistical purposes.

5.3.4 Error Control

Actions to minimize errors will be instituted during the data collection phase of the surveys. Qualified radiation survey personnel will perform the survey and record the data. Automated recording of survey data will be used where possible to minimize errors. Data transcribing is an activity where errors may arise. To minimize data errors for manual surveys, experienced personnel will record and transcribe data.

Standard applicable quality assurance and QC measures will be implemented to control error.

The ongoing on-site analyses and evaluation of survey results provide a verification check for errors, which will be corrected if detected.

A knowledgeable individual who is not involved in the direct data collection process (e.g., the RTS) will review the survey data on a daily basis. This will ensure an ongoing independent review for consistency of survey data collected.

5.4 ASSESSMENT OF SURVEY RESULTS

A preliminary evaluation of the data set will be conducted to better understand the structure of the data and thereby identify appropriate approaches and limitations for utilization. For non-FSSs, this may be merely identifying areas of elevated contamination or reviewing the mean, median, and standard deviation of the data set. FSS evaluations include, but are not limited to, reviewing quality assurance reports, calculating statistical quantities, and graphing the data.

5.4.1 Scoping and Characterization Surveys

Basic statistical quantities (mean, maximum, standard deviation) will be calculated from the data collected. When a reference area is surveyed, the same quantities will be calculated. The focus of the data assessments will normally be the comparison of the survey data to the DCGL for the building/area. If all measurements are less than the DCGL, then the data will be used in the FSSs, where possible. Measurements above the DCGL will be assessed for further action.

5.4.2 Remedial Action Support Surveys

The focus of these data assessments will also be the comparison of the survey data to the DCGL for the building/area. If all measurements are less than the DCGL, then the remedial action can be declared complete and an FSS performed. Otherwise, measurements above the DCGL will be identified for continued remedial action.

5.4.3 Final Status Surveys

When determining compliance with FSS goals, the survey data are examined. Compliance tests are summarized as follows:

- The largest measurement is compared to the DCGL (net of background, if present in background). If all measurements are lower than the release limits (net of background, if present in background), no statistical test is necessary.
- The average measurement is compared to the DCGL (net of background, if present in background).
- The appropriate statistical test is used to determine if the survey data exceed the release limits, if necessary.
- If scan measurements are above the DCGL, a fixed measurement will be taken to confirm the elevated reading. If the elevated reading is confirmed, the unit would fail.

When multiple nuclides are present, each with an individual DCGL, they will be assessed in accordance with the methods described in Section 6.2.

This Management Plan will use an analysis structure incorporating three possible common statistical procedures, as well as conventional qualitative and semi-quantitative comparisons for FSS data. The statistical tests are only applied to measurements made at fixed locations. The tests are:

- **Sign test** – The Sign test is a one-sample, nonparametric test that can be used to evaluate compliance with the release limit. The Sign test is the recommended compliance evaluation procedure when the contaminant(s) under evaluation are not present at significant levels in background. Any one of the individual samples (each individual survey unit is a "sample" in this context) or any combination can be compared to the release limit with the Sign test. For example, each of the Class 1

survey units could be pooled for an overall building comparison to the release limits rather than comparing an individual survey unit to the release limit.

- **Wilcoxon Rank-Sum test** – The WRS test is a two-sample, nonparametric procedure that can be used to evaluate compliance when the contaminant is present in background. The WRS test can be used as a two-sample test to compare medians between samples (contamination concentration measured in reference background materials versus the same parameter measured in site investigative materials) when either or both sampling distributions deviate significantly from normal.
- **Normal means test** – This is the traditional two-sample t-test based on the central limit theorem (i.e., normality). It can be used to assess compliance, derive confidence intervals, and compare between samples (mean removable surface contamination concentration in one survey unit versus the same parameter measured in another survey unit) when both sample distributions are normal or do not deviate appreciably from normality.

Both scan and fixed measurements are subject to the elevated measurement comparison. The result of this comparison is not conclusive as to whether the survey unit meets or exceeds the release criterion, but is a flag or trigger for further investigation. This comparison is described in Section 6.1.

5.5 DECISION MAKING

5.5.1 Scoping and Characterization Surveys

For a scoping survey, the decision rule is, "If the survey results meet the criteria defined in the TSPs, then design and perform an optimized FSS. If the survey results do not meet the criteria defined in the TSPs, then design and perform an optimized characterization survey." In practice, most scoping surveys will be tested against DCGLs. If no contamination above the DCGL is found, then the survey data will be used in an FSS. If contamination is found, then a characterization survey would be performed.

For a characterization survey, the decision rule is, "If the survey results meet the criteria defined in the TSPs, then design and perform an optimized FSS. If the survey results do not meet the criteria defined in the TSPs, then perform remedial action." If no contamination above the DCGL is found, then the survey data would be used in an FSS.

5.5.2 Remedial Action Support Surveys

The decision rule is, "If the survey results indicate that the remediation is complete (as defined in the TSPs), then design and perform an optimized FSS. If the survey results indicate that the remediation is incomplete, then reevaluate the remedial alternative and continue remediation if necessary."

5.5.3 Final Status Surveys

The results of the statistical testing of the data set for each survey unit will be used to evaluate whether to accept or reject the null hypothesis. Using the MARSSIM (DoD et al. 2000) Scenario A methodology, the null hypothesis is stated as "the residual activity in the survey unit exceeds the release criterion." Thus, in order to pass the survey unit (that is, release the area), the null hypothesis must be rejected. The objective of FSSs will be to demonstrate that residual radioactivity levels meet the release criterion. In demonstrating that the objective is met, the null hypothesis (H_o) is tested that residual contamination exceeds the release criterion; the alternative hypothesis (H_a) is then tested that residual contamination meets the release criterion.

To validate the use of a test, an evaluation will be made to determine that the data are consistent with the underlying assumptions made for the statistical procedure. Assumptions that can be made in the survey design are:

- The sample sizes determined for the tests are sufficient to achieve the DQO set for the Type I and Type II error.
- The data from the reference area or survey unit consist of independent samples from each distribution.
- The reference area and survey unit data distribution are similar, except for a possible shift in the medians.
- Whether the data represent a normal or asymmetric distribution.

Certain departures from these assumptions may be acceptable when given the actual data and other information about the study. One of the primary advantages of the nonparametric test is that it involves fewer assumptions about the data than the parametric test.

Scenario B methodology as defined in NUREG-1505 (NRC 1997a) may be used with concurrence from the RASO. If Scenario B is used, specific details will be listed in the TSP as a deviation or exception to the Management Plan.

6.0 RELEASE CRITERIA AND INVESTIGATION LEVELS

The release criteria for buildings, structures, material, and land areas at NAVSTA TI are listed in Table 6-1. Release criteria for equipment and material are taken from Atomic Energy Commission (AEC) Regulatory Guide 1.86 (AEC 1974). Criteria for structures (surfaces) are taken from either Regulatory Guide 1.86 or a dose-based calculation, whichever is lower. The dose-based calculation will be performed with a dose limit of 15 millirems per year, using the most current version of RESRAD (for outdoor areas) or RESRAD-BUILD (for structures) software packages. Release criteria for soils are taken from the U.S. Environmental Protection Agency's (risk-based) Preliminary Remediation Goals for two future-use scenarios. Limits for a specific building or area will be provided in the TSPs.

Release criteria organized by survey type are as follows:

- A remedial action support survey will use the release criteria for equipment, material, structures, and soil.
- An FSS will use all the release criteria in Table 6-1 and criteria for scanning surveys known as DCGLs for elevated measurement comparison ($DCGL_{EMC}$), discussed below.

6.1 ASSESSING SMALL AREAS OF ELEVATED ACTIVITY

Using guidance from MARSSIM (DoD et al. 2000), systematic measurements and sampling, in conjunction with surface scanning, are used to obtain adequate assurance that small areas of elevated radioactivity will satisfy the release criterion for small areas. Under RASO direction, this procedure may be implemented for survey units classified as Class 1.

The $DCGL_W$ is the average concentration across the site that is equivalent to the release criterion, based on dose or risk. The general assumption is that the concentrations of the radionuclides in the source are homogeneous. The degree to which any single localized area can be elevated above the average, assuming the average is at the $DCGL_W$, and not invalidate the homogeneous assumption is characterized by the small area criteria ($DCGL_{EMC}$).

Values for the $DCGL_{EMC}$ are obtained by modifying the $DCGL_W$ using an area factor that accounts for the difference in area and the resulting change in dose or risk. The area factor is the magnitude by which the concentration within the small area of elevated activity can exceed the $DCGL_W$ while maintaining compliance with the release criterion. The area factor takes into consideration how a smaller area would affect the dose or risk.

The first step in the process is to assess the scan minimum detectable concentration (MDC); this process is described in Section 7.2. The next step is to determine the "required" scan MDC. The

"required" scan MDC is the product of the $DCGL_W$ and the area factor (also known as the $DCGL_{EMC}$). This can be calculated using Equation 6-1:

Equation 6-1

$$\text{"required" Scan MDC} = DCGL_{EMC} = (DCGL_W) \times (\text{Area Factor})$$

The area factor is obtained from dose modeling using RESRAD or RESRAD-BUILD and is determined based on the size of the area bounded by the sample size in the survey unit. This bounded area (*a'*) is simply the survey unit area (in m^2) divided by the number of samples determined in Section 5.3.3. Equation 6-2 is used to derive the size of the area:

Equation 6-2

$$a' = \text{Survey Unit Area (in } m^2\text{)} / \text{number of samples}$$

The "actual" scan MDC is then compared to the "required" scan MDC. If the "actual" scan MDC is less than the "required" scan MDC, then no additional samples are required. However, if the "actual" scan MDC is greater than the "required" scan MDC, an increase in the number of samples taken may be required. To determine if there is an increase in sample size, the area factor is determined using Equation 6-3:

Equation 6-3

$$\text{Area Factor} = (\text{"actual" Scan MDC}) / (DCGL_W)$$

A table of possible area factors is determined by taking the ratio of doses established by using the most current version of RESRAD for outdoor areas or RESRAD-BUILD for structures. For each radionuclide of concern, all exposure pathways are calculated assuming a concentration of radioactive contamination at the release criteria.

The area of contamination in RESRAD defaults to 10,000 m^2. Other than changing the area (i.e., 1, 3, 10, 30, 100, 300, 1,000, or 3,000 m^2), the RESRAD exposure pathways remain constant. A table of area factors is then computed by taking the ratio of the dose or risk per unit concentration generated by RESRAD for the 10,000 m^2 to that generated for the other areas listed. If the DCGL for residual radioactivity distributed over 10,000 m^2 is multiplied by this value, the resulting concentration distributed over the specified smaller area delivers the same calculated dose.

Indoor area factors are calculated in a similar manner using the most current version of RESRAD-BUILD. The area of contamination in RESRAD-BUILD defaults to 36 m^2. The other areas to be compared to this value are 1, 4, 9, 16, and 25 m^2. Removable surface contamination

is assumed to be 20 percent. No other changes to exposure pathways are to be made between iterations when calculating a table of values.

This area factor is then used to determine the new area bounded by samples a' by logarithmically interpolating from a generated table of possible area factors using Equation 6-4 below, and solving for a':

Equation 6-4

$$\ln(a') = \frac{\ln(\frac{y}{z}) \cdot \ln(\frac{AF_x}{AF_z})}{\ln(\frac{AF_y}{AF_z})} + \ln(z)$$

Where:

y	=	size of area with lower area factor than area factor determined
z	=	size of area with higher area factor than area factor determined
AF_x	=	area factor determined
AF_y	=	area factor of area y
AF_z	=	area factor of area z

Substituting the new bounded area a' into Equation 6-5 provides the increased number of samples required, if any:

Equation 6-5

Additional number of samples required = Survey Unit Area (in m^2) / (a')

The additional number of samples required, in addition to the number required for a particular statistical test from Section 5.3.3, will form the total number of samples required for a particular survey unit when using elevated measurement comparisons. This new total number of samples required will then be applied to the systematic sampling pattern described in Section 4.4 to determine the grid spacing.

6.2 ASSESSING MULTIPLE RADIONUCLIDES

When multiple radionuclides are present, either the more conservative of the individual DCGLs or a combined DCGL will be used, as directed by the RASO. A combined DCGL is calculated using Equation 6-6:

Equation 6-6

$$\text{Combined DCGL} = \frac{1}{\frac{f_1}{DCGL_1} + \frac{f_2}{DCGL_2} + \ldots + \frac{f_n}{DCGL_n}}$$

Where f_n is the anticipated fraction of each radionuclide versus the total, and $DCGL_n$ is the DCGL for each radionuclide present, the sum of f_1, f_2,…f_n equals 1.

6.2.1 $DCGL_W$ for Multiple Radionuclides

As stated in MARSSIM (DoD et al. 2000) the $DCGL_W$, when using multiple radionuclides, is established by definition at 1.0. The unity rule, represented in the expression below (Equation 6-7), is satisfied when the radionuclide mixture yields a combined fractional concentration limit that is less than or equal to 1.0. Statistical tests will be used to prove that the total sum of all radionuclides does not exceed the applicable release criterion.

6.2.2 Determination of LBGR for Multiple Radionuclides

The LBGR is the net median concentration of the contaminant in the survey unit. Since this value is unknown, MARSSIM (DoD et al. 2000) suggests using a value for the LBGR of half the DCGL during planning purposes. However, once the median concentration activity in the survey unit is established, this value is used as a ratio to the lowest DCGL for the decay method to determine the LBGR. Equation 6-7, taken from MARSSIM, gives the method used to determine the LBGR:

Equation 6-7

$$LBGR = \frac{C_1}{DCGL_1} + \frac{C_2}{DCGL_2} + \frac{C_2}{DCGL_2} + \ldots + \frac{C_i}{DCGL_i} \leq 1$$

Where:

C_i = median concentration of radionuclide "i"
$DCGL_i$ = DCGL of radionuclide "i"

6.2.3 Determination of Standard Deviation for Multiple Radionuclides

There is no estimate of the standard deviation of the contaminant in a survey unit, especially if no contaminant is initially expected or if concentrations of radionuclides are spatially unrelated. Therefore, σ is assigned the value of the standard deviation of the adjusted measurement values in the survey unit as shown in Equation 6-8 from Section 6.2.3 of Decommissioning Health Physics (Abelquist 2001):

Equation 6-8

$$\sigma = \sqrt{\left(\frac{\sigma_{C1}}{DCGL_1}\right)^2 + \left(\frac{\sigma_{C2}}{DCGL_2}\right)^2 + \ldots + \left(\frac{\sigma_{Ci}}{DCGL_i}\right)^2}$$

Where:

σ_{Ci} = standard deviation from radionuclide "i"
$DCGL_i$ = DCGL of radionuclide "i"

6.3 CONVERTING DCGL UNITS

At times, it may be necessary to convert the DCGL from picocuries per gram (pCi/g) to counts per minute (cpm) in order to calculate the number of samples required in a given survey unit. To perform this conversion, an arbitrary concentration of the radionuclide is divided by the associated exposure rate produced by the concentration (as identified in Section 7.2.8). The resulting number is then divided by the average net cpm per microroentgens per hour (µR/hr) for the detector being used. Once the number is derived, the release criterion is divided by this number, as shown in Equation 6-9:

Equation 6-9

$$cpm = \frac{DCGL}{DCGL_{AC} / M * DCGL_{AC} / \mu Rcpm}$$

Where:

$DCGL$ = release criterion (pCi/g)
$DCGL_{AC}$ = arbitrary concentration of radionuclide (pCi/g)
M = exposure rate calculated by MicroShield™ (Grove Engineering 1996)
$\mu Rcpm$ = counts per minute per µR/hr for the detector

6.4 INVESTIGATION LEVELS

Investigation levels are specific levels of radioactivity used to indicate when additional investigation may be necessary. Investigation levels also serve as a QC check. For example, in addition to indicating potential contamination, a measurement that exceeds the investigation level may indicate that the survey unit has been improperly classified or may indicate a failing instrument.

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

When an investigation level is exceeded, the measurement will be confirmed to ensure that the initial measurement/sample actually exceeds the particular investigation level. This will involve taking further measurements to confirm the initial result, and as appropriate, to quantify the area of elevated residual radioactivity.

6.4.1 Investigation Levels for Gamma Radiation Surveys

For gamma surveys the investigation level will normally be established at the reference area mean + 3σ, where σ is the standard deviation of the gamma readings in the reference area. Other investigation levels may be implemented with prior RASO concurrence.

6.4.2 Investigation Levels for Alpha and Beta Radiation Surveys

For alpha and beta surveys, the investigation level will be the $DCGL_W$ or a statistical-based parameter, if used.

7.0 INSTRUMENTATION

Instruments will be selected that are suitable for the physical and environmental conditions at the site. The instruments and measurement methods selected will be able to detect the radionuclide of concern or radiation types of interest and are, in relation to the survey or analytical technique, capable of measuring levels sufficient to support the DQOs. Table 7-1 identifies the instrumentation resources available to support the survey objectives.

7.1 FIELD SURVEY INSTRUMENTS

Portable survey instruments will be used to perform measurements in the field. Table 7-1 lists the types of portable survey equipment expected to be used during survey activities at NAVSTA TI, and Table 7-2 provides examples of field radiological survey instrument calculations.

7.1.1 Calibration

Portable survey instrument calibration will be completed on an annual frequency. Instrument calibration will also be performed after repairs or modifications have been performed on the instrument. The instrument will be calibrated in accordance with the manufacturer's recommended method.

7.1.2 Daily Performance

Prior to use of the portable survey instruments, calibration verification, physical inspection, battery check, and source-response check will be performed per SOP 002, Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use.

All portable survey instruments will have a current calibration label that will be verified daily prior to use of the instrument.

Physical inspection of the portable survey instrument will include:

- General physical condition of the instrument and detector prior to each use
- Knobs, buttons, cables, connectors
- Meter movements/displays
- Instrument cases
- Probe/probe window(s)
- Other physical properties that may affect the proper operation of the instrument or detector

Any portable survey instrument or detector having a questionable physical condition will not be used until the problems have been corrected.

A battery check will be performed to ensure that sufficient voltage is being supplied to the detector and instrument circuitry for proper operation. This check will be performed in accordance with the instrument's operations manual.

The instrument will be exposed to the appropriate (alpha, beta, gamma) check source to verify that the instrument response is within the plus or minus percent range determined during the initial response check.

The results of the daily operation checks discussed above will be documented. Instruments that do not pass the daily operation checks will be removed from service until all deficiencies have been corrected.

7.1.3 Instruments for Surface Scan Surveys for Alpha Activity

Scan surveys for alpha radiation will be performed using a Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43 series alpha-beta gas proportional probe (or equivalent) or a Ludlum Model 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent).

7.1.4 Instruments for Surface Scan Surveys for Beta Activity

Scan surveys for beta radiation will be performed using a Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probe (or equivalent) or a Ludlum 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent).

7.1.5 Instruments for Direct Measurement Static Surveys for Alpha Activity

Static surveys for alpha radiation will be performed using a Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probe (or equivalent) or a Ludlum Model 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent).

7.1.6 Instruments for Direct Measurement Static Surveys for Beta Activity

Static surveys for beta radiation will be performed using a Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probe (or equivalent) or a Ludlum Model 43-89 or 43-93 ZnS(Ag) plastic scintillation detector (or equivalent).

7.1.7 Instruments for Scan Surveys for Gamma Activity

Scan surveys for gamma radiation will be performed using a Ludlum Model 2350-1 data logger (or equivalent) equipped with a Ludlum Model 44-10 2-inch by 2-inch sodium iodide (NaI) scintillation detector (or equivalent) or RASO-approved towed array gamma survey system.

7.1.8 Instruments for Direct Measurement Static Surveys for Gamma Activity

Direct measurement static surveys for gamma radiation will be performed using a Ludlum Model 2350-1 data logger (or equivalent) equipped with a Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector (or equivalent).

7.1.9 Instruments for Direct Measurement Surveys for Beta Gamma Activity

Direct measurement surveys for beta and gamma radiation will be performed using Ludlum Model 3, Model 12, Model 177, or equivalent, with a Model 44-9 Geiger Mueller pancake probe (or equivalent). This instrument combination is normally used for routine surveys associated with operational aspects of decommissioning activities such as monitoring personnel and equipment exiting a radiologically controlled area.

7.1.10 Instrument for Exposure Rate Surveys

Exposure rate surveys are conducted with use of a Ludlum Model 19 MicroR meter (or equivalent). Compatible with anticipated exposure rates, the instrument is equipped with an internally mounted 1-inch by 1-inch NaI scintillation detector that is integral to the meter housing.

7.1.11 Instrument for Portal Monitor Truck Surveys

The Ludlum Model 3500-1000RWM Radiation Monitor System is designed to detect low levels of radiation in loads passing through the system. Two scintillation detectors, each containing approximately 480 cubic inches of plastic detector media, provide coverage to both sides of the vehicle. The detector's large size (48 inches long by 5 inches wide by 2 inches thick) provides a large area for the detection of gamma radiation.

7.2 INSTRUMENTATION EQUATIONS

The following equations are used to calculate efficiencies, MDCs, and minimum detectable count rates (MDCRs).

7.2.1 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 7-1 will be used to calculate the instrument efficiency in counts per particle, although efficiency is typically reported as having no units or unitless:

Equation 7-1

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

Where:

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 (National Institute of Standards and Technology [NIST] traceable) in particles per minute
W_A	=	active area of the detector window (square centimeters [cm^2])
S_A	=	area of the source (cm^2)

The instrument efficiency procured from the instrument calibration service 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 instrument 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 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 the same as the detector-to-surface distance used in the field.

7.2.2 Surface Activity Measurements

Surveillance measurements are used to quantify surface activity levels on concrete and other building surfaces. International Organization for Standardization (ISO) 7503-1 (ISO 1988), NUREG/CR-1507 (NRC 1997b), and Selection and Use of Portable Radiological Survey Instruments for Performing In Situ Radiological Assessments in Support of Decommissioning (American Society for Testing and Materials 1998) are used as technical guidance to ensure accuracy in the measurement of surface activity.

Equation 7-1a is used to calculate the surface activity in units of disintegrations per minute (dpm) per 100 cm^2:

Equation 7-1a

$$A_S = \frac{R_{S+B} - R_B}{\varepsilon_i \varepsilon_s \frac{W_A}{100\,cm^2}}$$

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
ε_s	=	the contaminated surface efficiency
W_A	=	the area of the detector window (cm^2)

7.2.3 Count Detection Probability for Alpha Scans (≤ 126-cm^2 Probe)

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 using Equation 7-2:

Equation 7-2

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

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)

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 using Equation 7-3:

Equation 7-3

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

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)

7.2.4 Count Detection Probability for Alpha Scans (582-cm^2 Probe)

The larger (582 cm^2) gas-proportional detectors have background count rates on the order of 5 to 10 cpm, and a single count will not cause a surveyor to investigate further. A counting period long enough to establish that a single count indicates an elevated contamination level would be prohibitively inefficient. For these types of instruments, the surveyor usually will need to get at least two counts while passing over the source area before stopping for further investigation.

Assuming this to be a valid assumption, the probability of getting two or more counts can be calculated by Equation 7-4:

Equation 7-4

$$P(n \geq 2) = 1 - \left[1 + \frac{(GE + B)t}{60}\right]\left[e^{\frac{-(GE+B)t}{60}}\right]$$

Where:

$P(n \geq 2)$	=	probability of getting two or more counts during the time interval t
t	=	time interval (s)
G	=	contamination activity (dpm)
E	=	detector efficiency (4π)
B	=	background count rate (cpm)

7.2.5 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 7-5:

Equation 7-5

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

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 (DoD et al. 2000), the value of d', representing this performance goal, is 3.28.

The minimum detectable number of net source counts in the interval is given by S_i. Therefore, for an ideal observer, the number of source counts required for a specified level of performance can be arrived at by multiplying the square root of the number of background counts by the detectability value associated with the desired performance (as reflected in d'), as shown in Equation 7-5a:

Equation7-5a

$$S_i = d' \sqrt{b_i}$$

The scan MDC is determined from the 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 7-6:

Equation 7-6

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

Where:

MDCR is discussed above
p = surveyor efficiency factor
ε_i = instrument efficiency (counts per particle)
ε_s = contaminated surface efficiency (particles per disintegration)
W_A = area of the detector window (cm^2)

7.2.6 MDC for Static Alpha and Beta Counts

The static MDC is the level of radioactivity practically achievable by the overall measurement process. Equation 7-7 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 7-7

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

Where:

R_B = background count rate (cpm)
T_B = background counting time (minute [min])
ε_i = instrument efficiency (counts per particle)
ε_s = contaminated surface efficiency (particles per disintegration)
W_A = active area of the detector window (cm^2)

In Equation 7-7, 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 7-8 is used to calculate the MDC in dpm per 100 cm^2:

Equation 7-8

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

Where:

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

7.2.7 Surface Efficiency (ε_s) for Surface Activity Measurements

The surface efficiency term in the preceding equations is used to determine the 4π total efficiency for a particular surface and condition. Suitable values are based on the radiation and radiation energy, and are primarily impacted by the backscatter and self-absorption characteristics of the surface on which the contamination exists in the field. Backscatter is most affected by the energy of the radiation and the density of the surface material. Self-absorption characteristics or attenuation are also a function of the radiation's energy and surface condition. Surfaces typically encountered in the field include concrete, asphalt, wood, drywall, plaster, carpet, and metal. Surface conditions include both physical effects, such as scabbled concrete, and the effect of surface coatings: dust, paint, rust, water, and oil.

In the absence of experimentally determined surface efficiencies, ISO-7503-1 (ISO 1988) and NUREG-1507 (NRC 1997b) provide conservative recommendations for surface efficiencies. ISO-7503-1 recommends a surface efficiency of 0.5 for maximum beta energies exceeding 0.5 megaelectron volt (MeV) and to use a surface efficiency of 0.25 for beta energies between 0.15 and 0.4 MeV and for alpha emitters (ISO 1988; NRC 1997b). NUREG-1507 provides surface efficiencies based on studies performed for the NRC. In general, NUREG-1507 indicates that the ISO rule of thumb for surface efficiencies is conservative, particularly for beta-emitting radionuclides with end-point energies between 0.25 MeV and 0.4 MeV. A surface efficiency of 0.25 will be used for alpha and beta emitters at NAVSTA TI.

7.2.8 MDC for Gamma Scans of Surface Areas

The scan MDC (in pCi/g) for land areas 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 7-5 and then applying a surveyor efficiency factor p to get the $MDCR_{Surveyor}$ as shown in Equation 7-9:

Equation 7-9

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

The $MDCR_{Surveyor}$ is then converted into the corresponding minimum detectable exposure rate (MDER) by use of a calibration constant specific to the detector being used and the radionuclide of concern. For example, when used with the Ludlum Model 2350-1, the calibration records for the Ludlum Model 44-10 2-inch by 2-inch NaI scintillation detector provide a calibration constant that can be used to determine the ratio of cpm to µR/hr, as shown in Equation 7-10 below:

Equation 7-10

$$MDER\ (\mu R / hr) \quad = \quad \frac{MDCR_{Surveyor} * 6 \times 10^{7}}{cc}$$

Where:

$MDCR_{Surveyor}$	=	as calculated in Equation 7-9
6×10^{7}	=	a conversion factor accounting for differences in time and activity units ([µR-min]/[R-hr])
cc	=	calibration constant ([counts]/[R])

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
- 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 (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 or Monte Carlo *N*-Particle code, as shown in Equation 7-11 below:

Equation 7-11

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

7.2.9 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 7-12 is used to calculate the MDCR:

Equation 7-12

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

Where:

3 + 4.65	=	constant factor provided by MARSSIM
R_B	=	background count rate (cpm)
T_B	=	background counting time (min)

TSPs will not normally be designed to use different background and sample count times for gamma scan surveys; any deviation from this requires RASO approval, and notation in the TSP and final reports as an exception to the Management Plan. If the background and sample are counted for different time intervals, Equation 7-13 is used to calculate the MDC:

Equation 7-13

$$MDC = \frac{3 + 3.29\sqrt{R_B \cdot T_{S+B} \cdot (1 + \frac{T_{S+B}}{T_B})}}{T_{S+B}}$$

Where:

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

7.3 LABORATORY INSTRUMENTS

Laboratory equipment will be used to analyze samples collected in the field. Table 4 of the SAP provided in the NTCRA Work Plan lists the types of laboratory equipment expected to be used at NAVSTA TI.

7.3.1 Quality Assurance Checks

Quality assurance checks shall be performed on laboratory instrumentation to ensure proper operation and to maintain calibration. The quality checks shall be documented, reviewed, and

maintained. Data trends outside the tolerance limits shall be investigated to determine the cause and potential effect on measurement results.

7.3.2 Gross Alpha/Beta Loose Surface Contamination Surveys

Swipe samples will be processed using a Protean Instrument Corporation or a Canberra, Inc. (Tennelec) gas-flow proportional alpha/beta radiation counter (or equivalent) that features a low-background counting chamber. A microprocessor allows for data processing, and the unit provides a full range of simultaneous alpha and beta analysis at levels required for environmental release surveillance. Data are reported in units of dpm per 100 cm^2.

A Ludlum Model 3030P scaler and scintillation probe (or equivalent) may be used as a backup to the gas-flow proportional counters. Data are reported in units of dpm.

7.3.3 Gamma Spectroscopy

Gamma spectroscopy analysis is performed using EG&G ORTEC® detector systems equipped with beryllium end caps (windows), which allow for enhanced quantification of low-energy gammas (such as Ra-226). Hardware features include a high-purity germanium detector (gamma photon detector) supported by a multi-channel analyzer and analysis software. Instrument hardware is calibrated using a multi-energy NIST-traceable source ranging from 50 kiloelectron volts to 2.6 MeV. All results are reported in pCi/g, picocuries per milliliter (pCi/mL), or picocuries per liter (pCi/L), depending on the media analyzed. The on-site and off-site Laboratory Managers review all data results, including energy spectrums, for quality assurance and to verify count integration, efficiency, and background corrections, as well as the identification of overlapping peaks. If there is any question on the analysis results, the sample is reprocessed and possibly counted for a longer interval.

7.3.4 Liquid Scintillation Analysis

Liquid scintillation counting will be performed in accordance with the SAP included with the project-specific NTCRA Work Plan by a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) accredited laboratory. The results are identified in dpm or pCi/g and grouped by energy.

8.0 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. The survey procedures described in this section will be performed in accordance with approved SOPs or work instructions as identified in the project-specific NTCRA Work Plan. Additional survey implementation details will be identified in each TSP and/or project-specific NTCRA Work Plan.

8.1 REFERENCE (BACKGROUND) AREAS

An average background level will be determined by performing measurements at systematic or random locations within the designated background area. The detector probe will be held approximately 10 centimeters (4 inches) from the surface area for gamma radiation 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 the larger of the readings or the method detection limit or minimum detectable activity (MDA) reported by the laboratory for all of the readings taken will determine the background. Background scan ranges, swipes, and exposure rates will also be collected for reference data. In some cases, solid samples will need to be collected in the background area for comparative analyses of specific survey units. The same survey methodology and instruments used to collect the background data will be used to perform measurements within survey units.

8.2 SCAN SURVEYS

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.

8.2.1 Scan Surveys for Alpha/Beta Radiation

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 within 0.635 centimeter (0.25 inch) over the surface being surveyed.

8.2.2 Scan Surveys for Gamma Radiation

Scan measurements are obtained by traversing a path at a maximum speed (scan rate) of approximately 0.5 meter per second and slowly moving the detector assembly in a serpentine (S-shaped) pattern, while maintaining the detector approximately 10 centimeters (4 inches) above the area being surveyed.

8.3 STATIC SURVEYS

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.

8.3.1 Static Surveys for Alpha and Beta Surface Activity

Direct measurements will be conducted with the detector within 0.635 centimeter (0.25 inch) above the surface. Count time for conducting the measurement will be dependent upon the radionuclide of concern.

8.3.2 Static Surveys for Gamma Radiation

Static gamma measurements require positioning the detector assembly approximately 10 centimeters (4 inches) above the surface and completing a stationary 60-second survey.

8.4 EXPOSURE RATE MEASUREMENTS

Exposure rate surveys are performed to measure ambient gamma radiation levels. These measurements are obtained by holding the detection device at the required distance from the surface being surveyed. Instrumentation will be allowed to stabilize before taking the measurement.

8.5 SWIPE SAMPLE MEASUREMENTS

Swipe sampling will be performed to assess the presence of radioactive contamination that is readily removed from a surface. Swipe samples will be taken to evaluate the presence of alpha and beta surface activity. As called for in individual TSPs, swipe samples may be collected to evaluate tritium contamination. The procedures for collecting swipe samples are discussed in the SAP included in the project-specific NTCRA Work Plan.

8.6 SURVEY AND SAMPLE LOCATIONS

Static measurements, swipe samples, exposure rate measurements, and media samples will be taken from the same predetermined locations within each survey unit to obtain data for use in FSSs. Section 4.4, Reference Coordinate Systems, and Section 6.1, Assessing Small Areas of Elevated Activity, provide further discussion of survey and sample locations for FSSs. Static measurement locations for equipment and material surveys are given in TSPs and/or the project-specific NTCRA Work Plan; SOP 001, Radiation and Contamination Surveys; SOP 003, Release of Materials and Equipment from Radiologically Controlled Areas; and other work instructions. Table 1-1 lists each of the TtEC field SOPs developed for performing radiological work at NAVSTA TI. Copies of the SOPs are provided in the SAP included in the NTCRA Work Plan.

Work instructions are available on-site at NAVSTA TI and can be provided to the DON and/or regulatory agencies for review upon request.

8.7 EQUIPMENT AND MATERIAL SURVEYS

Equipment and materials surveys will be performed in accordance with SOPs as identified in the project-specific NTCRA Work Plan. Table 6-1 lists acceptable levels of contamination based on the AEC Regulatory Guide 1.86 limits. In the event that survey results indicate levels of contamination exceeding the limits listed in Table 6-1 (for surfaces), appropriate decontamination methods will be performed using methods described in SOP 007, Decontamination of Equipment and Tools.

8.8 PERSONNEL SURVEYS

Properly trained staff will perform personnel surveys in a predesignated low-background area before leaving a radiologically controlled area, as specified in the RWP or when deemed necessary by the RCT. Personnel who are not qualified to administer a self-survey will be monitored by a qualified technician. Personnel surveys will be performed using the appropriate survey methods described above and in accordance with SOP 001, Radiation and Contamination Surveys.

8.9 MEDIA SAMPLING

Various samples may be collected for radiological analysis, including soil, water, brick, porcelain, wood, and others. The SAP provided in the project-specific NTCRA Work Plan will describe the methods for collecting samples, sample numbering, sample labeling, sample shipment, and completion of the associated chain-of-custody and other required documentation.

8.10 AIR SAMPLING

As specified in the RWP, airborne activity monitoring (continuous or grab samples) and engineering controls will be necessary during the course of work. To control occupational exposures, establish PPE, and determine respiratory-protection requirements, monitoring and trending for airborne radioactive material will be performed as necessary. Engineered controls will be implemented if required to maintain airborne concentrations below 10 percent of the applicable derived air concentration (DAC) value for the radionuclides of concern (Table 8-1).

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. Air monitoring will be performed using the methods described in SOP 009, Air Sampling and Sample Analysis.

8.11 TRUCK SURVEYS

During the course of work at NAVSTA TI, soils and debris will be transported via truck to recycling centers, landfills, and other licensed disposal sites. Most of these items and materials will require radiological surveys prior to leaving the site. However, some stockpiles of soil, debris, and miscellaneous materials may not be surveyed because the likelihood of contamination is very low. As an added measure against inadvertently sending radioactive materials to a landfill or disposal site, trucks carrying material from potentially impacted sites will be surveyed for gamma radiation. Truck surveys will be performed using SOP 011, Gamma Screening of Trucks Using the Stationary Portal Monitor and Using Portable Survey Instrumentation. The RSO, RSOR, and Project Manager will be immediately notified of any truck rejected at the NAVSTA TI portal monitor or survey instrumentation.

8.12 GLOBAL POSITIONING SYSTEM MEASUREMENTS

As specified in TSPs, Global Positioning System (GPS) units may be used while performing outdoor area field surveys. For example, during an outdoor gamma scan survey, a GPS unit may be carried adjacent to the gamma detector. The GPS output will be logged along with the gamma count rates, so that each gamma reading will have an associated location point. After the survey, gamma data may be color coded and plotted on a survey map.

In addition, outdoor survey units may be mapped by walking the perimeter with a GPS unit. Once the outline is digitized, static reading locations for that survey unit can be generated in latitude and longitude, using Visual Sample Plan software (Gilbert et al. 2001). These points can be located using the GPS unit followed by the collection of static readings and samples, as appropriate.

Although GPS cannot be used for indoor surveys, building locations will be recorded by taking GPS readings at the exterior building corners, or taken from geospatially referenced aerial photographs, or found through other investigations or accepted land-surveying practices.

9.0 DECONTAMINATION, DISMANTLING, AND DISPOSITION

Decontamination, dismantling, and disposition activities will be performed, as identified in a TSP and/or project-specific NTCRA Work Plan, as part of radiological remedial action activities performed at NAVSTA TI. Decontamination is the removal, by chemical or physical means, of radioactive material from various types of internal and external surfaces including equipment, materials, components, systems, and structures. Dismantling is the removal, as applicable, of furniture, equipment, and walls or similar structural outworks and components for the purpose of permanently breaking down, removing, and eliminating such materials. This would also include conducting work in open land areas to support the removal of contaminated material or devices. To assess the extent and type of contaminants identified during the course of ongoing fieldwork, various remedial activity support surveys will be necessary.

9.1 DECONTAMINATION

To support ongoing work at NAVSTA TI, decontamination of materials, equipment, and structures may be necessary. There are numerous decontamination methods available for use. If practical, manual decontamination methods should be used. Abrasive methods may be necessary if areas of fixed contamination are identified. Chemical decontamination can also be advantageous by using detergents for nonporous surfaces with contamination present. Chemicals should be selected for decontamination that will minimize the creation of mixed waste.

Decontamination activities will be conducted using SOP 007, Decontamination of Equipment and Tools.

9.2 DISMANTLING AND REMEDIATION

To support the release of buildings, structures, equipment, materials, and land areas, remedial support activities will need to be conducted. These activities include, but are not limited to, soil removal, and dismantling, disassembling, and/or removal of various systems, components, and structures. The following is a list of expected remedial support activities that may be performed at NAVSTA TI:

- Piping removal
- Ventilation system removal
- Equipment, furniture, and material removal
- Soil, asphalt, or concrete removal
- Building demolition
- Structure removal

Specific control methods and more detailed information will be provided in the TSP and/or project-specific NTCRA Work Plan.

9.3 DISPOSITION

Disposition is the methodology of identifying the radiological status of equipment, materials, and structures for its end use. Disposition will be conducted after the decontamination and/or dismantling activities have been completed. This will include the following key elements:

- Control of equipment and materials
- Free release
- Decontaminate for free release
- Off-site disposal

Controlling equipment and materials is essential to ensure that contaminated items are not used in uncontrolled areas to prevent the inadvertent spread of contamination. If decontamination methods are unsuccessful, some materials and equipment may be stored for future use in radiologically controlled areas. If it is not feasible or cost-effective to control contaminated equipment and materials, they will be disposed of off-site in accordance with the project-specific NTCRA Work Plan.

10.0 RADIOACTIVE MATERIALS MANAGEMENT

Planned site activities are expected to involve the presence of radioactive materials. These activities will be conducted by trained and qualified personnel who are designated to apply management and control measures as regulated by the appropriate regulatory agencies. The management of radioactive materials including handling and control will be performed in accordance with TtEC's State of California Agreement State RML No. 7909-01 and the RPP presented in the project-specific NTCRA Work Plan.

This page intentionally left blank.

11.0 DOCUMENTATION AND RECORDS MANAGEMENT

The purpose of this section is to define standards for the maintenance and retention of radiological records. Radiological records provide historical data, document radiological conditions, and record personnel exposure.

Sample collection, field measurements, and laboratory data will be recorded both electronically and on paper, to the extent practicable. Electronically recorded data and information will be backed up to TtEC's server and mainframe on a nightly basis. Data and information recorded on paper will be recorded using indelible ink. Both electronic and paper records of field-generated data will be reviewed by the RSOR or a designee knowledgeable in the measurement method for completeness, consistency, and accuracy. Data manually transposed to paper from electronic data collection devices will be compared to the original data sets to ensure consistency and to resolve noted discrepancies. Electronic copies of original electronic data sets will be preserved on a nonmagnetic retrievable data storage device. No data reduction, filtering, or manipulation will be performed on the original electronic versions of data sets.

Changes or corrections to project documentation will be made by crossing out the erroneous item with a single line, initialing (by the person performing the correction), and dating the correction. The original item, although erroneous, must remain legible beneath the cross-out line. The new information will be written above the crossed-out item. Corrections must be written clearly and legibly with indelible black or blue ink.

11.1 REQUIREMENTS

Records resulting from implementation of this Management Plan shall meet the quality standards as outlined herein. All records must be retrievable and maintained for their prescribed retention time defined in the Project Contractor Quality Control Plan included with each project-specific NTCRA Work Plan. Working copies of records used for reference will be stored separately from the original.

Completed records awaiting transfer to long-term storage shall be stored in an appropriate manner to minimize loss and damage that could result from exposure to weather, fire, or other conditions.

Principal personnel who create, review, and approve radiological records must sign and date the record and follow quality standards specified in the Project Contractor Quality Control Plan presented in the project-specific NTCRA Work Plan.

11.2 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 substance. Shorthand or nonstandardized terms may not be used.

To ensure traceability, each record shall clearly indicate:

- Identification of the facility
- Specific location
- Function and process
- Date
- Document number (if applicable)

The quantities used in records shall be clearly indicated in standard units (curie, rad, rem, dpm, becquerel), including multiples and subdivisions of these units.

11.3 DOCUMENTATION

The four types of documentation that will be maintained and assessed are field operation records, laboratory records, data handling records, and work support documents. The majority of the data produced will be entered into the electronic data management system to produce quality data for inclusion in reports, documents, and presentations.

11.3.1 Data Management System

Supportable and definitive data must be produced and managed to achieve the removal action objectives. The TtEC team developed a unique "cradle-to-grave" data management system that seamlessly integrates all phases of the radiological and construction work process from initial survey, excavation, remediation, and FSS activities through backfill of survey units and site restoration. Acquiring, evaluating, and managing data are the principal tasks involved in every aspect of the removal action activities. The resulting survey data are easily uploaded to the Navy electronic data deliverable (NEDD) Naval Installation Restoration Information Solution (NIRIS) database.

11.3.2 Field Operation Records

The information contained in field operation records will document overall field operations and may consist of the following:

- Field measurement records – At a minimum, this documentation will identify the names of the persons conducting the activity, measurement identification, measurement locations, measurement results, maps and diagrams, equipment, and unusual observations. Data record forms, bound field notebooks, and electronic data

loggers will be used to record raw data and make references to prescribed procedures and changes in planned activities.

- Sample tracking records – These records will be documented as identified in the SAP presented in the project-specific NTCRA Work Plan.
- QC records – QC records will be prepared as indicated in the Project Contractor Quality Control Plan presented in the project-specific NTCRA Work Plan.
- Personnel files – Personnel files record the names and training certificates of the staff collecting data and will be maintained in accordance with the project-specific NTCRA Work Plan.
- Deficiency and problem identification reports – These reports will be prepared as indicated in the Project Contractor Quality Control Plan presented in the project-specific NTCRA Work Plan.
- Corrective action reports – Corrective action reports will be prepared as identified in the Project Contractor Quality Control Plan presented in the project-specific NTCRA Work Plan.

11.3.3 Laboratory Records

Laboratory records will be prepared as indicated in the SAP included in the approved project-specific NTCRA Work Plan.

11.3.4 Data Handling Records

Data-handling records document protocols used in data reduction, verification, and validation (as applicable). Data reduction involves data transformation processes such as converting raw data into reportable quantities and units, using significant figures, and calculating measurement uncertainties. Data verification involves reviewing reports of data entered into the electronic data management systems by the appropriate supervisory personnel knowledgeable of and with access to the original data to verify data transcription accuracy in accordance with SOPs identified in the project-specific NTCRA Work Plan. Data comparison and evaluation will be done on radiological samples as discussed in the SAP presented in the project-specific NTCRA Work Plan. Record copies of surveys, sampling, and analytical data (and their supporting data) will be protected and maintained in project record files as indicated in the project-specific NTCRA Work Plan. Table 1-1 lists each of the current TtEC field SOPs developed for use at NAVSTA TI. Copies of these SOPs are provided in the SAP included in the NTCRA Work Plan. Work instructions are available on-site at NAVSTA TI and can be provided to the DON and/or regulatory agencies upon request.

11.3.5 Work Support Documents

Work support documents may include RWPs, TSPs, reports, and work instructions that will be prepared, reviewed, and approved in accordance with the project-specific NTCRA Work Plan.

This page intentionally left blank.

12.0 REFERENCES

Abelquist. 2001. Decommissioning Health Physics: A Handbook for MARSSIM. Bristol, England: Institute of Physics Publishing.

AEC (Atomic Energy Commission). 1974. Regulatory Guide 1.86. Termination of Operating Licenses for Nuclear Reactors. June.

American Society for Testing and Materials. 1998. Use of Portable Radiological Survey Instruments for Performing In Situ Radiological Assessments in Support of Decommissioning.

CDPH (California Department of Public Health). 2011. Treasure Island, Site 12 Gamma Survey Report, Survey Dates: April 5–7, 2011. September 23.

DoD (Department of Defense), Department of Energy, Nuclear Regulatory Commission, and U.S. Environmental Protection Agency. 2000. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, Revision 1. August.

DON (Department of the Navy). 2007. Action Memorandum/Interim Remedial Action Plan: Non-Time Critical Removal Action for Solid Waste Disposal Areas, Installation Restoration Site 12, Old Bunker Area, Naval Station Treasure Island, San Francisco, California. February 15.

EPA (U.S. Environmental Protection Agency). 1992. Statistical Methods for Evaluating the Attainment of Cleanup Standards, Volume 3: Reference Based Standards for Soils and Solid Media. December.

——————. 2000. Radionuclides Notice of Data Availability Technical Support Document. Targeting and Analysis Branch, Standards and Risk Management Division, Office of Groundwater and Drinking Water, EPA. March.

Gilbert, R.O., J.R. Davidson, J.E. Wilson, and B.A. Pulsipher. 2001. Visual Sample Plan (VSP) Models and Code Verification. PNNL-13450, Pacific Northwest National Laboratory, Richland, Washington.

Grove Engineering. 1996. MicroShield™ Version 5.05 software. Grove Engineering: Rockville, Maryland.

ISO (International Organization for Standardization). 1988. Evaluation of Surface Contamination – Part 1: Beta-emitters (Maximum Beta Energy Greater than 0,15 MeV) and Alpha-emitters. ISO 7503-1, International Organization for Standardization, Geneva, Switzerland.

NRC (Nuclear Regulatory Commission). 1997a. A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys (Draft Report for Comment); NUREG-1505; Nuclear Regulatory Commission: Washington, DC.

——————. 1997b. Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions Guide. NUREG-1507, U.S. Nuclear Regulatory Commission: Washington, DC.

Weston (Weston Solutions, Inc.) 2006. Treasure Island Naval Station Historical Radiological Assessment, Former Naval Station Treasure Island, San Francisco, California. February.

TABLES

This page intentionally left blank.

TABLE 1-1

NAVAL STATION TREASURE ISLAND STANDARD OPERATING PROCEDURES[a]

Standard Operating Procedures	
SOP Number	**SOP Title**
SOP-001	Radiation and Contamination Surveys
SOP-002	Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use
SOP-003	Release of Materials and Equipment from Radiologically Controlled Areas
SOP-004	Radiological Records
SOP-005	Radiological Protective Clothing Selection, Monitoring, and Decontamination
SOP-006	Sampling Procedures for Radiological Surveys
SOP-007	Decontamination of Equipment and Tools
SOP-008	Control of Radiological Material
SOP-009	Air Sampling and Sample Analysis
SOP-010	Issue and Use of Radiation Work Permits
SOP-011	Gamma Screening of Trucks Using the Stationary Portal Monitor and Using Portable Survey Instrumentation
SOP-012	Radiologically Controlled Areas Posting and Access Control
SOP-013	Vehicle Towed Array (VTA)
SOP-014	Transfer of Low Level Radioactive Waste to Another Contractor for Waste Disposal
SOP-015	Use of the Berkeley Nucleonics Corporation SAM-940-3G Radioisotope Identifier

Notes:

[a] The most current version of each controlled SOP and Work Instruction is available on-site at Naval Station Treasure Island and can be provided to the DON and/or regulatory agencies upon request.

Abbreviations and Acronyms:

DON – Department of the Navy
SOP – Standard Operating Procedure

This page intentionally left blank.

TABLE 4-1

SURVEY UNIT SIZE

Area Classification	Survey Unit Size
Class 1 Structure	Up to 100 m^2 floor area
Class 1 Land area	Up to 2,000 m^2
Class 2 Structure	100 to 1,000 m^2
Class 2 Land area	2,000 to 10,000 m^2
Class 3 Structure	No limit
Class 3 Land area	No limit

Abbreviations and Acronyms:
m^2 – square meter

This page intentionally left blank.

TABLE 5-1

DATA LIFE CYCLE USED TO SUPPORT THE RADIATION SURVEY AND SITE INVESTIGATION PROCESS

RSSI Process	Data Life Cycle	Phases	MARSSIM Guidance
Site Identification	N/A	N/A	Provides information on identifying potential radiation sites (Section 3.3)[a]
Historical Site Assessment	Historical Site Assessment Data Life Cycle	Plan Implement Assess Decide	Provides information on collecting and assessing existing site data (Sections 3.4 through 3.9) and potential sources of information (Appendix G)
Scoping Survey	Scoping Data Life Cycle	Plan Implement Assess Decide	Discusses the purpose and general approach for performing scoping surveys, especially as sources of information when planning FSSs (Section 5.2)
Characterization Survey	Characterization Data Life Cycle	Plan Implement Assess Decide	Discusses the purpose and general approach for performing characterization surveys, especially as sources of information when planning FSSs (Section 5.3)
Remedial Action Support Survey	Remedial Action Data Life Cycle	Plan Implement Assess Decide	Discusses the purpose and general approach for performing remedial action support surveys, especially as sources of information when planning FSSs (Section 5.4)
FSS	Final Status Data Life Cycle	Plan Implement Assess Decide	Provides detailed guidance for planning FSSs (Chapter 4 and Section 5.5), selecting measurement techniques (Chapters 6 and 7, and Appendix H), and assessing the data collected during FSSs (Chapters 8 and 9)

Notes:
[a] Section numbers refer to chapters in MARSSIM (DoD et al. 2000).

Abbreviations and Acronyms:
FSS – Final Status Survey
MARSSIM – Multi-Agency Radiation Survey and Site Investigation Manual
N/A – not applicable
RSSI – Radiation Survey and Site Investigation

This page intentionally left blank.

TABLE 5-2

SURVEY STRATEGIES

Survey Type	Minimum Survey Requirement	Sampling and/or Direct Measurements[a]	Minimum Scanning Requirements	Static Measurements	Surface Scans	Exposure Rates	Swipes[b]	Media Samples[c]	General Operational Surveys[d]
Scoping[e]	N/A	Random and Additional Biased	Judgmental	X	X	X	I	O	
Characterization[e]	N/A	Systematic and Additional Biased	Judgmental	X	X	X	I	O	
Remedial Action Support	N/A	Random and Biased	Judgmental						X
Final Status	Class 1	Systematic with Random Start	100% Coverage	X	X	X	I	O	
	Class 2	Systematic with Random Start	50% Coverage	X	X	X	I	O	
	Class 3	Random	25% Coverage	X	X	X	I	O	

Notes:

I = indoor surveys; O = outdoor surveys; X = both

[a] Additional locations will be chosen based on history and the judgment of the radiological technician. The minimum number of sample points will be calculated as in Section 5.3.3.

[b] In addition to the swipes taken at each randomly or systematically determined sampling point, swipe sampling will be performed on floor drains, exhaust fans, work benches, sinks, and other suspect locations.

[c] Indoor locations may be chosen based on scanning results and the judgment of the radiological technician.

[d] General operation surveys may include static measurements, surface samples, exposure rates, swipes, and media samples.

[e] Reference the HRA for NAVSTA TI (Weston 2006).

Abbreviations and Acronyms:

HRA – Historical Radiological Assessment
N/A – not applicable
NAVSTA TI – Naval Station Treasure Island

This page intentionally left blank.

TABLE 6-1

RELEASE CRITERIA

Radionuclide	Surfaces			Soil[a] (pCi/g)				Water[f] (pCi/L)
	Equipment, Waste (dpm/100 cm^2)[b]	Structures (dpm/100 cm^2)[c]	Residual Dose (mrem/y)[d]	Outdoor Worker (pCi/g)[e]	Residual Dose (mrem/y)[d]	Residential (pCi/g)[e]	Residual Dose (mrem/y)[d]	
Radium-226	100	100	0.612	1.0[g]	6.342	1.0[g]	14.59	5[g]

Notes:

Criteria for other nuclides will be listed in TSPs, if needed.

[a] EPA PRGs for two future-use scenarios.

[b] These limits are based on AEC Regulatory Guide 1.86 (1974). Limits for removable surface activity are 20 percent of these values.

[c] These limits are based on 25 mrem/y using RESRAD-Build Version 3.3 or Regulatory Guide 1.86, whichever is lower.

[d] The resulting dose is based on modeling using RESRAD-Build Version 3.3 or RESRAD Version 6.3, with radon pathways turned off.

[e] The on-site and off-site laboratory will ensure that the MDA meets the listed release criteria by increasing sample size or counting time as necessary. The MDA is defined as the lowest net response level, in counts, that can be seen with a fixed level of certainty, customarily 95 percent. The MDA is calculated per sample by considering background counts, amount of sample used, and counting time.

[f] Release criteria for water have been derived from Radionuclides Notice of Data Availability Technical Document (EPA 2000) by comparing the limits from two criteria and using the most conservative limit.

[g] Limit is for total radium concentration.

Abbreviations and Acronyms:

AEC – Atomic Energy Commission
cm^2 – square centimeter
dpm – disintegrations per minute
EPA – U.S. Environmental Protection Agency
MDA – minimum detectable activity
mrem/y – millirems per year
pCi/g – picocuries per gram
pCi/L – picocuries per liter
PRG – Preliminary Remediation Goal
TSP – Task-specific Plan

This page intentionally left blank.

TABLE 7-1

PORTABLE SURVEY INSTRUMENTS

Measurement/ Technique	Primary Use	Type of Instrumentation		Typical Background	Typical Total Efficiency (%)	Detection Sensitivity	Typical Minimum Detectable Concentration
		Detector Type and Model Number(s)	Meter Description and Model Number(s)				
Surface alpha/beta scans	Structures	Large-area gas - proportional 43-37 Series (582 cm^2)	Data logger 2360	800–1,200 cpm β 10-15 cpm α	~12 β total efficiency ~12 α total efficiency	474 dpm/100 cm^2 β 56 dpm/100 cm^2 α	900 dpm/100 cm^2 β 80 dpm/100 cm^2 α
	Equipment, materials, debris, structures	Large-area gas - proportional 43-68 (126 cm^2)		150–250 cpm β 0–2 cpm α	~6 β total efficiency ~6 α total efficiency	900 dpm/100 cm^2 β 100 dpm/100 cm^2 α	553 dpm/100 cm^2 β 53 dpm/100 cm^2 α
Direct measurement static alpha/beta		Scintillation, Ludlum Model 43-89 or 43-93 or equivalent (100 cm^2)		100–200 cpm β 0–5 cpm α	~6 β total efficiency ~6 α total efficiency	900 dpm/100 cm^2 β 100 dpm/100 cm^2 α	553 dpm/100 cm^2 β 53 dpm/100 cm^2 α
				150–300 cpm β 0–3 cpm α	~10 β total efficiency ~10 α total efficiency	700 dpm/100 cm^2 β 100 dpm/100 cm^2 α	350 dpm/100 cm^2 β 50 dpm/100 cm^2 α
Surface gamma scans Direct measurement static gamma	Equipment, materials, debris structures	NaI 2-inch × 2-inch scintillation Ludlum Model 44-10	Data logger 2350-1	5,000 cpm γ	N/A	1,500 cpm γ 1.6 pCi/g ^{137}Cs 0.58 pCi/g ^{226}Ra	353 cpm γ
Low energy gamma scans and statics	Soil, structures, debris	Fiddler Model G-5	Data logger 2350-1	50–100 cpm γ	Dependent on threshold settings	Dependent on threshold settings	Dependent on threshold settings

TABLE 7-1

PORTABLE SURVEY INSTRUMENTS

Measurement/ Technique	Primary Use	Type of Instrumentation		Typical Background	Typical Total Efficiency (%)	Detection Sensitivity	Typical Minimum Detectable Concentration
		Detector Type and Model Number(s)	Meter Description and Model Number(s)				
Towed array surface gamma scans	Surfaces	(2) TSA 12 inches × 39 inches × 1.5 inches (30.5 cm × 99 cm × 3.8 cm) DA372 organic plastic scintillators	TSA SC-770	750 cps γ	N/A	0.2 pCi/g ^{226}Ra	110 cps γ
Surface beta/gamma scans	Equipment, materials, debris, personnel	Geiger-Mueller Ludlum Model 44-9 or equivalent	Ratemeter 3	50–100 cpm β γ	~ 10 β γ total efficiency	~ 1,000 dpm per probe area β γ	358 dpm/100 cm^2 β γ
Direct measurement static beta/gamma			Ratemeter 12	50–100 cpm β γ	~ 10 β γ total efficiency	~ 1,000 dpm per probe area β γ	358 dpm/100 cm^2 β γ
			Ratemeter 177	50–100 cpm β γ	~ 10 β γ total efficiency	~ 1,000 dpm per probe area β γ	358 dpm/100 cm^2 β γ
Exposure rates	All inclusive	MicroR Meter with integral 1-inch × 1-inch NaI scintillation	Ratemeter 19	7–8 μR/hr	N/A	2 μR/hr	N/A
Beta, gamma, X-ray surveys	Devices, gauges, dials	220 cm^2 Ion chamber/RO20	Analog movement with 5 linear ranges	Less than 1 μR/hr	N/A	N/A	N/A

Abbreviations and Acronyms:

α – alpha
β – beta
γ – gamma
μR/hr – microroentgens per hour
cm^2 – square centimeter
cpm – counts per minute
cps – counts per second
^{137}Cs – cesium-137
dpm – disintegrations per minute
N/A – not applicable
NaI – sodium iodide
^{226}Ra – radium-226

TABLE 7-2

EXAMPLES OF FIELD RADIOLOGICAL SURVEY INSTRUMENT CALCULATIONS

Measurement Technique	Calculation Type and Applicable Equations	Meter [a]	Detector [a]	Probe Area (cm^2)	Typical Detector Efficiency (%)	Surface Efficiency (%) [b]	Bkg Count Time (min)	Sample Count Time (min)	Bkg Count Rate (cpm)	Required Detection Sensitivity (dpm/100 cm^2)	Scan Speed (cm/s)	Probe Width (cm)	Scan Interval(s)	Surveyor Efficiency (%)	Bkg Counts Per Scan Interval	Results [c]
Surface alpha scans	Count detection probability for α scans; Equations 7-2, 7-3, or 7-4 (depends on detector area)	Ludlum Model Number(s) 2360 or 2350-1 data logger	Gas-proportional, Ludlum Model 43-37	582	0.120	N/A			10.0	100	1.3	14.0	10.8	N/A		90%
			Gas-proportional, Ludlum Model 43-68	126	0.120				1.0	100	0.7	8.8	12.6			92%
			Scintillation, Ludlum Model 43-89	126	0.130				0.4	100	0.7	7.6	10.9			90%
Surface beta scans	MDC for β scans; Equations 7-5 and 7-6	Ludlum Model Number(s) 2360 or 2350-1 data logger	Gas-proportional, Ludlum Model 43-37	582	0.250	0.25	N/A		800	N/A	1.7	14.0	8.2	0.50	110	974 dpm/100 cm^2
			Gas-proportional, Ludlum Model 43-68	126	0.250	0.25			200		0.2	8.8	44.0	0.50	147	973 dpm/100 cm^2
			Scintillation, Ludlum Model 43-89	126	0.250	0.25			180		0.2	7.6	38.0	0.50	114	993 dpm/100 cm^2
Direct measurement static alpha	MDC for static α counts; Equations 7-7 and 7-8	Ludlum Model Number(s) 2360 or 2350-1 data logger	Gas-proportional, Ludlum Model 43-37	582	0.250	0.25	5	0.3	15.0	N/A						93 dpm/100 cm^2
			Gas-proportional, Ludlum Model 43-68	126	0.250	0.25	5	1.2	2.0							92 dpm/100 cm^2
			Scintillation, Ludlum Model 43-89	126	0.250	0.25	5	0.7	0.4							88 dpm/100 cm^2
Direct measurement static beta	MDC for static β counts; Equations 7-7 and 7-8	Ludlum Model Number(s) 2360 or 2350-1 data logger	Gas-proportional, Ludlum Model 43-37	582	0.250	0.25	5	0.1	1,000	N/A						996 dpm/100 cm^2
			Gas-proportional, Ludlum Model 43-68	126	0.250	0.25	5	0.5	200							953 dpm/100 cm^2
			Scintillation, Ludlum Model 43-89	126	0.250	0.25	5	0.5	180							908 dpm/100 cm^2
Surface gamma scans	MDC for γ scans; Equation 7-9	Ludlum Model Number(s) 2360 or 2350-1 data logger, or 2221 scaler/rate meter	NaI 2-inch × 2-inch scintillation, Ludlum Model 44-10	N/A			1	0.017	5,000	N/A						4.8 μR/hr
Direct measurement static gamma	MDCR for static γ counts; Equation 7-10	Ludlum Model Number(s) 2360 or 2350-1 data logger, or 2221 scaler/rate meter	NaI 2-inch × 2-inch scintillation, Ludlum Model 44-10	N/A			1	1.0	5,000	N/A						332 cpm (net)
Direct measurement beta/gamma	N/A	Ludlum Model Number 3	Geiger-Mueller, Ludlum Model 44-9	N/A					50	N/A						~1,000 dpm/probe area
Exposure rates	N/A	Ludlum Model Number(s) 19 MicroR Meter	Integral NaI 1-inch × 1-inch scintillation	N/A					6 μR/hr	N/A						~2 μR/hr
Truck Portal Monitor	N/A	Ludlum Model Number(s) 3500-1000RWM Radiation Monitor System	Plastic scintillator, ~480 cubic inches (48 inches long × 5 inches wide × 2 inches thick)	N/A					N/A	N/A						N/A

TABLE 7-2

EXAMPLES OF FIELD RADIOLOGICAL SURVEY INSTRUMENT CALCULATIONS

Notes:

[a] or equivalent.

[b] 0.25 will be assumed surface efficiencies unless otherwise noted in the TSP.

[c] Results for alpha scans reflect the probability of detecting 1 or more counts during the scan interval, as appropriate.
Results for other activities reflect the instrument sensitivities calculated using the provided equations, or as provided by the manufacturer where equations in this plan are not applicable.

Abbreviations and Acronyms:

α – alpha
β – beta
γ – gamma
μR/hr – microroentgen per hour
cm^2 – square centimeter
cm/s – centimeters per second
cpm – counts per minute
dpm – disintegrations per minute
MDC – minimum detectable concentration
MDCR – minimum detectable count rate
min – minute
N/A – not applicable
NaI – sodium iodide
TSP – Task-specific Plan

TABLE 8-1

DERIVED AIR CONCENTRATION

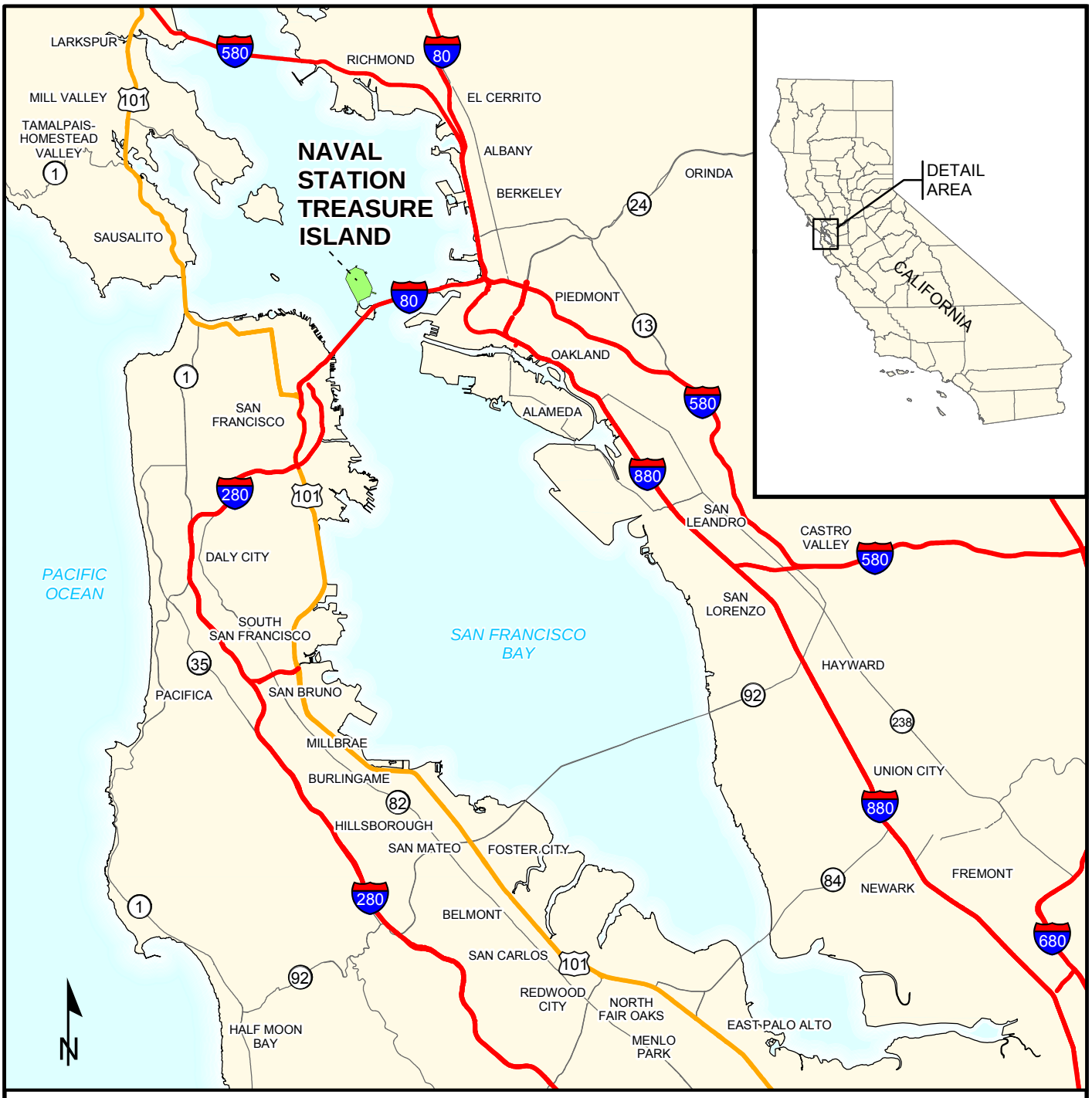
Radionuclide	Radiation	DAC (μCi/mL)	10% DAC (μCi/mL)
Radium-226	Alpha (α)	3.0×10^{-10}	3.0×10^{-11}

Abbreviations and Acronyms:
μCi/mL – microcuries per milliliter
DAC – derived air concentration (10 CFR 20 Appendix B)

This page intentionally left blank.

FIGURES

This page intentionally left blank.



LEGEND

- STATE HIGHWAY
- US HIGHWAY
- INTERSTATE HIGHWAY
- NAVAL STATION TREASURE ISLAND
- WATER

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

RADIOLOGICAL MANAGEMENT PLAN
INSTALLATION RESTORATION SITE 12

FIGURE 2-1

REGIONAL LOCATION MAP
NAVAL STATION TREASURE ISLAND, SAN FRANCISCO, CALIFORNIA

REVISION:
AUTHOR: DMACK
DCN:

TETRA TECH EC, INC.

P:\GIS\projects\Treasure Island\Fig2-1 Regional Location Map - Treasure Island (RMP).mxd

ATTACHMENT 5

WASTE MANAGEMENT PLAN

This page intentionally left blank.

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

CONTRACT NO. N62473-10-D-0809
CTO NO. 0013

ATTACHMENT 5

FINAL

WASTE MANAGEMENT PLAN

April 2013

NON-TIME-CRITICAL REMOVAL ACTION FOR SOLID WASTE DISPOSAL AREA RADIOLOGICAL HOT SPOT REMOVAL AND BUILDING DEMOLITION
INSTALLATION RESTORATION SITE 12
NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

DCN: RMAC-0809-0013-0007

Prepared by:

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

Prepared by: _____
Shanti Montgomery
Technical Lead

Reviewed by: _____
Jennifer Dessort
Environmental Compliance Manager

TABLE OF CONTENTS

PAGE

ABBREVIATIONS AND ACRONYMS iii

1.0 INTRODUCTION 1-1
- 1.1 SITE HISTORY 1-1
- 1.2 REGULATORY FRAMEWORK 1-2
- 1.3 RADIOLOGICAL ACTION OBJECTIVES 1-4
- 1.4 PROJECT POINTS OF CONTACT 1-5
- 1.5 UPDATING THE WASTE MANAGEMENT PLAN 1-5
- 1.6 PLAN ORGANIZATION 1-5

2.0 WASTE STREAMS AND DESIGNATION 2-1
- 2.1 ANTICIPATED WASTE STREAMS 2-1
- 2.2 WASTE DESIGNATION AND MINIMIZATION 2-2

3.0 HAZARDOUS AND NONHAZARDOUS WASTE ACCUMULATION 3-1
- 3.1 WASTE ACCUMULATION AND STORAGE 3-1
  - 3.1.1 Soil, Construction Debris, Housing Appliances, and Used PPE 3-1
  - 3.1.2 Wastewater and Waste Fluids 3-2
  - 3.1.3 Container Labeling 3-2
- 3.2 WASTE ACCUMULATION AREAS 3-4
  - 3.2.1 Hazardous Waste Accumulation Area 3-4
  - 3.2.2 Nonhazardous Waste Accumulation Areas 3-4
- 3.3 INSPECTIONS AND DOCUMENTATION 3-4

4.0 RADIOACTIVE WASTE ACCUMULATION AND STORAGE 4-1
- 4.1 LOW-LEVEL RADIOACTIVE WASTE 4-1
- 4.2 CONTAINER LABELING 4-1
- 4.3 WASTE ACCUMULATION AREAS 4-2
- 4.4 INSPECTIONS AND DOCUMENTATION 4-2

5.0 TRANSPORTATION AND WASTE DISPOSAL REQUIREMENTS 5-1
- 5.1 DISPOSAL FACILITY REQUIREMENTS 5-1
- 5.2 PROFILES 5-2
- 5.3 HAZARDOUS WASTE MANIFESTS AND LDR CERTIFICATION 5-2
- 5.4 NONHAZARDOUS WASTE MANIFESTS 5-3
- 5.5 MANIFEST REVIEW 5-3
- 5.6 TRANSPORTATION REQUIREMENTS 5-3

6.0 REPORTING SPILLS AND RELEASES 6-1

7.0 TRAINING/CERTIFICATION REQUIREMENTS 7-1

TABLE OF CONTENTS
(Continued)

PAGE

8.0 DOCUMENTATION AND RECORDS RETENTION 8-1
8.1 DOCUMENTATION 8-1
8.2 RCRA RECORDS RETENTION 8-1

9.0 REFERENCES 9-1

FIGURES

Figure 1-1 Project Organization Chart

ABBREVIATIONS AND ACRONYMS

ACM	asbestos-containing material
AM	Action Memorandum
ARAR	applicable or relevant and appropriate requirement
CCR	*California Code of Regulations*
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COPC	chemicals of potential concern
CSO	Caretaker Site Office
CTO	contract task order
DON	Department of the Navy
DOT	U.S. Department of Transportation
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ESQ	Environmental Safety and Quality
FSS	Final Status Survey
HRA	Historical Radiological Assessment
IR	Installation Restoration (Program)
LDR	land disposal restriction
LLRW	low-level radioactive waste
NAVSTA TI	Naval Station Treasure Island
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NTCRA	non-time-critical removal action
ODC	ozone-depleting chemical
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PESM	Project Environmental Safety Manager
PPE	personal protective equipment

ABBREVIATIONS AND ACRONYMS
(Continued)

ppm	parts per million
Ra-226	radium-226
RCA	Radiologically Controlled Area
RCRA	Resource Conservation and Recovery Act
SWDA	solid waste disposal area
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TtEC	Tetra Tech EC, Inc.
TTLC	total threshold limit concentration
WMP	Waste Management Plan

1.0 INTRODUCTION

The Department of the Navy (DON) contracted with Tetra Tech EC, Inc. (TtEC) to 1) remove two hot spots identified in the California Department of Public Health (CDPH) Site 12 Gamma Survey Report (CDPH 2011), and 2) perform a radiological survey and demolish Buildings 1121 and 1323 within Installation Restoration (IR) Site 12, Naval Station Treasure Island (NAVSTA TI). This work will be conducted under Contract No. N62473-10-D-0809, Contract Task Order (CTO) No. 0013, and in conjunction with TtEC's State of California Agreement State Radioactive Materials License.

The purpose of this Waste Management Plan (WMP) is to present the waste management practices and procedures to be followed to manage all waste streams, with the exception of low-level radioactive waste (LLRW), that will be generated during performance of the hot spot removal excavation activities, the radiological surveys, remediation (if required), and associated demolition of Buildings 1121 and 1323. Procedures for the management and transfer of LLRW will be outlined in the Memorandum of Understanding with the LLRW contractor prior to mobilization. All LLRW generated will be transferred to the DON's (Army Joint Munitions Command) radioactive waste disposal contactor for characterization and disposal.

This WMP identifies waste management activities to be conducted during the accumulation, preparation, and/or transport and disposal of waste (including waste characterization, packaging, accumulation, and management while being accumulated). A secondary goal of this plan is to ensure that waste minimization practices are followed, to the extent practicable, to reduce the volume of waste that will be generated, stored, and removed from the site for disposal.

1.1 SITE HISTORY

NAVSTA TI is located in San Francisco Bay, midway between San Francisco and Oakland, California. The former naval station consists of two contiguous islands: Treasure Island, which is approximately 403 acres, and Yerba Buena Island, which is approximately 147 acres. Treasure Island is a manmade island constructed of materials dredged from the bay. Military activities at the former NAVSTA TI date back to 1866, before the construction of Treasure Island, when the U.S. government took possession of Yerba Buena Island for defensive fortifications. In 1993, NAVSTA TI was designated for closure under the Base Closure and Realignment Act of 1990. The naval station was closed on September 30, 1997, and is currently in the transfer process.

IR Site 12 is located on the northwest portion of NAVSTA TI on a relatively flat 93-acre area. The site consists of multiplex housing units with private backyards and common area front yards, side yards, and surrounding greenbelts. The area was originally used as a parking lot during the 1939–1940 Golden Gate International Exposition. After Navy occupation of the island in 1940,

the area was developed for bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields, and disposal or burning of solid waste. Beginning in the1960s, areas of IR Site 12 were incrementally developed into housing for Navy personnel and their dependents. Former residential Buildings 1121 and 1323 are located within IR Site 12 near Westside Drive.

An NTCRA was implemented in May 2006 to remediate chemicals in soil associated with chemical/fuel storage and disposal or burning of solid waste in four solid waste disposal areas (SWDAs) (SWDA A & B, SWDA 1231/1233, SWDA 1207/1209, and SWDA Bigelow Court) located within IR Site 12. A Historical Radiological Assessment (HRA) (Weston 2006) identified the radiological contamination potential for the SWDAs as "unlikely" and recommended radiation monitoring during excavation of identified SWDAs. During the initial stages of this NTCRA, a radiation survey and sample analysis identified radium-226 (Ra-226)-impacted debris and soil in some of the SWDAs. Subsequently, an Action Memorandum (DON 2007) summarizing the site characteristics identified the chemicals of potential concern (COPCs) and the horizontal extent of the SWDAs. Generally, the radiological contamination in IR Site 12 SWDAs is colocated with chemical contaminants. The NTCRAs at IR Site 12 determined that some of the SWDAs were contaminated with radiological items or soil containing Ra-226. Elevated gamma readings were also detected along the northern and southern fence lines (two areas) of SWDA A & B by the CDPH Radiologic Health Branch during a gamma survey conducted in April 2011. The current scope of work includes investigating and remediating these two areas with elevated gamma readings.

The Westside Drive SWDA, also known as SWDA A & B, is an approximately 4.5-acre area on the west side of IR Site 12 abutting Perimeter Road. Two radiological hot spots were identified near the Westside Drive SWDA along the northern and southern fence lines during the 2011 CDPH survey of this area. The source of radioactivity is believed to be near-surface radiological commodities containing Ra-226 (deck markers, foils containing radium powder, instrument gauges) but may include limited pockets of soil contamination. Based on CDPH's report, there is one area of elevated activity north of the currently established Radiologically Controlled Area (RCA) (Northern Hot Spot) and four locations of elevated activity south of the RCA (Southern Hot Spot). This NTCRA focuses only on radiological contamination in the two radiological hot spots. The ongoing NTCRA activities in the center of SWDA A & B are currently being performed by another contractor under a separate contract.

1.2 REGULATORY FRAMEWORK

Environmental investigation and remediation activities are being conducted at NAVSTA TI under the Department of Defense IR Program in accordance with CERCLA and the NCP. Under Executive Order 12580, the DON is the lead agency responsible for implementation of the IR Program and the removal actions. The California Department of Toxic Substances Control

(DTSC) is the lead regulatory agency. The CDPH and the Regional Water Quality Control Board San Francisco Bay Region will provide additional state regulatory oversight.

This NTCRA will comply with the substantive requirements of the applicable or relevant and appropriate requirements (ARARs) as identified in the final Action Memorandum (AM) (DON 2007). This WMP identifies the ARARs that pertain solely to management of wastes on this project. Only the substantive requirements of the regulations are considered as possible ARARs because CERCLA on-site response actions do not require permitting or compliance with other administrative requirements for CERCLA actions that are confined to the site. Any off-site actions, however, such as waste transport and off-site disposal, must comply with all applicable regulatory requirements, not just substantive requirements. The ARARs, as follows, are based on the AM for this NTCRA.

The substantive provisions of the following Resource Conservation and Recovery Act (RCRA) requirements are chemical-specific ARARs for the characterization of any waste, such as excavated soil and debris, define a RCRA hazardous waste, and set forth RCRA hazardous waste land disposal restrictions in California as regulated by the DTSC:

- *California Code Regulations* (CCR), Title 22, Section 66261.21 – defining the identification and listing of hazardous waste – ignitability
- CCR, Title. 22, Section 66261.22 – defining the identification and listing of hazardous waste – corrosivity
- CCR, Title 22, Section 66261.23 – defining the identification and listing of hazardous waste – reactivity
- CCR, Title 22, Section 66261.24 – defining the identification and listing of hazardous waste – toxicity
- CCR, Title 22, Section 66261.100 – RCRA hazardous wastes
- CCR, Title 22, Section 66268.1 – land disposal restrictions and treatment standards

The substantive provisions of the following requirements are chemical-specific ARARs for characterization of any waste, such as excavated soil and debris in California that are state-regulated, non-RCRA waste, nonhazardous waste, and inert waste:

- CCR, Title 27 Sections 20210, 20220, and 20230 – defining designated waste, nonhazardous waste, and inert waste
- CCR, Title 22 Section 66261.22(a)(3) and (4), Section 66261.24(a)(2)–(a)(8), Section 66261.101, Section 66261.3(a)(2)(C) or Section 66261.3(a)(2)(F) – defining a state regulated non-RCRA waste

The following substantive provisions of the Toxic Substances Control Act (TSCA) self-implementing on-site cleanup and disposal option are ARARs for polychlorinated biphenyls (PCBs) remediation waste:

- 40 *Code of Federal Regulations* (CFR) Section 761.61(a)(4) – allowing a bulk PCB remediation waste cleanup level for high-occupancy areas of less than or equal to 1 milligram per kilogram (or part per million)

The substantive provisions of the following action-specific RCRA requirements and U.S. Department of Transportation (DOT) laws and regulations are federal and state ARARs for the actions conducted under this NTCRA:

- CCR, Title 22 Sections 66261.10 and 66261.11 – require a determination of whether waste generated in the removal action is RCRA hazardous waste.
- 40 CFR Section 264.554(d)(1)(i–ii) and (d)(2), (e), (f), (h), (i), (j), and (k) – allows generators of RCRA hazardous waste and nonhazardous remediation waste to temporarily stage remediation waste for off-site disposal. The Federal Hazardous Materials Transportation Law (49 *United States Code* Sections 5101–5127), implemented at 49 CFR Sections 171.2(f), 171.2(g), 172.300, 172.301, 172.302, 172.303, 172.304, 172.312, 172.400, and 172.504 governs transportation of hazardous materials (including hazardous wastes off-site) including proper marking, labeling, and placarding requirements, and assignment of a proper shipping name.

1.3 RADIOLOGICAL ACTION OBJECTIVES

Based on past site history, and results from ongoing NTCRAs and other investigations, the DON determined that contamination present in soil and debris at the four SWDAs at IR Site 12 required a response action. This decision was documented in the AM and is consistent with the NCP requirements in Title 40 CFR, Part 300.415(b)(2). The removal action objectives for remediation activities are to implement the AM Alternative 3 and protect public health and welfare and the environment by physically removing and disposing of contaminated soil and debris that exceeds the release criteria for the chemicals of concern presented in Section 2.1.4 of the AM (DON 2007) (dioxins, lead, PCBs, and polynuclear aromatic hydrocarbons [PAHs]) and the NAVSTA TI-established release criterion for the radionuclide of concern, Ra-226.

The primary objectives of this CTO are to:

- Remove the two areas with elevated Ra-226 until the release criterion is achieved and perform an FSS for free release of the two hot spots.
- Perform a radiological survey and demolish Buildings 1121 and 1323.

Radiological surveys of the interior of the buildings will be performed prior to demolition to ensure no soil with elevated levels of Ra-226 has been tracked into and radiologically impacted these buildings. To confirm that the wind has not deposited radiologically impacted soil onto the exterior surfaces, radiological surveys of the building exterior will also be performed. Remediation will be performed for any areas with Ra-226 exceeding the release criterion prior to demolition.

1.4 PROJECT POINTS OF CONTACT

Figure 1-1 presents the key individuals who will be responsible for the oversight and/or implementation of the hot spot removals and survey, remediation (if required), and demolition, of Buildings 1121 and 1323 at NAVSTA TI.

1.5 UPDATING THE WASTE MANAGEMENT PLAN

This WMP will be updated as changes in site activities or conditions, or changes in applicable regulations occur. Revisions to this WMP will be reviewed and approved by the DON.

1.6 PLAN ORGANIZATION

This WMP is organized as follows:

- **Section 1.0** provides the introduction, site history and current operations, regulatory framework, radiological action objectives, and project points of contact.
- **Section 2.0** describes the potential waste streams, waste designation, and waste minimization process.
- **Section 3.0** provides information on waste accumulation and storage, and inspections and documentation.
- **Section 4.0** discusses radioactive waste accumulation and storage.
- **Section 5.0** describes the transportation and waste disposal requirements.
- **Section 6.0** addresses the reporting of spills and releases.
- **Section 7.0** presents the training and certification requirements.
- **Section 8.0** discusses documentation and records retention.
- **Section 9.0** presents the references cited in this document.

This page intentionally left blank.

2.0 WASTE STREAMS AND DESIGNATION

2.1 ANTICIPATED WASTE STREAMS

Site activities will consist of remediation of two hot spots adjacent to the currently established RCA within IR Site 12 until the following is achieved:

- Release criterion for Ra-226 in the soil is achieved.
- Surveys of the interiors and exteriors of Buildings 1121 and 1323 confirm that these buildings have not been radiologically impacted by former residents tracking in radiologically impacted soil nor by windblown dust from adjacent radiologically impacted excavations.

If the results of the building surveys indicate elevated radioactive levels on the buildings' surfaces, these areas will be remediated and resurveyed until the radiological remedial objectives for materials and equipment, based on Atomic Energy Commission Regulatory Guide 1.86, is achieved. The anticipated waste streams listed below will either be classified as radiologically impacted or non-radiologically impacted:

- Radiologically impacted material
  - Construction debris (including wood, drywall, rubber, ventilation ducting, metal, glass, asphalt, plastic, concrete, ceiling and floor tile, piping, conduit, and housing appliances)
  - Soil and commodities/devices
  - Personal protective equipment (PPE)
  - Wastewater
- Non-radiologically impacted materials
  - Construction debris (including wood, drywall, rubber, ventilation ducting, metal, glass, asphalt, plastic, concrete, ceiling and floor tiles, piping, conduit, and housing appliances)
  - Soil
  - PPE
  - Wastewater

If asbestos-containing material (ACM) is encountered, it will be handled and removed by a qualified, licensed asbestos subcontractor and staged for disposal pending results of the radiological surveys. If the radiological surveys indicate the building surfaces are radiologically impacted, this material will be classified as LLRW. Otherwise, this material will be transported to the disposal facility permitted to accept ACM.

2.2 WASTE DESIGNATION AND MINIMIZATION

All LLRW generated will be transferred to the DON's (Army Joint Munitions Command) radioactive waste disposal contractor for characterization and disposal. Bins (or other approved containers) will be provided by the radioactive waste disposal contractor.

Waste characterization and designation for non-LLRW will be coordinated with the Caretaker Site Office (CSO) and disposal facilities to determine the sampling and analysis requirements to properly characterize the waste for transport and disposal. All project wastes must be properly characterized so they can be correctly managed. Waste will be sampled, as required, in a representative manner to characterize it in accordance with RCRA and DTSC regulatory requirements and in accordance with disposal facility requirements. Waste may be classified as hazardous waste (RCRA hazardous, state-only hazardous waste [California hazardous], or both). Other wastes may be classified as nonhazardous, depending on the characteristics of the waste. If samples for waste characterization are required, standard laboratory practices will be followed including container requirements, analytical method requirements, and laboratory quality control procedures. The off-site analytical laboratory selected to analyze waste samples for this project will be, at a minimum, certified by the CDPH for all the analytical methods required for the project, as applicable. Additional state certifications may also be required by the disposal facility. In addition, the laboratory must have successfully achieved the Department of Defense Environmental Laboratory Accreditation Program certification prior to receipt of samples for analysis and also must maintain current status throughout the duration of the project. An Environmental Safety and Quality (ESQ) Scientist will help determine the sampling and analysis required for the waste streams and will review all waste analytical data to determine waste characterization and disposition requirements for each waste stream.

To minimize the volume of all waste streams generated during the project, the following general guidelines will be followed:

- Waste material will not be contaminated unnecessarily.
- Work will be planned ahead.
- Material may 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 the supplies clean and minimize additional waste generation.
- 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.
- Contaminated material will not be placed with clean material.

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

This page intentionally left blank.

3.0 HAZARDOUS AND NONHAZARDOUS WASTE ACCUMULATION

The requirements of the state and federal hazardous waste generation, characterization, accumulation, treatment, and management regulations of Title 22 CCR Sections 66261, 66262, and 66264, and 40 CFR, Parts 261, 262, 264, 265, and 268, are applicable to the management of wastes generated during this project's activities. Off-site activities, such as waste transport and off-site disposal, as stated in Section 1.2, must comply with the full regulatory requirements, not just substantive requirements.

3.1 WASTE ACCUMULATION AND STORAGE

Regulations per 22 CCR Titles 22 and 27 (which include federal RCRA requirements of 40 CFR Parts 261–265 and 268) are applicable to the generation, storage, management, and accumulation of RCRA, state-only hazardous wastes, and non-RCRA hazardous wastes. Specific requirements apply to the accumulation time for hazardous wastes on-site and to the accumulation and labeling of hazardous wastes. Any RCRA and state hazardous wastes will be managed on-site in accordance with these regulations, including requirements for accumulation time limits, conducting of documented inspections, proper container use and segregation, and marking/labeling requirements. If the waste generator (DON) is a large quantity generator at NAVSTA TI, the time limit for on-site accumulation of hazardous waste is less than 90 days from the accumulation start date to the date transported off-site. The CSO is responsible for designating waste accumulation areas on-site, and a representative of the DON is responsible for signing all profiles, manifests, and land-disposal restriction forms.

3.1.1 Soil, Construction Debris, Housing Appliances, and Used PPE

Previous IR Site 12 removal actions indicate that waste soil within SWDAs that contains visible debris will often contain lead and is likely to be profiled as Class 1 hazardous waste (Weston 2007). Therefore, if areas of significant debris are encountered during excavation activities anticipated to contain Class 2 nonhazardous waste, the soil may be segregated from other excavated material and debris, off hauled as Class 1 hazardous waste, or sampled to confirm profile characteristics to determine whether hazardous or not. Class 1 hazardous waste will be managed on-site to meet the time limits for accumulation of less than 90 days, will be inspected every 7 calendar days, and will be packaged in containers in good condition that meet the DOT Hazardous Material Regulations packaging requirements for transport off-site.

If soil sampling is performed, at a minimum, the soil will be analyzed for the chemicals of concern at IR Site 12 (Ra-226, PAHs, PCBs, dioxins, and lead). In addition, the statement of work provided by the DON for this project has requested analyses for metals (the other 16 metals besides lead that are part of Title 22 metals analysis), total petroleum hydrocarbons (TPH)-

extractable (to include diesel and motor oil), and toxicity characteristic leaching procedure (TCLP) lead. All of these analyses will be performed as requested by the DON statement of work for this project except for the TCLP lead, which will be analyzed for only if the total lead results exceed the regulatory criterion that would require a TCLP analysis. Additional analyses may also be performed per disposal facility requirements.

Soil, construction debris, and housing appliances (other than appliances that may contain ozone depleting chemicals [ODCs] if present) that have been determined to be nonhazardous and not radiologically impacted will either be stockpiled or placed directly into roll-off bins or 55-gallon drums and stored in a location designated by the CSO pending transport and disposal to an approved nonhazardous waste disposal or recycling facility, as appropriate. Appliances that may contain ODCs (e.g., refrigeration or air conditioning units) will be segregated and recycled through an approved appliance recycler authorized to handle ODCs. Debris that may be generated may include metal, glass, ventilation ducting, wood, drywall, ceiling and floor tiles, piping, conduit, asphalt, plastic, and concrete. Used PPE that has been determined not to be radiologically impacted will be bagged and placed in the bin with the construction debris.

3.1.2 Wastewater and Waste Fluids

Any wastewater generated (for example, decontamination water generated from equipment and personnel decontamination and water generated from dewatering excavated material) will be collected in containers such as Baker tanks, Rain for Rent® tanks, or 55-gallon drums and labeled as "Potentially Hazardous Water – Pending Analysis." An accumulation start date will be noted on the label. Tanks will be temporarily staged within a predesignated and secondarily contained (unless tanks are double-walled) on-site waste accumulation area pending characterization and appropriate disposal. Tank trucks or drums will be used to transfer water from the point of generation to the tank storage area. Wastewater generated from hazardous and nonhazardous waste and/or decontamination activities will be segregated from wastewater generated from radioactive decontamination. Wastewater will be sampled in accordance with the San Francisco Public Utilities Commission discharge permit for their publicly owned treatment works located on NAVSTA TI. At a minimum, the chemicals of concern for soil at IR Site 12 (Ra-226, PAHs, PCBs, dioxins, and lead) will be analyzed. In addition, the statement of work provided by the DON for this project has requested analyses for metals (the other 16 metals besides lead that are part of Title 22 metals analysis) and TPH-extractable (to include diesel and motor oil). If the radiological and chemical analytical results meet the San Francisco Public Utilities Commission pretreatment discharge requirements, the wastewater will be disposed of at their facility; otherwise, it will be disposed of off-site at an approved facility as profiled.

3.1.3 Container Labeling

All project waste must be classified according to State of California and RCRA labeling requirements. In addition, prior to transport of waste off-site, waste containers must also be

classified and marked/labeled in accordance with DOT Hazardous Material Regulations if it meets one of the nine DOT hazard classifications. This includes labels and placards, as required. All RCRA hazardous wastes are DOT hazardous materials, though not all California-only hazardous wastes or nonhazardous wastes will be. An ESQ Specialist will assist in the proper classification of waste for transportation and disposal. Trained personnel, as required by DOT regulations at 49 CFR Part 172, Subpart H, will conduct all DOT functions.

If suspected hazardous waste is encountered (potentially from excavated soil from hot spot removals as the chemicals of concern for IR Site 12 are dioxins, PCBs, lead, and the PAH benzo(a)pyrene), containers of this suspected hazardous waste material will be presumed to be hazardous for lead and dioxins or benzo(a)pyrene (may be RCRA hazardous) and will be managed as such pending confirmation of sample results. If the sample results demonstrate the waste is nonhazardous, the waste will be managed as nonhazardous waste. PCBs are not RCRA wastes, but if over 50 parts per million (ppm), are regulated under TSCA and require disposal in a Class 1 facility that is also approved to dispose of TSCA PCBs. As stated in Table 1 of the AM, the DON does not expect the concentration of PCBs in soil to be greater than 50 ppm at this site. California regulates PCBs as state hazardous waste if the waste solids exceed a total threshold limit concentration (TTLC) of 50 ppm.

Containers of presumed or known hazardous waste will be marked or labeled in indelible ink as "Potentially Hazardous Waste – Pending Analysis" until the actual waste determination is made when the results of waste analysis are received. An accumulation start date (the date the first drop of material was placed in container) will be marked on any container of suspected hazardous waste. A container log will be used to track contents, accumulation start date, sample identification number, sampling date, and disposal date. If containers are determined to contain nonhazardous waste, they will be labeled accordingly and segregated from hazardous wastes. If containers are determined to contain hazardous waste, they will immediately be labeled with a completed "Hazardous Waste" label that will include:

- U.S. Environmental Protection Agency (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

An inventory of waste containers will be maintained. 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 that labels and markings are in good condition.

3.2 WASTE ACCUMULATION AREAS

3.2.1 Hazardous Waste Accumulation Area

If hazardous waste must be stored on-site, TtEC will implement the following hazardous waste storage area requirements:

- A "Danger Hazardous Waste Area – Unauthorized Personnel Keep Out" sign will be posted at each waste accumulation area at a location that can 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 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 hand-held two-way radio, capable of summoning emergency assistance
  - Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment
  - A spill-response kit for minor spills to include a shovel, adsorbent pads and/or "kitty litter," and a collection container

Bulk quantities of fuel, oil, or other hazardous material will not be stored on-site. These materials will be managed by an off-site contractor who will, on an as-needed basis, perform equipment fueling and maintenance activities.

3.2.2 Nonhazardous Waste Accumulation Areas

No prescribed markings or emergency equipment are required for nonhazardous waste storage areas. The general storage requirements for nonhazardous wastes as described in Section 3.1.1 should be followed.

3.3 INSPECTIONS AND DOCUMENTATION

While all waste accumulation areas will be informally inspected on a daily basis, formal inspections of all container accumulation and stockpile areas will be conducted and recorded at least weekly in accordance with 40 CFR, Part 264, Subpart I, and 22 CCR, Section 66264. The Project Environmental Safety Manager (PESM) or designee will conduct inspections. Inspections will be recorded on a weekly inspection checklist. The container storage area(s) will be inspected to ensure the following:

- The containers will be checked for good condition. If a container is not in good condition or appears to be leaking, the waste will be transferred to another container.

- All containers used will be checked to be sure that they are made of material that will not react with, and are otherwise compatible with, the hazardous waste to be stored.
- The containers will be checked to ensure that they remain closed at all times, except when adding or removing waste.
- The container label will be checked to ensure that it is filled out properly and to check the waste accumulation date.

Documentation requirements apply to all waste managed during project activities. Field records will be kept of all waste-generation activities. In addition, the following information will be recorded in the log:

- Description of waste-generating activities
- Location of waste generation
- Type and volume of waste
- Date and time of generation
- Description of any waste sampling
- Name of person recording information
- Name of field manager at time of generation

This page intentionally left blank.

4.0 RADIOACTIVE WASTE ACCUMULATION AND STORAGE

4.1 LOW-LEVEL RADIOACTIVE WASTE

Radiologically impacted soil and debris will be placed in covered and lined roll-off containers (or other suitable container) provided by the DON basewide LLRW disposal contractor (EMS). Each container will be assigned a unique identification number by the DON basewide LLRW disposal contractor, and each will be properly inventoried and labeled. Inventories will include material description and isotopic identification, if available. The contents of each container will be recorded on the inventory sheet (Intermodal Tracking Sheet). From the information provided on the Intermodal Tracking Sheet, a Bin Field Content Sheet and LLRW Field Bin Daily Report, documenting the contents of the container, will be completed. The Bin Field Content Sheet will be kept with the container. The LLRW Field Bin Daily Report will be forwarded to the Database Group where the information is entered into the database.

Containers will be stored in a designated and posted radioactive material storage area under the authority of TtEC's California State Agreement Radioactive Material License. Storage areas will be at the site where the waste originated until removed by the DON basewide LLRW disposal contractor. Containers will be secured to prevent unauthorized access to their contents. Once containers are filled and prior to their transport from the radioactive materials storage area, the DON basewide LLRW disposal contractor will survey the containers and collect surface radiation measurements. This information will be reported on the Field Content Sheet & Transfer Document.

Wastewater from the radioactive material decontamination area will be maintained separately from hazardous decontamination and dewatering wastewater. The wastewater will be managed as LLRW wastewater until the chemical and radiological characteristics are known.

4.2 CONTAINER LABELING

Each container of LLRW will be labeled and placed in a designated radioactive material storage area. The waste containers will be posted with a "Caution Radioactive Material" sign. The sign will also note the maximum surface radiation level (measured in microroentgens per hour). For bin type containers, the posting will be placed on all four sides. An inventory of contents (Bin Field Content Sheet) will be posted on the outside of the container. The inventory contents and radionuclide and specific activity (if available) will be entered into the database.

4.3 WASTE ACCUMULATION AREAS

TtEC will implement the following for radioactive waste stored within a designated radioactive material storage area:

- A "Caution, Radiologically Controlled Area, Radioactive Materials Area, RWP Required For Entry, Authorized Personnel Only" (in English and Spanish) placard will be posted at each radioactive waste storage area at a location that can 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 for 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 hand-held two-way radio, capable of summoning emergency assistance
  - Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment

4.4 INSPECTIONS AND DOCUMENTATION

While all waste accumulation areas will be informally inspected on a daily basis. The Certified Health Physicist/Radiation Safety Officer (or designee) will conduct inspections. The container storage area(s) will be inspected to ensure the following:

- The containers will be checked for good condition. If a container is not in good condition, the DON basewide LLRW disposal contractor will be notified.
- The containers will be checked to ensure that they remain closed and secured at all times, except when adding or removing waste.
- The container label will be checked to ensure that it is filled out properly and is visible.

Documentation requirements apply to all waste managed during project activities. Field records of all waste-generating activities will be kept. All pages of the field data record log (Intermodal Tracking Sheet) will be initialed and dated by the technician who is entering the data. In addition, the following information will be recorded on the Bin Field Content Sheet:

- Description of waste-generating activities
- Location of waste generation
- Type and volume of waste
- Date of generation

- Description of any waste sampling (if necessary)
- Initials of technician entering data

Prior to transfer of the bin to the DON basewide LLRW disposal contractor, the activity in each waste container will be measured in picocuries per gram, and maximum contact radiation levels will be measured in milliroentgens per hour. This information will be reported on the Field Content Sheet & Transfer Document for transfer to the DON basewide LLRW disposal contractor.

This page intentionally left blank.

5.0 TRANSPORTATION AND WASTE DISPOSAL REQUIREMENTS

Elements of off-site transportation and waste disposal include disposal facility selection, waste loading and transportation, and vehicular traffic control related to the loading and the off-site transportation and disposal of project waste.

The following subsections present transportation and disposal requirements for project wastes that may be transported from the site. Workers, operators, and drivers will be expected to adhere to these requirements.

5.1 DISPOSAL FACILITY REQUIREMENTS

Based on waste characterization data, waste profiles will be prepared for non-LLRW solid wastes. Multiple profiles may be needed, depending on the classification of various waste streams. For instance, RCRA-regulated wastes (i.e., RCRA hazardous) and/or non-RCRA hazardous (California hazardous) and nonhazardous waste may be generated during the project. The waste classification could potentially require the use of several different disposal facilities. Although PCBs are a contaminant of concern for soils on this project, the DON does not expect that concentrations in soil (remediation waste) will exceed 50 ppm. PCBs in soil will be managed based on the concentrations at which they are found and will be disposed of accordingly. It is not anticipated that any wastes will be generated that would require disposal at a TSCA-regulated disposal facility, although sampling will be required to verify that concentrations are under 50 ppm and additionally, TTLC analysis of soils will be required to determine whether levels of PCBs are present as California hazardous waste (> 50 ppm TTLC).

If the waste is determined to be RCRA-regulated hazardous waste, then the nature of the underlying hazardous constituents and the facility-specific treatment authorizations must be determined. The intended disposal facility must be capable of and permitted to receive the waste as profiled and be capable of treating any underlying hazardous constituents.

If the non-LLRW wastewater meets the San Francisco Public Utilities Commission pretreatment discharge requirements for their publicly owned treatment works on NAVSTA TI, the wastewater will be discharged in accordance with their discharge permit requirements, which may include direct discharge to a nearby manhole or transfer to their facility. If the wastewater does not meet discharge requirements, the wastewater will be loaded and transported to a disposal facility permitted to accept this wastestream.

All waste containing CERCLA hazardous substance, pollutant, or contaminant will be disposed of off-site at a facility authorized and permitted to accept CERCLA waste under the CERCLA off-site rule regulation, 40 CFR 300.440.

5.2 PROFILES

All waste will be profiled by a TtEC ESQ Scientist prior to disposal. Profiles will be prepared specific to the particular disposal facility and will contain process information, characterization decisions, waste composition, and analytical data. Profiles and associated analytical data will be forwarded by the ESQ Scientist to the CSO for review and signature. The ESQ Scientist will then forward the profile to the transporter for submission to the disposal facility. A copy of the signed profile and analytical data will be maintained in the project files. Upon approval of the profile by the disposal facility, the facility will issue a profile number and will authorize shipment of the waste to the facility.

5.3 HAZARDOUS WASTE MANIFESTS AND LDR CERTIFICATION

All hazardous waste transported from the site will be accompanied by a Hazardous Waste Manifest. A DOT-trained individual will prepare Hazardous Waste Manifests with assistance from the ESQ Scientist. The ESQ Scientist will forward a draft manifest to the CSO for review and approval and will arrange for the CSO representative to sign the manifest. TtEC does not sign manifests. The CSO representative is responsible for reviewing and signing all waste documentation. Prior to the manifest being signed, TtEC will ensure that pretransport requirements of packaging, labeling, marking, and placarding are met according to 22 CCR Sections 66262.30 through 66262.33 and 49 CFR Parts 100 through 177.

The DON will receive one original copy (designated at the bottom of the manifest as "generator's initial copy") of the manifest; the remaining copies will be given to the transporter. If possible, two good quality photocopies will be made of the top manifest copy after it has been signed by the transporter. One photocopy and the "generator's initial copy" will be returned to the CSO by the site waste coordinator who will retain one copy for recordkeeping requirements. The second photocopy will be retained on-site in a central project file.

The signed terminal (original) copy of a hazardous waste manifest must be received by the generator no later than day 35 after shipment. If it is not, an exception report may be required. The waste coordinator will track waste shipments to ensure that original manifests are returned and that waste is disposed of at the proper designated facility.

A land disposal restriction (LDR) form will accompany any shipments of RCRA-hazardous waste to the treatment, storage, and disposal facility (TSDF). The TSDF must be notified prior to sending the waste. Copies of LDRs will be provided to the CSO for signature and approval and will be maintained in the project file with the profile sheets.

5.4 NONHAZARDOUS WASTE MANIFESTS

All nonhazardous waste transported from the site will be accompanied by a Nonhazardous Waste Manifest. Transporters will prepare Nonhazardous Waste Manifests with assistance from the ESQ Scientist. The ESQ Scientist will forward a draft manifest to the CSO for review and approval and will arrange for the CSO to sign the manifest. The CSO will be responsible for reviewing and signing all waste documentation, including waste profiles and manifests. TtEC does not sign manifests. Prior to the manifest being signed, TtEC will ensure that pretransport requirements of packaging, labeling, marking, and placarding (if the nonhazardous waste is classified as a DOT hazardous material) are met according to 22 CCR Section 66262.30 through 66262.33 and 49 CFR Parts 100 through 177.

If possible, two good quality photocopies will be made of the top manifest copy after it has been signed by the transporter. The CSO will receive one copy of the manifest and one copy of the signed first cover sheet; the remaining copies will be given to the transporter. The manifest will be returned to the DON signatory official to be placed on file. The photocopy of the manifest will be maintained in a central project file.

The generator (CSO) is responsible for ensuring that the signed terminal manifest is received and that the waste is disposed of at the proper designated facility since the generator will be the one who receives the signed terminal manifest and is contacted should there be an issue with the waste. The waste coordinator will track waste shipments to ensure original manifests are returned and to ensure waste is disposed of at the proper designated facility.

5.5 MANIFEST REVIEW

Manifests will be reviewed by the site waste coordinator immediately prior to shipment. At the end of each day that shipment occurs, the DOT-trained Project Quality Control Manager (or designee) will review all copies of manifests shipped that day to ensure accuracy. If any mistakes are noted, the ESQ Scientist will be contacted as soon as possible. During inspections, the PESM will review a minimum of 10 percent of the manifests for accuracy.

5.6 TRANSPORTATION REQUIREMENTS

All transportation companies or drivers will be approved by procedure EHS 1-4, Subcontractor Selection and Management, prior to use to ensure that they are qualified and permitted to transport the particular type of waste being shipped (e.g., RCRA hazardous, non-RCRA hazardous, TSCA, and/or nonhazardous) and that they are authorized to transport to the designated location (i.e., special authorization is required by the DOT for out-of-state shipments).

The transportation subcontractor will have all appropriate licenses, medical certifications, permits, and registrations appropriate to the type of waste being shipped (including, but not limited to, a California Environmental Protection Agency Department of Toxic Substances Control hazardous waste transporter[s] registration, an EPA identification number, DOT registration, and DOT Hazardous Material Registration) as well as proof of liability insurance coverage.

If handling DOT hazardous materials, the transporter will have a written DOT Hazardous Material Security Plan (49 CFR 172.800[b]) in effect when required, and all waste hauling subcontractor personnel will have been trained on its requirements.

Transportation documentation will comply with DOT regulations 49 CFR Parts 100 through 178 and will be prepared by appropriately trained TtEC personnel.

Containers will be marked, labeled, and/or placarded prior to off-site transport. TSDF waste profile sheets, LDR notifications, waste manifests, and shipping documents will be prepared by properly trained TtEC personnel for the appropriate DON officials to review and sign.

If an on-site truck scale is not available, only transporters with built-in calibrated scales will be used to ensure that DOT weight restrictions are not exceeded and to provide accurate weights for all waste manifests. It will be the dual responsibility of site personnel and the transportation subcontractor to document truck weights before trucks exit NAVSTA TI.

Waste hauling trucks, if not enclosed, will be covered with tarps prior to leaving the site. Appropriate placards will be placed on each transport vehicle, as required by DOT. In addition, a hazardous waste manifest or nonhazardous waste manifest, as appropriate, will be used to transport all wastes that leave the site.

All manifests will be prepared in advance of the shipment; however, certain information (such as transporter name and EPA identification number) may not be known at the time of the shipment. If this occurs, it is the responsibility of the site waste coordinator to carefully and accurately fill in this information and to ensure that the transporter is authorized for that waste transport. The ESQ Scientist will assist as necessary. Transporters are NOT permitted to fill out any part of the manifest, other than the transporter signature block. They may not fill in the transporter name or EPA ID number. This must be filled in by TtEC personnel or the generator after confirming the correct transporter name and EPA identification number with the ESQ Scientist.

6.0 REPORTING SPILLS AND RELEASES

Precautions will be taken to prevent hazardous material spills. Site personnel will conduct informal daily inspections of equipment, structure(s), and containers. In addition, personnel working with hazardous materials will inspect containers before and after use. In the event of a spill/release, the Project Manager will immediately notify the PESM, who will determine what, if any, notifications need to be made by the DON to regulatory agencies. The Project Manager will subsequently notify the DON, as necessary. Spill response will be conducted in accordance with the Site Safety and Health Plan; federal, state, and local regulations; and with NAVSTA TI policies and procedures.

This page intentionally left blank.

7.0 TRAINING/CERTIFICATION REQUIREMENTS

Employees involved in waste management operations will be trained in TtEC Waste Management and Environmental Compliance policies and procedures to ensure they are familiar with the program. These policies and procedures satisfy the hazardous waste management training requirements under 22 CCR Section 66265.16. Waste management training is required annually.

In addition, personnel who perform or oversee DOT-related activities will be DOT-trained. DOT and waste management training records will be maintained in TtEC Corporate ESQ Department files and will be available, as necessary, to on-site personnel. DOT training is required every 3 years (2 years for air shipment).

Supervisors and employees who perform waste management functions, such as container handling/labeling or manifest coordination, are required to have current waste management and DOT training.

This page intentionally left blank.

8.0 DOCUMENTATION AND RECORDS RETENTION

This section presents project requirements for waste management documentation and records, and their retention.

8.1 DOCUMENTATION

The information contained in this section applies to all waste managed during project activities. Field records will be kept in a bound, numbered field notebook. Information to be recorded includes, but is not limited to, the following:

- Description of waste-generating activities
- Location of waste generation (including depth, if applicable)
- Type of waste
- Date and time of generation
- Name of person recording information
- Name of field manager at time of generation and at time of disposal
- Test results
- Inspection logs
- Waste documentation, including the following:
  - Waste profile sheets
  - LDR certification
  - Hazardous waste manifest
  - Nonhazardous waste manifest
  - Trip tickets or bills of lading
  - Copies of any state or local permits or approvals

8.2 RCRA RECORDS RETENTION

The DON's designated manifest signatory official will be responsible for ensuring that all hazardous waste recordkeeping requirements are met according to 22 CCR Sections 66262.20 through 66262.44, including retention of signed copies of manifests from the designated facility that received the waste. The copy must be maintained for at least 3 years from the date the waste was accepted by the initial transporter.

This page intentionally left blank.

9.0 REFERENCES

DoD (Department of Defense), Department of Energy, Nuclear Regulatory Commission, and U.S. Environmental Protection Agency. 2000. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). NUREG-1575. August.

DON (Department of the Navy). 2007. Action Memorandum/Interim Remedial Action Plan: Non-Time Critical Removal Action for Solid Waste Disposal Areas, Installation Restoration Site 12, Old Bunker Area, Naval Station Treasure Island, San Francisco, California. February 15.

Weston (Weston Solutions, Inc.) 2006. Treasure Island Naval Station Historical Radiological Assessment, Former Naval Station Treasure Island, San Francisco, California. February.

——————. 2007. Removal Action Work Plan/Remedial Design, Non-Time Critical Removal Action, Installation Restoration Site 12, Three Solid Waste Disposal Areas (SWDAs A&B, 1207/1209, and 1231/1233), Treasure Island, San Francisco, California. February.

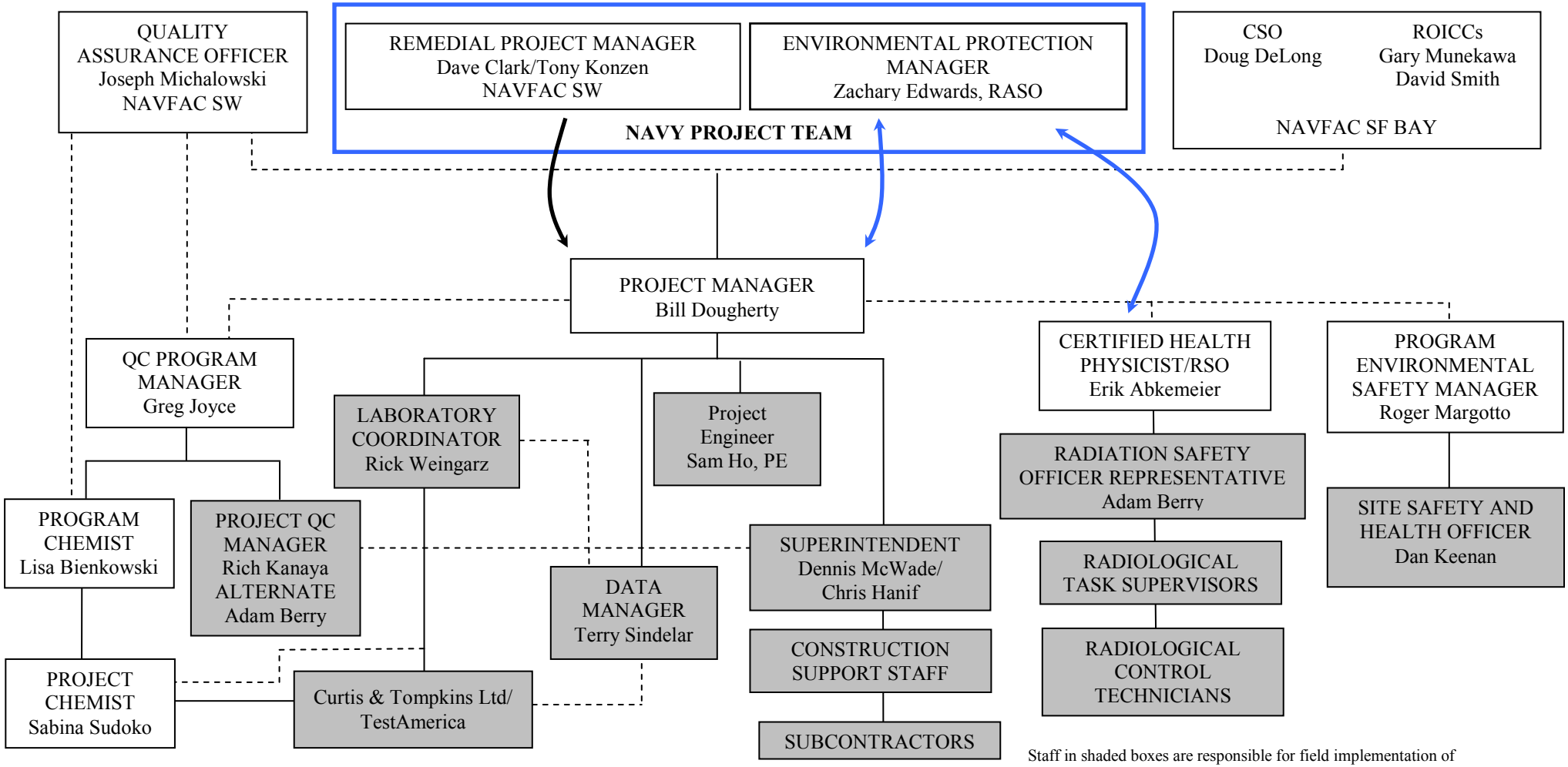
This page intentionally left blank.

FIGURES

This page intentionally left blank.

FIGURE 1-1

PROJECT ORGANIZATION CHART



Staff in shaded boxes are responsible for field implementation of activities under the NTCRA Work Plan.

The Construction Manager (Jeff Bray) has overall responsibility for coordinating the activities of on-site technical staff.

Abbreviations and Acronyms:
CSO – Contractor Site Office
NAVFAC SW – Naval Facilities Engineering Command Southwest
NTCRA – Non-Time-Critical Removal Action
RASO – Radiological Affairs Support Office
ROICC – Resident Officer in Charge of Construction
RSO – Radiation Safety Officer
QC – quality control
SF – San Francisco

Legend

Formal reporting relationship

Supporting relationship

Primary lines of technical communication

Line of technical direction (alternate where dashed)