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Base Realignment and Closure
Program Management Office West
1230 Columbia Street, Suite 1100
San Diego, California 92101

BASE-WIDE RADIOLOGICAL WORK PLAN

Revision 0

February 16, 2005

HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

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Prepared for

Base Realignment and Closure
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ABBREVIATIONS, ACRONYMS, AND SYMBOLS

μCi/mL	microcurie per milliliter
μR/hr	microroetgen per hour
α	alpha
β	beta
γ	gamma
AEC	Atomic Energy Commission
AHA	Activity Hazard Analysis
ALARA	as low as reasonably achievable
^{241}Am	americium-241
BAAQMD	Bay Area Air Quality Management District
BHASP	Building Health and Safety Plan
BMP	Best Management Practice
BRAC PMO	Base Realignment and Closure Program Management Office West
Caltrans	California Department of Transportation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
CIH	Certified Industrial Hygienist
cm	centimeters
cm^2	square centimeters
cm/s	centimeters per second
CMT	Construction Management Technician
COC	chain-of-custody
Co-60	cobalt-60
cpm	counts per minute
CPR	cardiopulmonary resuscitation
CQC	Contractor Quality Control
^{137}Cs	cesium-137
CSO	Caretaker Site Office

ABBREVIATIONS, ACRONYMS, AND SYMBOLS
(Continued)

CTO	Contract Task Order
D&D	decontamination and decommissioning
DAC	derived air concentration
DCGL	derived concentration guideline level
DFW	definable feature of work
DON	Department of the Navy
DOT	Department of Transportation
dpm	disintegrations per minute
DQO	data quality objective
EHS	Environmental Health and Safety
EM	Engineer Manual
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
FCR	Field Change Request
FSS	Final Status Survey
g/cm^3	grams per cubic centimeter
GPS	Global Positioning System
G-RAM	general radioactive material
^3H	hydrogen-3
HPGe	high-purity Germanium (gamma photon detector)
HPS	Hunters Point Shipyard
HRA	Historical Radiological Assessment
IR	Installation Restoration
ISO	International Organization for Standardization
keV	kiloelectron volt
LLRW	Low-level Radioactive Waste
m	meters
m^2	square meters
min	minutes
m/s	meters per second

ABBREVIATIONS, ACRONYMS, AND SYMBOLS
(Continued)

MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCA	multi-channel analyzer
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
MDER	minimum detectable exposure rate
MeV	megaelectron volt
mrem/y	millirem per year
MSDS	Material Safety Data Sheet
N/A	not applicable
NaI	sodium iodide
NAVSEA	Naval Sea Systems Command
NCR	Nonconformance Report
NFECSW	Southwest Division, Naval Facilities Engineering Command
NIST	National Institute of Standards and Technology
NORM	naturally occurring radioactive material
NPDES	National Pollutant Discharge Elimination System
NRDL	Naval Radiological Defense Laboratory
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
PjM	Project Manager
PPE	personal protective equipment
PQCM	Project Quality Control Manager
PRG	Preliminary Remediation Goal
^{239}Pu	plutonium-239
QAO	Quality Assurance Officer
QC	quality control
QCM	Quality Control Program Manager
^{226}Ra	radium-226

ABBREVIATIONS, ACRONYMS, AND SYMBOLS
(Continued)

RADLAB	Radiation Laboratory
RASO	Radiological Affairs Support Office
RCP	Radiological Control Plan
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RSO	Radiation Safety Officer
RSS	Radiological Safety Section
RSSI	Radiation Survey and Site Investigation
RTM	Radiation Task Manager
RTS	Radiological Task Supervisor
RWP	Radiation Work Permit
SARA	Superfund Amendments and Reauthorization Act
SFRA	San Francisco Redevelopment Agency
SHSP	Site-Specific Health and Safety Plan
SHSS	Site Health and Safety Specialist
SOP	Standard Operating Procedure
^{90}Sr	strontium-90
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	Stormwater Resources Control Board
^{232}Th	thorium-232
Triple A	Triple A Machine Shop, Inc.
TSP	Task-specific Plan
TtFW	Tetra Tech FW, Inc.
^{235}U	uranium-235
VSP	Visual Sample Plan
WRS	Wilcoxon Rank Sum (test)

1.0 INTRODUCTION

This Base-wide Radiological Work Plan (Base-wide Plan) describes survey and decontamination approaches that will be implemented in support of radiological release of buildings and areas at Hunters Point Shipyard (HPS), San Francisco, California. Tetra Tech FW, Inc. (TtFW), formerly Foster Wheeler Environmental Corporation, has been contracted by the Department of the Navy (DON) to perform these activities at HPS for the Base Realignment and Closure Program Management Office West (BRAC PMO) under Southwest Division, Naval Facilities Engineering Command (NFECSW) Remedial Action Contract N68711-98-D-5713.

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 work carried out under the Base-wide Plan for survey activities.

The Base-wide Plan will be used to conduct the following activities in support of radiological surveys. The objectives of these activities are to evaluate impacted sites that may contain residual radioactive contamination as a result of past activities at HPS, cleanup radioactive contamination that is identified, and confirm that buildings and sites at HPS meet the release criteria. These activities include:

- Reference (Background) Surveys
- Scoping Surveys
- Characterization Surveys
- Remedial Action Support Surveys
- Final Status Surveys (FSSs)
- Personnel Surveys
- Equipment and Material Surveys
- Truck Surveys
- Media Sampling
- Air Sampling
- Decontamination and Dismantling
- Radioactive Materials Management

Where applicable, survey activities will be conducted consistent with the guidelines in the *Multi-Agency Radiation Survey and Site Investigation Manual* [Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM); Nuclear Regulatory Commission (NRC) NUREG-1575, 2000], as incorporated into this Base-wide Plan. Survey activities, as well as activities not addressed by MARSSIM, will be performed in accordance with this Base-wide Plan and the Standard Operating Procedures (SOPs) presented in the *Hunters Point Shipyard Base-wide Radiological Control Plan* (RCP) (TtFW, 2004a).

The Base-wide 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 Base-wide Plan.
- **Section 2.0, Background** – Section 2.0 presents a description of HPS, a historical summary of the shipyard, and an overview of the radiological history of HPS, including sites identified as impacted in Volume II of the Historical Radiological Assessment [Naval Sea Systems Command (NAVSEA), 2004].
- **Section 3.0, Project Management** – Section 3.0 discusses the project organization, roles and responsibilities of key project personnel, personnel qualifications, and work control activities, including Radiation Work Permits (RWPs).
- **Section 4.0, Radiological Surveys** – 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 Planning and Design** – Section 5.0 presents the survey strategies and data quality objectives.
- **Section 6.0, Release Criteria** – Section 6.0 identifies the criteria for radiological release from structures and areas.
- **Section 7.0, Instrumentation** – Section 7.0 identifies 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 and Dismantling** – 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 assess, interpret, and report data.

- **Section 12.0, Environmental Protection Plan** – Section 12.0 identifies potential environmental impacts that will be considered during project implementation and how they will be managed.
- **Section 13.0, Quality Assurance/Quality Control** – Section 13.0 provides the methods and means that will be employed to ensure a consistent approach to achieving project quality goals.
- **Section 14.0, References** – Section 14.0 presents references cited in the body of the Base-wide Plan.
- **Appendix A, Example Radiation Work Permit** – Appendix A presents an example RWP.
- **Appendix B, Base-wide Sampling and Analysis Plan** – The Sampling and Analysis Plan summarizes the protocols for collecting, tracking, and analyzing samples collected under this plan.

Task-specific Plans (TSPs) will be prepared for each survey and remediation performed under the Base-wide Plan. These TSPs will supplement the information provided in the Base-wide Plan. Each TSP will provide relevant location-specific data and identify variances and/or additions to the Base-wide Plan. Substantial deviations from the Base-wide Plan may result in the generation of a stand-alone, job-specific work plan. Where prepared, these stand-alone work plans would supersede this Base-wide Plan.

2.0 BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The HPS site lies entirely within the corporate boundaries of the City and County of San Francisco, California, near its southern boundary with San Mateo County (Figure 2-1). HPS is located on San Francisco Bay in the southeast corner of San Francisco. The site encompasses approximately 848 acres, including approximately 416 acres on land, at the point of a high, rocky, 2-mile-long peninsula projecting southeastward into the bay.

HPS is divided into six parcels (Figure 2-1); Parcels A through E encompass onshore areas and Parcel F comprises offshore areas. In November 2004, Parcel A was transferred to the City and County of San Francisco. In 2004 the DON subdivided Parcel E, creating Parcel E-2. Radiologically impacted sites that will be addressed under this Base-wide Plan are located in Parcels B, C, D, E, and F.

2.2 GENERAL SITE HISTORY

Commercial shipyard activity has taken place on the Hunters Point peninsula since 1868 when the first drydock on the Pacific Coast was constructed there. By 1939, two drydocks and associated support facilities were present on Hunters Point. The DON purchased the drydocks and surrounding land from Bethlehem Steel in 1939 and occupied the site in late 1941, creating Hunters Point Naval Shipyard. After a significant expansion and buildup during World War II, the shipyard diversified as a major fleet support center performing ship repair throughout the Korean Conflict. The shipyard operated as a general repair facility specializing in submarines, aircraft carrier overhaul, and ship repair operations through the early 1970s. The workload consisted primarily of the repair and conversion of conventionally powered ships, repair of diesel submarines, and non-radiological work on nuclear-powered ships.

The DON deactivated HPS in 1974 and most of the site was then leased to a commercial ship repair company, Triple A Machine Shop, Inc. (Triple A) from 1976 to 1986. Triple A dedicated more than 80 percent of the shipyard to the repair of commercial and naval vessels and subleased unused facilities to private warehousing, industrial, and commercial firms. In 1986, the DON again assumed control of the shipyard and used it for the docking and repair of several DON surface ships.

In 1991, HPS was selected for closure pursuant to the terms of the Defense Base Closure and Realignment Act of 1990. The property will be transferred to the City and County of San Francisco for non-defense use. Closure activities at HPS involve environmental remediation activities to make the property suitable for transfer. Currently, BRAC PMO manages the HPS

property. Routine access to the property is controlled by the San Francisco Redevelopment Agency (SFRA) under an agreement with the DON.

Hazardous materials are present at HPS because of previous shipyard operations. Investigation and cleanup of contamination at HPS by the DON has been underway since the 1980s. In 1989, the U.S. Environmental Protection Agency (EPA) placed HPS on the National Priorities List as a Superfund site pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Some of the tenants that sublet from Triple A are still operating at HPS, now under direct leases with the DON. These tenants operate a variety of business and cultural ventures including storage units, machine workshops, woodworking shops, auto restoration garages, vehicle parking, and a railroad museum. In addition, the DON has leased space to the SFRA, who in turn sublets space to various artists for studios and to elements of the City of San Francisco Police Department. A limited number of DON-related entities also maintain operations at the site.

2.3 RADIOLOGICAL HISTORY

As part of the environmental investigations being performed to facilitate transfer of HPS, the DON has prepared a Historical Radiological Assessment (HRA) that documents the history of radiological materials at HPS. The HRA is presented in two volumes. Volume I (NAVSEA, 2000) addressed radioactivity associated with the Naval Nuclear Propulsion Program and concluded that berthing of nuclear-powered ships at HPS or work done on these ships resulted in no adverse effects on the human population or the environment. Volume II (NAVSEA, 2004) presented the history of general radioactive material (G-RAM) at HPS in three primary operational areas:

- Use of G-RAM at HPS by the naval shipyard and Triple A
- Decontamination activities associated with ships that participated in atomic weapons testing including OPERATION CROSSROADS
- Radiological activities associated with the Radiation Safety Section/Radiation Laboratory/Navy Radiological Defense Laboratory

Volume II concluded that there are areas of known or potential radiological contamination at HPS and identified additional investigation and/or cleanup activities to support the transfer and reuse of the base. This Base-wide Plan has been prepared to address the recommendations presented in Volume II of the HRA.

The HRA states that, beginning in the late 1930s, devices incorporating radioluminescent radium paint came into wide use in the Navy. These devices constituted the first G-RAM introduced to HPS. Other G-RAM used at HPS as part of routine shipyard activities included:

- Other radioluminescent devices
- Gamma sources for gamma radiography
- Sources for calibrating radiation detection instruments
- Materials found in items such as smoke detectors, welding rods, and night vision equipment

The use and/or handling of these materials could have resulted in radiological contamination at HPS.

Some of the ships that participated in atomic weapons testing, including OPERATION CROSSROADS, were brought to HPS for decontamination. OPERATION CROSSROADS involved detonating two atomic bombs at Bikini Atoll in July 1946. During these tests, a number of ships at the atoll became contaminated with radioactive materials. The DON concluded that a shipyard environment would be needed to decontaminate many of these ships and HPS was selected as the principal location for this activity. Consequently, contaminated ships were involved in experimental decontamination efforts at HPS. Decontamination of these ships and ships involved in other atomic weapons testing was conducted by mechanical methods, such as scraping or sandblasting, and/or chemical methods, such as acid washing. Decontamination activities and/or the associated waste disposal could have resulted in radiological contamination at HPS.

In 1946, the DON created an organization tasked with applying radiological safety throughout the Navy. Initially known as the Radiological Safety Section (RSS), this unit was briefly renamed the Radiation Laboratory (RADLAB) and ultimately became the Naval Radiological Defense Laboratory (NRDL) in 1948. The unit was established at HPS with the original mission of supporting the decontamination efforts on the OPERATION CROSSROADS ships. By the time the unit became the NRDL, the mission had expanded to include the study of nuclear weapons effects and development of methods for the protection of DON personnel and ships. From the 1950s until 1969 when it was closed, NRDL was recognized as a leading radiological research facility. Because of the breadth of the research performed by NRDL they used a large number of radionuclides. The use of these materials and the disposal of wastes generated during research activities could have resulted in radiological contamination at HPS.

In accordance with MARSSIM (NUREG-1575, 2000), an "impacted site" is defined as one that has a potential for radioactive contamination based on historical information or is known to have radioactive contamination. Based on the review of historical information regarding radiological operations at HPS, the HRA concluded that there were 91 impacted sites associated with HPS.

The HRA recommends 56 sites at HPS for further investigation and remediation by the DON. These include buildings, drydocks, former building sites, outdoor areas, Installation Restoration (IR) sites, ships' berths, the Gun Mole Pier, and the sanitary and storm sewer systems. Specific recommendations for surveys and/or cleanup at each of the 56 areas are presented in the HRA

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and summarized in Table 2-1. This Base-wide Plan will provide the basis for conducting these activities. As appropriate, individual, location-specific, or stand-alone work plans may be prepared for one or more of these sites. Where prepared, these stand-alone work plans would supersede this Base-wide Plan.

TABLE 2-1

SUMMARY OF SITES IDENTIFIED FOR FURTHER ACTION BY THE DON

Building Number or Area	Recommended Action in HRA				Isotopes of Concern								
	Scoping Survey	Characterization Survey	Remediation	Final Status Survey	Am-241	Co-60	Cs-137	H-3	Pu-239	Ra-226	Sr-90	Th-232	U-235
Parcel B													
114	X						X			X	X		
140 and Discharge Tunnel	X	X	X	X			X		X	X	X		
142	X	X	X	X			X		X	X	X		
146		X	X	X			X			X	X		
157	X	X	X	X		X	X			X			
IR-07	X	X	X	X			X		X	X	X		
IR-18	X	X	X	X			X		X	X	X		
Drydock 5	X	X	X	X			X		X	X	X		
Drydock 7	X	X	X	X			X		X	X	X		
Parcel C													
203	X	X	X	X			X		X	X	X		
205 and Discharge Tunnel	X	X	X	X			X		X	X	X		
211			X	X			X			X		X	
253		X	X	X			X		X	X	X	X	
Parcel D													
351A			X	X			X		X	X	X	X	
364			X	X		X	X		X	X	X		X
366/351B			X	X			X			X	X		
408	X	X	X	X						X			
813	X	X	X	X							X		
819	X	X	X	X			X			X			
Parcel E													
500	X	X	X	X			X			X			
500 Building Series	X	X	X	X	X		X		X	X	X		
503 Site	X						X			X	X		
506 Site	X	X	X	X	X		X	X	X	X	X		
507 Site		X					X		X	X	X		
508 Site		X	X	X			X			X	X		
509 Site		X	X	X			X				X		
510 Site		X	X	X	X		X		X	X	X		
510A Site		X	X	X			X				X		
517 Site		X	X	X		X	X				X		
520 Site		X	X	X			X			X	X		
521	X						X		X	X	X		
529 Site		X	X	X			X	X		X	X		
704 Area	X						X		X	X	X		
704 Pens	X						X			X	X		
707/Kennel		X	X	X			X		X	X	X		
707B Site		X	X	X			X			X	X		
707C Site		X	X	X			X		X	X	X		
707 Triangle Area		X	X	X			X		X	X	X		X
719 Site	X	X		X			X			X	X		
807 Site	X	X		X			X			X	X		
810	X	X	X	X			X			X	X		
Shack 79 Site		X	X	X			X			X	X		
Shack 80 Site			X	X			X			X	X		
Experimental Shielding Range			X	X		X	X			X			
IR-01/21, Industrial Landfill			X	X			X			X	X		
IR-02, Bay Fill		X	X	X			X			X	X		
IR-03	X	X	X	X			X			X	X		
IR-04		X	X	X			X			X	X		
Former Salvage Yard	X	X	X	X			X			X	X		
Shoreline		X	X	X			X			X	X		
Base-wide													
Storm Drain Lines	X	X	X	X			X			X	X		
Sanitary Sewers	X	X	X	X			X			X	X		
Septic Systems	X	X	X	X			X			X	X		
Parcel F													
Underwater Areas	X						X		X	X	X		X
Ship's Berths	X						X		X	X	X		
Off-site Facility													
ICW 418	X						X			X	X		

Notes:
DON - Department of the Navy
HRA - Historical Radiological Assessment
AM-241 - americium-241
CO-60 - cobalt-60
Cs-137 - cesium-137
H-3 - hydrogen-3
Pu-239 - plutonium-239
Ra-226 - radium-226
Sr-90 - strontium-90
Th-232 - thorium-232
U-235 - uranium-235

3.0 PROJECT MANAGEMENT

3.1 INTRODUCTION

This section describes management of the project including organizational, structural, and functional responsibilities; the use of RWPs; prerequisite requirements of survey activities; and client notifications.

3.2 ORGANIZATION

The project personnel will be organized to facilitate effective communications and to ensure that organizational lines of communications, roles and responsibilities, and reporting requirements are well defined. The organization will be defined to a level sufficient to ensure that each participant, whose actions could affect the quality of radiological task planning, field or laboratory operations, or reporting, has an understanding of his/her responsibilities and how these responsibilities fit into the overall team. The project organization chart is provided in Figure 3-1. The following table provides contact information of DON and key project personnel.

Agency	Contact	Project Title
Commander Southwest Division, Naval Facilities Engineering Command Attn: Code 06CH.RP 1230 Columbia St., Suite 1100 San Diego, CA 92101	Mr. Ralph Pearce (619) 532-0912 ralph.pearce@navy.mil	Remedial Project Manager (RPM)
NAVSEA DET RASO Building 1971 NWS P.O. Box Drawer 260 Yorktown, VA 23691-0260	Ms. Laurie Lowman (757) 887-4692 lowmanll@raso.navy.mil	Radiological Site Manager
NAVSEA DET RASO Building 1971 NWS P.O. Box Drawer 260 Yorktown, VA 23691-0260	Mr. Matthew Slack (757) 887-4692 slackml@raso.navy.mil	Assistant Radiological Site Manager
Naval Facilities Engineering Command Southwest Division 2450 Saratoga Street, Building 110, Suite 200 Alameda Point, Alameda, CA 94501-7545	Mr. Peter Stroganoff (510) 759-5941 peter.stroganoff@navy.mil	Resident Officer in Charge of Construction (ROICC)
Naval Facilities Engineering Command Southwest Division 2450 Saratoga Street, Building 110, Suite 200 Alameda Point, Alameda, CA 94501-7545	Mr. Andrew Uehisa (510) 759-5946 andrew.uehisa@navy.mil	ROICC Construction Management Technician (CMT)

Agency	Contact	Project Title
Commander Southwest Division, Naval Facilities Engineering Command 1220 Pacific Highway San Diego, CA 92132-5190	Mr. Nars Ancog (619-532-2544 narciso.ancog@navy.mil	Quality Assurance Officer (QAO)
Tetra Tech FW, Inc. Hunters Point Shipyard 270 Nimitz Ave. (Bldg. 270) San Francisco, CA 94124	Mr. Gerry Slattery (415) 216-2730 (415) 860-6740 (cellular) gslattery@ttfwi.com	Project Manager (PjM)
Tetra Tech FW, Inc. 1940 E. Deere Ave, Suite 200 Santa Ana, CA 92705	Ms. Mary Schneider (949) 756-7586 mschneider@ttfwi.com	Quality Control Program Manager (QCM)
Tetra Tech FW, Inc. 1230 Columbia St., Suite 500 San Diego, CA 92101	Mr. Roger Margotto (619) 471-3503 (714) 810-3742 (pager) rmargotto@ttfwi.com	Certified Industrial Hygienist (CIH)
Tetra Tech FW, Inc. Hunters Point Shipyard 270 Nimitz Ave. (Bldg. 270) San Francisco, CA 94124	Mr. Bill Williams (415) 216-2730 (415) 860-6740 (cellular) wwilliams@ttfwi.com	Construction Manager
Tetra Tech FW, Inc. 3200 George Washington Way, Suite G Richland, WA 99352-3429	Mr. Cliff Stephan (509) 371-0140 (509) 430-4655 (cellular) cstephan@ttfwi.com	Certified Health Physicist (CHP)
Tetra Tech FW, Inc. Hunters Point Shipyard 270 Nimitz Ave. (Bldg. 270) San Francisco, CA 94124	Mr. Carl Jones (415) 216-2731 (925) 324-1572 (cellular) cjones@ttfwi.com	Project Quality Control Manager (PQCM)
Tetra Tech FW, Inc. Hunters Point Shipyard 270 Nimitz Ave. (Bldg. 270) San Francisco, CA 94124	Mr. Daryl Delong (415) 216-2734 (415) 308-7027 (cellular) ddelong@ttfwi.com	Radiation Safety Officer (RSO)
Tetra Tech FW, Inc. Hunters Point Shipyard 270 Nimitz Ave. (Bldg. 270) San Francisco, CA 94124	Richard Quinn (415) 216-2740 (650) 450-1969 (cellular) rquinn@ttfwi.com	Site Health and Safety Specialist (SHSS)
Tetra Tech FW, Inc. 1940 E. Deere Ave, Suite 200 Santa Ana, CA 92705	Ms. Lisa Bienkowski (949) 756-7592 lbienkowski@ttfwi.com	Program Chemist
New World Technology Hunters Point Shipyard 270 Nimitz Ave. (Bldg. 270) San Francisco, CA 94124	Mr. Bert Bowers (415) 216-2732 (415) 308-7027 (cellular) bertbowers@aol.com	Radiation Task Manager (RTM)

Agency	Contact	Project Title
MKM Engineering Hunters Point Shipyard 270 Nimitz Ave. (Bldg. 270) San Francisco, CA 94124	Mr. Kelly Ellis (415) 216-2752 (865) 603-3247 (cellular) k228250@earthlink.net	RTM

The project personnel with the primary responsibilities for the achievement and verification of the project's radiological goals and objectives are the PjM, CIH, QCM, Construction Manager, PQCM, CHP, RSO, SHSS, RTMs and Supervisors, Radiological On-site Laboratory Supervisors, Radiological Control Technicians (RCTs), and quality control (QC) representatives. Their roles and responsibilities are described in the following sections. DON oversight of the activities performed by the project team will be provided by Radiological Affairs Support Office (RASO), BRAC PMO, and NFECSW personnel.

3.2.1 Project Manager

The PjM is responsible for the direction, execution, and successful completion of project tasks to achieve overall project goals. The PjM has the primary responsibility for coordinating activities and concerns with the Navy RPMs and RASO. The PjM also has the responsibility and authority to perform the following:

- Coordinating work activities of subcontractors and TtFW personnel and ensuring that all personnel adhere to the administrative and technical requirements of the project
- Monitoring and reporting the progress of work and ensuring that project deliverables are completed on time and within budget
- Ensuring adherence to the requirements of the contract, project scope of work, and the project plans
- Ensuring that all work activities are conducted in a safe manner in accordance with the Site-Specific Health and Safety Plan (SHSP)
- Attending required meetings, including the pre-construction conference, weekly QC meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings
- Serving as the senior contact between the DON and TtFW for actions and information related to the work
- Ensuring effective implementation of the radiological record management program
- Ensuring that all personnel assigned to perform field work are appropriately monitored for exposure to ionization radiation
- Coordinating regulatory site visits

3.2.2 Certified Industrial Hygienist

The CIH has authority to implement and oversee the TtFW Health and Safety Program. The CIH has the responsibility and authority to perform the following:

- Ensuring that all staff, including subcontractors, comply with the SHSPs, state and federal regulations, and corporate policies
- Interacting with the PjM on all aspects of health and safety from the initial planning phase through fieldwork and closeout
- Providing advice and assistance on any safety, industrial hygiene, or accident prevention issue to the SHSS, PjM, and Construction Manager
- Reviewing all site health and safety documents and cost estimates, and working to properly staff projects
- Working to pre-qualify field subcontractors

3.2.3 Quality Control Program Manager

The QCM will report directly to the Corporate QC Manager and has the responsibility and authority to perform the following:

- Establishing and maintaining the QC program for the project
- Overseeing the QC program including data acquisition
- Working directly with the PjM and NFECSW QAO to ensure implementation of the Program QC Plan
- Acting as a focal point for coordination of all QC project-related matters and resolving all QC issues
- Providing QC direction and training to the PQCM and others who are performing QC functions
- Suspending project activities if quality standards are not maintained
- Interfacing with the DON, including the NFECSW QAO, on quality-related items
- Conducting field QC audits to ensure that site QC plans are being followed
- Performing reviews of audit and surveillance reports conducted by others
- Implementing DON technical direction letters related to QC topics

3.2.4 Construction Manager

The Construction Manager will report to the PjM and is responsible for coordinating, directing, implementing, and supervising site construction and support activities. The Construction Manager has the responsibility and authority to perform the following:

- Implementing field activities in accordance with the Base-wide Plan and TSPs
- Scheduling and directing field activities, support personnel, and subcontractors
- Administering site access and communication within active work areas
- Maintaining work site, facilities, vehicles, and equipment
- Ensuring that all work activities in the field are conducted in a safe manner in accordance with the health and safety plans
- Coordinating and maintaining logistics of components of on-site tasks, including personnel and equipment
- Attending required meetings, including the pre-construction conference, weekly QC meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings
- Preparing status reports and estimating future scheduling needs
- Preparing Daily Contractor Production Reports

3.2.5 Project Quality Control Manager

The PQCM is responsible for overall management of project QC and will report to the QCM. The PQCM or an alternate PQCM will be on-site at all times during field activities. The PQCM has the responsibility and authority to perform the following:

- Monitoring activities to ensure conformance with the Base-wide Plan and that policies, procedures, contract specifications, and sound practices are followed
- Preparing the Daily QC Reports
- Ensuring that the three phases of inspection (preparatory, initial, and follow-up) are implemented for all definable features of work (DFWs)
- Ensuring that required tests and inspections are performed and the results reported
- Attending required meetings, including the pre-construction conference, weekly QC meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings
- Issuing and maintaining Field Change Requests (FCRs) and Nonconformance Reports (NCRs) for project activities (construction- and radiological-related)
- Maintaining an 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

3.2.6 Certified Health Physicist

The CHP is responsible for implementing, directing, and supervising all radiological project-related activities. The CHP has the responsibility and authority to perform the following:

- Assisting in the development and approval of the SHSP
- Assisting in identifying radiological analysis needs
- Providing technical support in subcontractor selection
- Providing health physics guidance on an as-needed basis
- Providing radiological control protection services, if required
- Directing and assisting project personnel in proper completion of radiological records
- Assisting the RSO to determine if an external dose is to be assigned to an individual who reported lost or damaged dosimetry devices
- Ensuring that the required radiological safety training is provided to project personnel
- Reviewing and approving project field procedures that involve the handling of radioactive materials or access to radiological areas
- Ensuring timely and thorough review of records, in accordance with the Radiological Records SOP, prior to approval
- Approving records with verifiable signature and date once records meet the quality standards as described in the Radiological Records SOP
- Conducting radiation incident investigations
- Conducting radiological project inspections
- Conducting data assessment.

3.2.7 Radiation Safety Officer

The RSO will be responsible for oversight of the inspection and certification activities for radiological safety-related activities. The duties specified for the RSO may be shared with the CHP as appropriate. In accordance with DON requirements, the RSO or a qualified designee will be on site during radiological work conducted under this Base-wide Plan. The RSO has the responsibility and authority to perform the following:

- Providing radiological material-related safety briefings
- Assuring 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 QC meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings
- Serving as a contact person for lost or damaged dosimeters for TtFW staff
- Conducting search, investigating, and then documenting dosimeters that are reported lost or damaged for TtFW staff
- Ensuring that an individual who reported a lost or damaged dosimeter is excluded from a radiologically controlled area until the investigation is completed, documented, and the dosimetry device re-issued for TtFW staff
- Reviewing the exposure condition of an individual who reported lost or damaged dosimetry in order to assign an external dose with concurrence of the CHP
- Ensuring that each individual working at an impacted area wears a dosimetry device specified in the RWP
- Verifying compliance with on-site RWPs and SOPs (including laboratory SOPs)
- Assuring that all radiological safety documentation is provided to the PQCM for inclusion in the project files
- Providing surveillance of radiological-related activities
- Serving as a contact person for NRC site inspections
- Stopping work that is not in compliance with RWPs, good radiological practices, and SOPs

3.2.8 Site Health and Safety Specialist

The SHSS ensures that all elements of the approved SHSPs are implemented and enforced on site. The SHSS will report directly to the CIH and will assist in implementing and enforcing the SHSP in the field. The SHSS has full authority to issue stop work orders or evacuation orders where work operations or noncompliance(s) may threaten the health and safety of site workers or the public. The SHSS has the responsibility and authority to perform the following:

- Ensuring that all personnel understand the requirements of TtFW's Environmental Health and Safety (EHS) program and procedures through training and communication
- Ensuring enforcement of SHSPs by means of daily site inspections
- Investigating all accidents, injuries, illnesses, near-misses, and other incidents
- Ensuring that project personnel are trained on the hazards of hazardous substances on the project, maintaining Material Safety Data Sheet (MSDS) file to provide easy access to project personnel and performing inspections to ensure that all waste containers are correctly labeled

- Ensuring that the Base-wide Health and Safety Plan, Building Health and Safety Plan (BHASP), or SHSP are read, understood, and signed by all personnel including subcontractors
- Ensuring that tailgate safety meetings are conducted on days that work is performed and that documentation of all meetings and any other additional training is completed
- Verifying that project safety equipment is inspected, as required by the EHS program
- Coordinating site health and safety requirements with the Construction Manager and PjM
- Ensuring maintenance of all health and safety monitoring and personal protective equipment and directing site-monitoring activities
- Coordinating daily field activities with the Construction Manager
- Coordinating site safety and emergency response duties; verifying site communications system with site personnel
- Performing inspection of safety equipment
- Reporting to the ROICC within 2 hours, all incidents required to be reported by Engineer Manual (EM) 385-1-1; and immediately reporting to the ROICC any fatal injury, one or more persons admitted to a hospital, or property damage to government property
- Verifying that all personnel have the necessary training and medical clearance prior to entering the exclusion zone or contamination reduction zone at the site; informing the Construction Manager of any site personnel with medical restrictions
- Determining and posting routes to medical facilities and emergency telephone numbers arranging for emergency transportation to medical facilities
- Serving as the Project Hazard Communication Coordinator
- Maintaining training records and medical certifications for all on-site personnel including subcontractors
- Initiating necessary revisions or changes to the SHSP
- Maintaining site control procedures
- Maintaining current records of certification for first aid and cardiopulmonary resuscitation (CPR) for project field personnel
- Attending required meetings, including the pre-construction conference, weekly QC meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings

3.2.9 Radiological Task Managers

The RTMs will plan, direct, and coordinate radiological activities ensuring that requirements, goals, and objectives of the project are accomplished. The RTMs have the responsibility and authority to perform the following:

- Reviewing project plans to determine scheduling and procedures for accomplishing project objectives
- Ensuring that the RTM or a similarly qualified designee will be on site during radiological activities
- Distributing and collecting dosimetry devices
- Performing dosimetry program reviews
- Determining accumulated external dose of workers, documenting dose in NRC Form 4 and providing a copy to each worker
- Writing TSPs and, in conjunction with TtFW, work directly with the RPM and RASO to ensure that each TSP is finalized and accepted
- Determining requirements for work assignments including personnel monitoring devices
- Determining and providing for radiological staffing for each phase of the project, and arranging for assignment of project personnel
- Conferring with project staff to outline work plan and to assign duties, responsibilities, and scope of authority
- Attending required meetings, including the pre-construction conference, weekly QC meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings
- Reviewing reports prepared by project personnel and modifying schedules or plans as required
- Preparing project reports
- Conferring with project personnel to provide technical advice and to resolve problems
- Coordinating project activities with activities of regulatory or other governmental agencies, as directed by the PjM
- Notifying the PjM, RPM, and RASO regarding radioactive anomalies
- Managing the storage of radioactive waste in accordance with the radioactive material license
- Implementing and monitoring on-site radiological training programs

3.2.10 Program Chemist

The Program Chemist oversees sample collection, handling, analysis, and analytical data reporting. The Program Chemist has responsibility and authority for the following:

- Developing Sampling and Analysis Plan
- Evaluating and selecting qualified subcontract laboratories
- Implementing data QC procedures and performing audit of field performance

- Reviewing off-site laboratory data prior to use
- Ensuring that proper review of on-site laboratory data is performed
- Coordinating data validation of off-site laboratory data
- Reviewing data validation reports
- Preparing analytical reports and supports project report preparation

3.2.11 Radiological Task Supervisors

Radiological Task Supervisors (RTSs) will direct field survey personnel and health physics operations as assigned by the RTMs. The RTS has the responsibility and authority to perform the following:

- Performing the functions enumerated in the Base-wide RCP (TtFW, 2004a)
- Supervising field staff for survey, site remediation and decontamination, use of survey equipment and instrumentation, and support of programs and projects
- Ensuring compliance by RCTs with the applicable SOPs for safety program, survey, and/or remediation actions
- Ensuring compliance with NRC, Occupational Safety and Health Administration (OSHA), and EPA directives, as well as applicable local, state, and federal statutes and codes
- Interpreting and verifying data accumulated from surveys and monitoring activities
- Maintaining inventory and ensuring safe use and serviceability of tools, equipment, and vehicles on site
- Compiling, writing, and ensuring compliance with the TSPs
- Informing the RTM of work progress
- Ensuring that each individual working at an impacted area complies with the requirements specified in the RWP

3.2.12 Radiological On-site Laboratory Supervisors

The Radiological On-site Laboratory Supervisors will maintain oversight of the on-site laboratory program. The Radiological On-site Laboratory Supervisor has the responsibility and authority to perform the following:

- Maintaining laboratory equipment
- Running calibration checks and maintaining calibration data
- Maintaining chain of custody of on-site samples while in their possession; ensuring correct shipment of off-site confirmation samples
- Verifying on-site laboratory results with those obtained from the off-site laboratory

- Communicating analytical needs and capabilities
- Implementing the SOPs and laboratory quality assurance manual
- Providing training to staff regarding laboratory quality assurance policies
- Making recommendations for corrections and improvements as necessary
- Establishing and maintaining statistical limits for QC measurements

3.2.13 Radiological Control Technicians

The RCTs will support projects in the field and laboratory. The RCT has the responsibility and authority to perform the following:

- Conducting and documenting field surveys, sampling, and laboratory support in accordance with the Base-wide Plan, TSPs, and SOPs
- Interpreting and verifying field data accumulated from surveys and monitoring activities
- As assigned, assisting in training support personnel in health physics and safety
- Supporting dose assessments, and assuring compliance with QC programs, emergency plans, and procedures
- Performing effluent monitoring and radioactive material inventories
- Performing survey equipment efficiencies, response checks, and daily checks of the survey instruments
- Conducting safety evaluations of health physics field and laboratory equipment
- Preparing and implementing use of RWPs, including being present at active work areas to ensure compliance with the RWPs in the absence of the RTS

3.2.14 Radiological Support Personnel

Radiological support personnel are equipment operators and laborers performing field activities in support of survey activities under the direction of the Construction Manager. The equipment operators will maintain and operate heavy equipment. The laborers will support various field activities directed by the Construction Manager or his designee.

3.2.15 Remedial Project Manager

The RPM has primary responsibility within the DON for day-to-day management of the project activities performed under this Base-wide Plan and for their successful completion. The RPM's duties and authority include:

- 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 TtFW project team, as needed
- Integrates CERCLA issues at HPS with ongoing radiological activities
- Coordinates with RASO and RPMs of other projects being performed in radiologically impacted areas to ensure proper controls are in place
- Acts as lead interface with agencies on non-radiological issues
- Together with the Radiological Site Manager, negotiates radiological release criteria with regulatory agencies

3.2.16 Radiological Site Manager

As a representative of RASO, the Radiological Site Manager has primary responsibility within the DON for the technical accuracy and the regulatory conformance of work performed under this Base-wide Plan. The Radiological Site Manager's duties and authority include:

- Reviews and approves project work plans and procedures
- Acts as lead interface with regulatory agencies on radiological survey plans and reports
- Together with the RPM, negotiates radiological release criteria with regulatory agencies
- Reviews and approves on-site laboratory analytical data
- Reviews and approves project reports
- Ensures compliance with applicable MARSSIM requirements
- Recommends changes in TtFW scope to the RPM, as appropriate
- Supports public meetings

3.2.17 Quality Assurance Officer

The QAO is the DON representative with primary responsibility for ensuring that contract-required quality assurance measures are in place and effective for the work performed under this Base-wide Plan. The QAO's duties and authority include:

- Reviewing and approving Sampling and Analysis Plans
- Providing DON oversight of the TtFW Quality Assurance Program
- Providing quality-related directives through Contracting Officer Representative
- Providing technical and administrative oversight of TtFW surveillance audit activities
- Acting as point of contact for matters concerning quality assurance and the DON's Laboratory Quality Assurance Program

- Coordinating training on matters pertaining to generation and maintenance of quality of data
- Authorizing the suspension of project execution if quality assurance requirements are not adequately followed

3.2.18 Resident Officer in Charge of Construction

The ROICC staff have the primary responsibility for providing on-site quality assurance and safety oversight of contractors performing work at HPS. The ROICC staff member's duties and authority include:

- Verifying that all work has been completed per contract and technical specifications prior to final government acceptance
- Performing ongoing field inspections to verify that all work is in compliance with both contract and technical specifications
- Notifying the contractor of any work that is not in compliance
- Interacting with the contractor's PQCM on quality-related issues
- Reviewing and signing waste manifests for non-radiological wastes as the generator's representative
- Reviewing contractor daily reports for completeness and accuracy
- Attending Preparatory Phase, Initial Phase, Pre-final, and Final Acceptance Inspections
- Attending weekly QC meetings

3.3 TRAINING

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

- OSHA 40 Hour and Annual 8 Hour Refresher
- Radiation awareness training
- RWP and TSP training for the specific site or task
- Activity Hazard Analysis (AHA) training for the specific site or task
- BHASP or SHSP training, as required by the plans

3.4 WORK CONTROL PROCEDURES

Prerequisites for the initiation of survey activities include completion of a TSP, BHASP and SHSP, required notifications, as well as the procurement of services, equipment, and materials necessary to perform the work. Additional activities will include a pre-work radiological evaluation of the designated work areas.

3.4.1 Task-specific Plan

The Base-wide Plan is intended to provide the requirements and conditions applicable throughout the course of the project. In order to implement the work plan, it will be necessary to develop a TSP for each building, area, or activity. Each TSP will include the following information as applicable to the task:

- Task description, including the specific location history, purpose of the task, and the isotopes 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 (D&D) activities (as required)
- Variations, if any, to the Base-wide Plan will be specifically identified, including the work plan requirement, the required 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 DON (RPM, RASO, and QAO) for review and approval.

3.4.2 Radiological Health and Safety

The Base-wide RCP (TtFW, 2004a) will be used to address controls necessary for radiologically safe operations. Critical requirements resulting from the aforementioned document include the presence of a SHSS at active work locations to ensure implementation of the SHSP or BHASP. Additionally, a RCT will be present at active work areas to ensure compliance with the RWP. Dose rate, contamination, and air monitoring, including initial baseline sampling to determine radiological background conditions, will be performed as necessary. 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 BHASP.

3.4.3 Radiation Work Permits

An RWP will be prepared that will specify the activities to be performed and include radiological safety requirements for the work. All personnel assigned to site work will be required to understand the requirements and sign the RWP prior to beginning work. RWPs will be used to

identify the requirements for entering, exiting, and conducting work in radiologically impacted areas identified in the HRA. An example of an RWP is presented in Appendix A.

3.4.3.1 Purpose of the Radiation Work Permit

RWPs provide guidelines specifying the appropriate personnel protective measures within the scope of the work based upon the radiological conditions in the area. The RWP will also provide a complete document addressing existing radiological conditions, work scope and limitations, radiological limitations, PPE requirements, dosimetry requirements, ALARA considerations, and specific instructions to personnel. An RWP should not be used unless a radiological survey has been performed in the work area within the last 24 hours or there is reasonable assurance that radiological conditions have not changed as determined by the RTM or his/her designee. Changes to an RWP will be noted during the daily safety briefing. The absence of any changes will also be communicated during the briefing.

3.4.3.2 Development of the Radiation Work Permit

The RTM, or qualified designee, will perform, or assign an RCT to perform an assessment of the work area. Prior to performing a work area survey, the RCT will be as knowledgeable as possible about the nature of the work to be performed (surface or sub-surface surveying, drilling, sample collection, equipment repair, decontamination, and jack hammering, and so forth). In addition, consideration will be given to the specific component or equipment to be worked on, the positions the workers may take to perform the work (i.e., kneeling on the ground, leaning against one component to work on another), and the possibility of the presence of radioactive debris.

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

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

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

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3.4.3.3 Review and Approval of the Radiation Work Permit

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

3.4.3.4 Implementation of the Radiation Work Permit

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

3.4.3.5 Changes to the Radiation Work Permit

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

3.4.4 Notifications

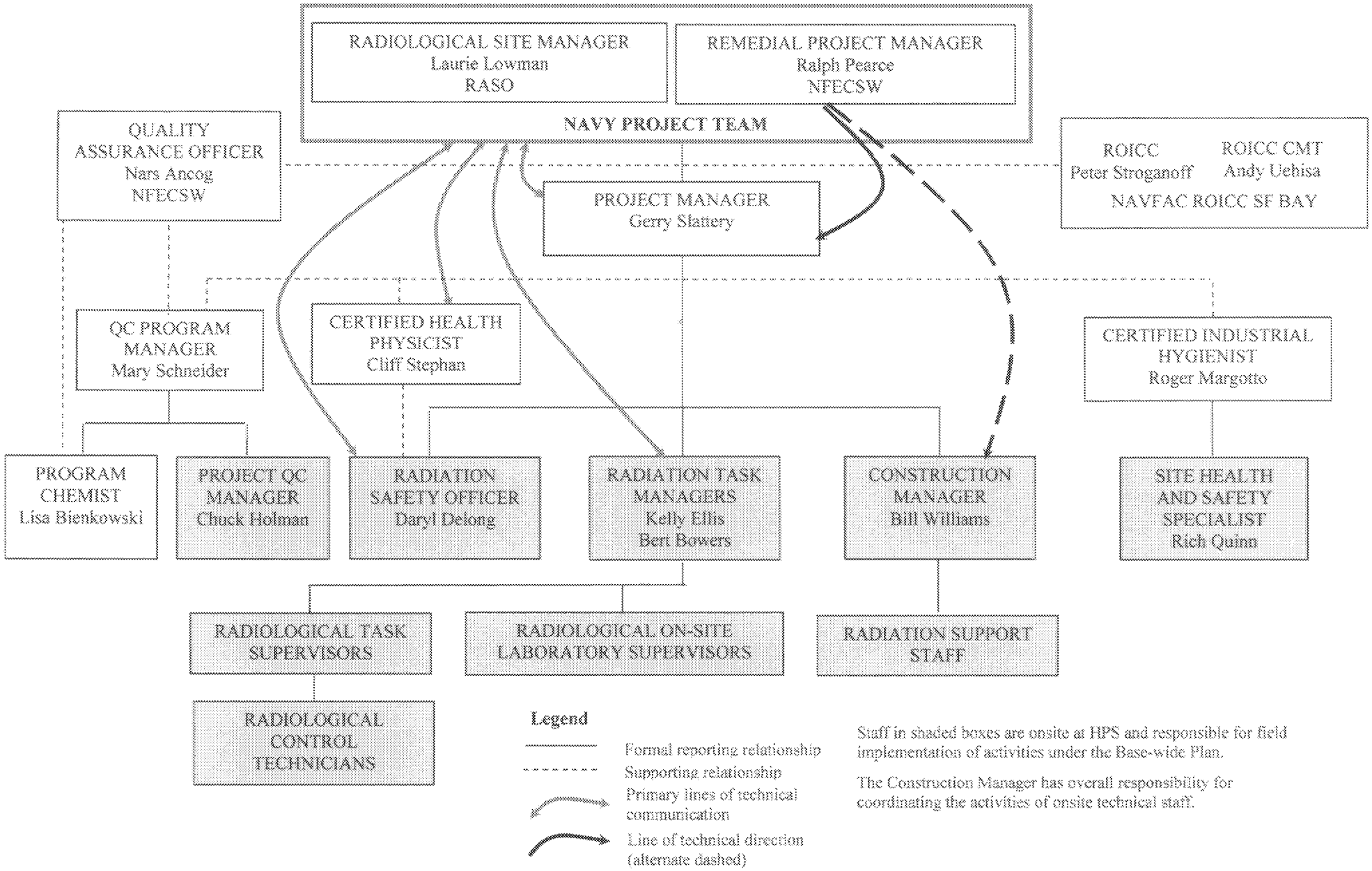
During survey activities, radioactive anomalies could be identified and significant events could occur. An anomaly, for purposes of this plan, is described as a reading or result that appears to be an outlier in the professional judgment of the RTM. When an anomaly is identified, the RTM will notify the PjM, RPM, and the Radiological Site Manager. If neither person is available, the RTM 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 NRC), radiological issues, injuries, and breaches in security. All significant events will be notified to the RPM and RASO as described above.

Non-regulatory third-party individuals, including members of the media, requesting access to the site or asking questions will be referred to the RPM. TtFW personnel or their subcontractor will not grant site access or answer questions for unauthorized personnel. The PjM will notify the RPM and RASO of any attempts to gain site access.

FIGURE 3-1

ORGANIZATION CHART



Staff in shaded boxes are onsite at HPS and responsible for field implementation of activities under the Base-wide Plan.

The Construction Manager has overall responsibility for coordinating the activities of onsite technical staff.

4.0 RADIOLOGICAL SURVEY TYPES, AREA CLASSIFICATION, AND SELECTION

Several types of radiological surveys will be conducted at HPS. 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

Listed below are the types of surveys that may be performed.

4.1.1 Reference (Background) Area Survey

The reference area is where the background radioactivity is measured and defined for comparison to field survey/sample data collected during surveys.

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 is an area that should have similar physical, chemical, radiological, and biological characteristics as the impacted area(s) being investigated, but that has not been identified as impacted by the HRA. 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.

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 (with guidance from MARSSIM) and will consist of judgment measurements based on the HRA data 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
- Support classification of impacted areas

- Evaluate whether the survey strategy can be optimized for use in the characterization or FSSs

4.1.3 Characterization Survey

The characterization survey is the most comprehensive of the survey types and generates the most data. This includes preparing a reference grid, systematic as well as judgment measurements, and 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 Base-wide Plan and each TSP.

Characterization surveys are planned based on the HRA, MARSSIM 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 HPS—such as scoping, characterization, and remedial action support surveys—can provide valuable information for planning a FSS. The primary objectives of FSSs are to:

- Verify classification
- Demonstrate that the potential dose or risk from residual contamination is below the release criteria
- Demonstrate that the potential dose or risk from small areas of elevated activity is below the release criteria

4.1.6 Personnel Surveys

Personnel surveys are used to ensure that individuals leaving a radiological area are free of contamination.

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.

- Equipment and/or materials that are being put into service in a radiological work area at HPS that exceed the release criteria will be returned to the supplier for replacement or decontamination.
- 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 impacted areas loaded with non-contaminated material as a measure to protect against the inadvertent shipment of materials exhibiting elevated radiation levels. Surveys will be accomplished using a portal monitor with similar specifications as those used at disposal facilities or manually surveyed using portable survey equipment.

4.2 SURVEY AREA CLASSIFICATION

The HRA has identified areas at HPS that have been classified as impacted. Based on available information from previous surveys and the HRA, 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 (based on site operating history) or known contamination (based on previous radiation surveys) above the 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

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 areas that might be classified as Class 2 for the FSS 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
- 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 areas that might be classified as Class 3 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

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 criteria. 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. A square grid system will be used for Class 1 and Class 2 survey units. For Class 3 survey units a square grid system may 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 squares grids [meters (m)]
A	=	surface area of the survey unit [square meters (m^2)]
N	=	statistically calculated number of data points

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 or discussions and technical direction from RASO. The exception will be remedial action support surveys, personnel surveys, equipment and material surveys, and truck surveys, which 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 criteria during a FSS effort. If a Class 2 or 3 survey unit fails to meet the criteria for release, it would undergo decontamination 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 criteria, decontamination and remedial action support surveys will be performed. A Class 1 survey will follow decontamination activities.

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

Notes:

m^2 – square meter^2

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 plan. Additional specific details will be provided in future TSPs.

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 presented in detail 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. Additionally, 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 HPS 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 DQO methodology discussed below will be used at HPS to implement the RSSI process. This process consists of the following six principal steps:

- Site identification
- Historical site assessment
- Scoping survey
- Characterization survey
- Remedial action support survey
- 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 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 can be established, a general strategy must be determined.

5.2.2 SURVEY STRATEGY

Strategies for implementing the various survey types at HPS are provided in Table 5-2. The selection of specific survey types for each area investigated under the Base-wide Plan will be based on information given in the HRA (NAVSEA, 2004) and will be identified in each area's corresponding TSP. For an FSS, the standard survey strategy will be based on using a MARSSIM Scenario A approach, as described in Sections 5.2.3.5 and 5.5.3. On a case-by-case basis, as identified in a TSP, the FSS design using the Scenario B approach would 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 around each survey situation. This section summarizes DQO elements applicable to most of the surveys to be performed under this plan. Specific DQOs for each survey will be established in the relevant TSPs.

5.2.3.1 State the Problem

The first step in the DQO process is to simply state the problem. The problem is, "Existing data are not sufficient to support release of the impacted areas at HPS."

- A scoping survey is needed to provide data to plan the release or remediation of a building or area.
- A characterization survey is needed to provide additional data to plan the release or remediation of a building or area.
- A remedial action support survey is needed to provide data while implementing the remediation of a building or area.
- A FSS is needed to provide data for free release of a building or area.

5.2.3.2 Identify the Decision

- For a scoping survey, the decision is, "Does the survey defined in the TSP identify the radionuclides of concern and assess general levels and extent of contamination?"
- For a characterization survey, the decision is, "Does the survey information defined in the TSPs identify the nature and extent of the contamination, which may lead to remediation?"
- For a remedial action support survey, the type of decision is, "Does the remedial action support survey indicate that the remediation is complete (as defined in the TSPs)?"
- For a FSS, the decision is, "Do the FSS results demonstrate compliance with the release criteria?"

5.2.3.3 Identify Inputs to the Decision

Inputs will vary, depending on the specific survey, and will be detailed in the TSP. However, in general, some or all of the following data will be used.

- Gamma scan survey
- Alpha/beta scan surveys
- Systematic and biased static alpha, beta (buildings and structures), and gamma static readings

- Systematic and biased solid and smear sampling
- Systematic and biased exposure rate measurements

For a scoping survey, additional inputs to the decision are the information in the HRA and the radiological survey data collected during the implementation phase.

For a characterization survey, additional inputs are again the information in the HRA 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 a FSS, additional inputs are the radiological survey results and the release criteria.

5.2.3.4 Define Study Boundaries

Study boundaries will depend on the particular survey performed. For a building or land area, it will be the physical boundaries of those spaces. For remedial action support surveys, it will be the extent of the remedial action work area and associated support areas. Study boundaries will be presented, on a case-by-case basis, in TSPs.

5.2.3.5 Develop a Decision Rule

For each applicable survey, developing a decision rule is as follows:

- 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."
- 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."
- For a remedial action support survey, 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 re-evaluate the remedial alternative and continue remediation if necessary."
- For a FSS, the decision rule is, "If the survey results demonstrate compliance with the release criteria, then document the results in the FSS report. If the survey results do not demonstrate compliance with the release criteria, then additional assessment and/or remediation are necessary."

The release criteria for buildings, structures, material and land areas at HPS are listed in Section 6.0. Limits for a specific building, area or for multiple radionuclides will be given in the TSPs.

In evaluating this decision, unless otherwise indicated in the TSP, MARSSIM Scenario A will be applied. In Scenario A, the null hypothesis (H_0) is tested to verify if the residual contamination exceeds the release criterion; also, the alternative hypothesis (H_a) is tested to determine if the residual contamination meets the release criterion. Details on the null hypothesis are given in Sections 5.2.3.6 and 5.5.3.

5.2.3.6 Set Limits on Decision Errors

For those surveys where decision errors would be used, there are two types of decision errors that can be made. The first type of decision error, called a Type I error, occurs when the null hypothesis is rejected when it is actually true. A Type I error is sometimes called a "false positive." The probability of a Type I error is usually denoted by α. The Type I error rate is often referred to as the significance level or size of the test.

The second type of decision error, called a Type II error, occurs when the null hypothesis is not rejected when it is actually false. A Type II error is sometimes called a "false negative." The probability of a Type II error is usually denoted by β . The *power* of a statistical test is defined as the probability of rejecting the null hypothesis when it is false. It is numerically equal to $1-\beta$, where β is the Type II error rate.

This survey is designed to limit Type I and Type II errors to 5 percent. It is important to minimize the chances of concluding that a survey unit meets the release limits (reject the null hypothesis) when it actually exceeds the limits (Type I Error), and concluding that a survey unit exceeds the release limit (accept the null hypothesis) when it actually meets the limit (Type II Error).

5.2.3.7 Optimize Data Collection

Guidelines for optimizing the data collection process are presented below:

- Review Outputs and Existing Data for Consistency

  Radioactive source readings will be used to check instruments for consistency prior to use in each daily shift. The instrument will only be used after readings are compared and agree within +/- 20 percent of predetermined responses. The RTS (or designee) will review the information each day to verify the equipment is operating satisfactorily.

The RTM, or qualified designee, who is not involved in the direct data collection process will review the survey data on a daily basis. This will ensure an ongoing independent review for consistency of survey data collected.

- Develop Data Collection Design Alternatives

  The MARSSIM guidelines will be used and a 95 percent confidence level for detecting radioactivity above the release criteria will be assumed with Type I and Type II errors limited to 5 percent.

- Document Operational Details and Theoretical Assumptions

  Operational details for the radiological survey process have been developed for and are included as part of this Base-wide Plan. The theoretical assumptions are based on guidelines contained in MARSSIM. Generic information regarding types of radiation measurements, instrument detection capabilities, selecting the quantities and locations of data to be collected, investigation levels, and release criteria are contained in this Base-wide Plan and associated SAP. Site-specific operational details and theoretical assumptions will be identified in relevant TSPs.

5.3 SURVEY IMPLEMENTATION

Survey implementation for each of the types of surveys to be conducted at HPS 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 of this Base-wide Plan. Other survey specifics will be presented in the TSP.

5.3.1 Scoping and Characterization Surveys

These surveys will be implemented as described in their individual TSPs. In practice, scoping and characterization survey data that indicate that the residual activity is below the 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

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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 tests are described in Section 5.4.

When the contaminant is present in background, Equation 5-1 is used with the WRS test:

Equation 5-1

$$N = \frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{3\left(P_r - 0.5\right)^2}(1.2)$$

When the contaminant is not present in background, Equation 5-2 is used with the Sign test:

Equation 5-2

$$N = \left(\frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{4\left(Sign\ p - 0.5\right)^2}\right)(1.2)$$

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

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.

The ongoing on-site analyses and evaluation of survey results provide a verification check for errors, which, if detected, will be corrected.

A knowledgeable individual who is not involved in the direct data collection process (e.g., 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 limitation for their use. 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 activities to accomplish the evaluation 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 a final status survey 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:

- Compare the largest measurement to the DCGL (net of background, if present in background).
- Compare the average measurement to the DCGL (net of background, if present in background).
- Use the appropriate statistical test to determine if the survey data exceed the release limits. (If no readings exceed the DCGL, then no statistical tests are necessary.)
- If scan measurements are above the DCGL, then a fixed measurement will be taken to confirm the elevated reading. If the elevated reading is confirmed, then the unit would fail.

When multiple nuclides are present, each with an individual DCGL, they will be assessed in accordance with the methods given in Section 6.2.

This 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, non-parametric 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, non-parametric 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 means 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 a 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

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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 a 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 re-evaluate 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 Scenario A methodology, the null hypothesis is stated as "the residual activity in the survey unit exceeds the release criteria". 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: 1) the sample sizes determined for the tests are sufficient to achieve the DQO set for the Type I and Type II error; 2) the data from the reference area or survey unit consist of independent samples from each distribution; 3) the reference area and survey unit data distribution are similar, except for a possible shift in the medians; and 4) 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 non-parametric test is that it involves fewer assumptions about the data than the parametric test.

TABLE 5-1

THE DATA LIFE CYCLE USED TO SUPPORT THE RADIATION SURVEY AND SITE INVESTIGATION PROCESS

RSSI Process	Data Life Cycle	Phases	MARSSIM Guidance
Site Identification			Provides information on identifying potential radiation sites (Section 3.3)
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 final status surveys (Chapter 4 and Section 5.5), selecting measurement techniques (Chapter 6, Chapter 7, and Appendix H), and assessing the data collected during FSSs (Chapter 8 and Chapter 9)

Notes:

FSS – Final Status Survey

Chapter numbers refer to chapters in Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)

TABLE 5-2

SURVEY STRATEGIES

Survey Type	Minimum Survey Requirement	Sampling and/or Direct Measurements (Note 2)	Minimum Scanning Requirements	Static Measurements	Surface Scans	Exposure Rates	Smears (Note 3)	Media Samples (Note 4)	General Operational Surveys (Note 5)
Scoping (Note 1)	N/A	Random and Additional Biased	Judgmental	X	X	X	I	O	
Characterization (Note 1)	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

Note 1: Reference HRA for HPS, NAVSEA 2004.

Note 2: 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.

Note 3: In addition to the smears taken at each randomly or systematically determined sampling point, smear sampling will be performed on floor drains, exhaust fans, work benches, sinks and other suspect locations.

Note 4: Indoor locations may be chosen based on scanning results and the judgment of the radiological technician.

Note 5: General operation surveys may include static measurements, surface samples, exposure rates, smears, and media samples.

HPS – Hunters Point Shipyard

HRA – Historical Radiological Assessment

MARSSIM – Multi-Agency Radiation Survey and Site Investigation Manual

NAVSEA – Naval Sea Systems Command

N/A – not applicable

6.0 RELEASE CRITERIA AND INVESTIGATION LEVELS

The release criteria for buildings, structures, material and land areas at HPS are listed in Table 6-1. Release criteria for equipment and material are taken from Atomic Energy Commission (AEC) *Regulatory Guide 1.86* (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 25 millirem per year (mrem/y), using the NRC's D&D code Ver. 2 (details of the calculation will be given in the TSP, when the limit is used). Release criteria for soils are taken from EPA's (risk-based) Preliminary Remediation Goals (PRGs) for two future use scenarios, or from negotiated agreements with regulators. Limits for a specific building or area will be given 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.
- A FSS will use all the release criteria in Table 6-1, and criteria for scanning surveys known as $DCGL_{EMC}$, discussed below.

6.1 ASSESSING SMALL AREAS OF ELEVATED ACTIVITY

According to MARSSIM (NUREG-1575, 2000), systematic measurements and sampling, in conjunction with surface scanning, are used to obtain adequate assurance that small areas of elevated radioactivity will still 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 criteria, based on dose or risk. The general assumption is that the concentrations of the radionuclides in the source are fairly homogenous. 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 homogenous 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.

At HPS, the guidance provided in NUREG-1757, Vol. 2, Appendix I (NRC, 2002), will be used to determine area factors. Specific area factor determinations will be performed on a case-by-case basis, and presented in the TSPs using D&D, RESRAD, or RESRAD-BUILD.

The $DCGL_{EMC}$ for scan surveys in Class 1 areas will be calculated as follows:

Equation 6-1

$$DCGL_{EMC} = (DCGL_W) \times (Area\ Factor)$$

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 RASO. A combined DCGL is calculated using Equation 6-2.

Equation 6-2

$$\text{Combined DCGL} = \frac{1}{\frac{f_1}{DCGL_1} + \frac{f_2}{DCGL_2} + \ldots + \frac{f_n}{DCGL_n}}$$

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 $f_1, f_2, \ldots f_n$ equals one.

6.3 INVESTIGATION LEVELS

Investigation levels are specific levels of radioactivity used to indicate when additional investigation may be necessary. Investigation levels also serve as a quality control 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, non-parametric), 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.

6.3.1 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.

6.3.2 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 (e.g. reference area mean + 3σ), if used.

TABLE 6-1

RELEASE CRITERIA*

Radionucide	Surfaces (dpm/100 cm^2)		Soil[c] (pCi/g)	
	Equipment, Waste[a]	Structures[b]	Outdoor Worker[d]	Residential[d]
^{241}Am	100	23.9	5.67	1.87
^{137}Cs	5,000	5,000	0.13[e]	0.13[e]
^{60}Co	5,000	5,000	0.0602	0.0361
^{239}Pu	100	24.7	14.0	2.59
^{226}Ra	100	100	2.0[f]	2.0[f]
^{90}Sr	1,000	1,000	42.3	0.331
^{232}Th	1,000	6.49	19.0	3.1
^{3}H	5,000	5,000	4.23	2.28
^{235}U	5,000	86.6	0.417	0.205

Notes:

Criteria for other nuclides will be listed in TSPs, if needed.

a. These limits are based on U.S. NRC Regulatory Guide 1.86. Limits for removable surface activity are 20 percent of these values.

b. These limits are based on 25 mrem/y, using D&D Version 2 or Reg. Guide 1.86, whichever is lower.

c. EPA PRGs for two future use scenarios.

d. The on-site and off-site laboratory will ensure that the minimum detectable activity (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%. The MDA is calculated per sample by considering background counts, amount of sample used, and counting time.

e. Decay-corrected PRG for industrial reuse provided by EPA Region IX.

f. Limit is 1 pCi/g above background; not to exceed 2 pCi/g total, per agreement with EPA.

* Release criteria for water generated as a result of remedial activities will be negotiated with regulators, and therefore, are currently not available.

cm^2 – square centimeters
CFR – Code of Federal Regulations
D&D – decommissioning and decontamination
dpm – disintegrations per minute
EPA – U.S. Environmental Protection Agency
mrem/y – millirem per year
NRC – Nuclear Regulatory Commission
pCi/g – picocuries per gram
PRG – Preliminary Remediation Goal
TSP – Task-specific Plan

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 that are sufficient to support the DQOs. Tables 7-1 and 7-2 identify the instrumentation resources available to support the survey objectives.

7.1 FIELD SURVEY INSTRUMENTS

Portable survey instruments will be utilized to perform measurements in the field. Table 7-1 lists the types of portable survey equipment expected to be used during survey activities at HPS.

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.

All portable survey instruments will have a current calibration label, which 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 there is sufficient voltage being supplied to the detector and instrument circuitry for proper operation. This check will be performed in accordance with the instrument's operations manual.

The instrument will be exposed to the appropriate (alpha, beta, gamma) check source to verify that the instrument response is within the +/- 20 percent range determined during the initial response check.

The results of the daily operation checks discussed above will be 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 either a Ludlum Model 2350-1 or Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probes (or equivalent) or a Ludlum Model 43-89 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 either a Ludlum Model 2350-1 or Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probes (or equivalent) or a Ludlum 43-89 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 either a Ludlum Model 2350-1 or Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probes (or equivalent) or a Ludlum Model 43-89 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 either a Ludlum Model 2350-1 or Ludlum Model 2360 data logger (or equivalent) equipped with either a Ludlum Model 43-68 or Model 43-37 alpha-beta gas proportional probes (or equivalent) or a Ludlum Model 43-89 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 or Ludlum Model 2360 data logger (or equivalent) equipped with a Ludlum Model 44-10 2-inch by 2-inch sodium iodide (NaI) scintillation detector (or equivalent).

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 or Ludlum Model 2360 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 (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 detectors' 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, minimum detectable concentrations (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 counts per minute (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] (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 is determined by obtaining static counts with the detector over a calibration source that has a NIST traceable surface emission rate. The 2π particle fluence rate is corrected for decay, attenuation and scatter. Then the surface emission rate of the source must be corrected for the area subtended by the probe. Factors that can also affect the instruments 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 a efficiency check source equal to or greater than the area of the probe. If a source that is smaller than the probe is used, a conversion factor is applied to the MDC to account for the active region of the probe.
- Source-to-detector Distance. The detector efficiency will be calculated at a source-to-detector distance that is the same as the detector-to-surface distance used in the field.

7.2.2 Count Detection Probability For Alpha Scans ($\leq$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 by 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 [disintegrations per minute (dpm)]
E	=	detector efficiency (4π)
d	=	width of detector in direction of scan (cm)
v	=	scan speed [centimeters per second (cm/s)]

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

7.2.3 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)

7.2.4 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

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

Where:

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

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

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 (count per particle)
ε_s = contaminated surface efficiency (particle per disintegration)
W_A = area of the detector window (cm^2)

7.2.5 MDC For Static Alpha and Beta Counts

The static MDC is the level of radioactivity that is 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 (min)
ε_i = instrument efficiency (count per particle)
ε_s = contaminated surface efficiency (particle per disintegration)
W_A = active area of the detector window (cm^2)

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 (count per particle)
ε_s = contaminated surface efficiency (particle per disintegration)
W_A = active area of the detector window (cm^2)

7.2.6 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, dry wall, 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.

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In the absence of experimentally determined surface efficiencies, ISO-7503-1 [International Organization for Standardization (ISO), 1988] and NUREG-1507 (NRC, 1997a), 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, 1998; NRC, 1997a). 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. Therefore at HPS a surface efficiency of 0.25 will be used for alpha and beta emitters.

7.2.7 MDC for Gamma Scans of Surface Areas

The scan MDC [in picocuries per gram (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 then applying a surveyor efficiency factor p to get the $MDCR_{Surveyor}$ as show below in Equation 7-9 below:

Equation 7-9

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

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 microroentgen per hour (μR/hr), as shown in Equation 7-10 below:

Equation 7-10

$$MDER\,(\mu R/hr) = \frac{MDCR_{Surveyor} * 6 \times 10^{7}}{cc}$$

Where:

$MDCR_{Surveyor}$ = as calculated in Equation 7-9
$6x10^7$ = 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 (g/cm^3)
- DCGL of the radionuclide of concern in pCi/g
- The depth of detection for the DCGL
- The circular dimension of the cylindrical area of detector capability (m^2)

The concentration of the radionuclide of concern (Scan MDC) necessary to yield the MDER may be calculated by taking the ratio of the MDER to the exposure rate calculated by Microshield, as shown in Equation 7-11 below:

Equation 7-11

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

7.2.8 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)

If the background and sample are counted for different time intervals, Equation 7-13 is used to calculate the MDC.

Equation 7-13

$$MDC = \frac{3 + 3.29\sqrt{R_B T_B}}{T_B}$$

Where:

$3 + 3.29$	=	constant factor provided by MARSSIM
R_B	=	background count rate (cpm)
T_B	=	background counting time (min)

7.3 LABORATORY INSTRUMENTS

Laboratory equipment will be used to analyze samples collected in the field. Table 7-2 lists the types of laboratory equipment expected to be used during survey activities at HPS.

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 that are outside the tolerance limits shall be investigated to determine the cause and potential effect on measurement results.

7.3.2 Gross Beta-gamma-alpha Loose Surface Contamination Surveys

Smear samples will be processed using a Protean IPC 9025 and/or a Tennelec Series 5 XLB gas-flow proportional alpha/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 alpha and beta analysis at levels required for environmental release surveillance. Data is reported in units of dpm per 100 cm^2.

As a backup to the gas-flow proportional counters a Ludlum Model 2929 scaler with a Model 43-10-1 ZnS(Ag) scintillation probe (or equivalent) may be used. Data is reported in units of dpm.

7.3.3 Gamma Spectroscopy

Gamma spectroscopy analysis incorporates an EG&G Ortec and/or a Canberra Genie 2000 (or equivalent) detector system. Hardware features include a high-purity Germanium (HPGe) gamma photon detector supported by a multi-channel analyzer (MCA) and analysis software.

Instrument hardware is calibrated using a multi-energy NIST traceable source ranging from 50 kiloelectron volts (keV) to 1.8 MeV. Data results will be reviewed for quality assurance and reported in units of pCi/g. Analysis and review processes will address count integration, efficiency and background corrections, as well as the processing of overlapping peaks.

7.3.4 Liquid Scintillation Analysis

Liquid scintillation counting will be accomplished using a Perkin Elmer Tri-Carb 3100TR (or equivalent) with a photo-multiplier array and associated hardware to identify beta emissions in the range of 2 keV to 2000 keV. The system is calibrated using NIST traceable sources. The results are identified in dpm or pCi/g and grouped by energy.

TABLE 7-1

PORTABLE SURVEY INSTRUMENTS

Measurement / Technique	Type of Instrumentation		Typical Background	Typical Total Efficiency (%)	Detection Sensitivity
	Detector Type and Ludlum Model Number(s)	Meter Description and Ludlum Model Number(s)			
Surface alpha/beta scans Direct Measurement Static alpha/beta	Large-area gas proportional 43-37 (582cm^2)	Data logger 2350-1, 2360	800-1,200 cpm β 10-15 cpm α	~6 β total efficiency ~6 α total efficiency	~ 474 dpm/100cm^2 β ~ 56 dpm/100cm^2 α
Surface alpha/ beta scans	Large-area gas proportional, 43-68 (126 cm^2)	Data logger 2350-1, 2360	150-250 cpm β 0-2 cpm α	~6 β total efficiency ~6 α total efficiency	~ 900 dpm/100cm^2 β ~ 100 dpm/100cm^2 α
Direct Measurement Static alpha/beta	Scintillation, Ludlum Model 43-89 (100cm^2)		100-200 cpm β 0-2 cpm α		
Surface gamma scans Direct Measurement Static gamma	NaI 2-inch x 2-inch Scintillation 44-10	Data logger 2350-1, 2360 Scaler / Ratemeter 2221	100 to 12,000 cpm; varies with calibration γ	N/A	150-1500 cpm γ
Surface beta/ gamma scans Direct Measurement beta/gamma	Geiger-Mueller 44-9	Ratemeter 3	50 to 100 cpm β γ	~10 β γ total efficiency	~ 1,000 dpm per probe area β γ
Exposure Rates	MicroR Meter with integral 1 inch x 1 inch NaI Scintillation	Ratemeter 19	7-8 μR/hr	N/A	2 μR/hr

Notes:

α - alpha
β - beta
γ - gamma
μR/hr – microroetgen per hour
cm^2 – square centimeters
cpm – counts per minute
dpm – disintegrations per minute
N/A – not applicable
NaI – sodium iodide

TABLE 7-2

ON-SITE LABORATORY INSTRUMENTATION

Laboratory Instruments				
Measurement/ Technique	**Type of Instrumentation***	**Typical Background**	**Typical Efficiency (%)**	**Detection Sensitivity**
Gamma spectroscopy	Canberra Genie 2000 HPGe	N/A	N/A	0.05 pCi/g (for Cs-137)
	EG&G Ortec Beryllium Window			
Gross beta-gamma-alpha on smears (Smears)	Protean IPC9025 Low-background gas-flow proportional counter	1-5 cpm β 0-0.5 cpm α	~62 β ~27 α	4-10 dpm/100 cm^2 β 2-5 dpm/100 cm^2 α
	Tennelec Low Series 5 XLB background gas-flow proportional counter	1-5 cpm β 0-0.5 cpm α	~33 β ~33 α	10 dpm/100 cm^2 β 5 dpm/100 cm^2 α
	Ludlum Model 2929 ZnS(Ag) detector	>80 cpm β >3 cpm α	16 β 26 α	100 dpm/100 cm^2 β 10 dpm/100 cm^2 α
Liquid scintillation analysis	Perkin Elmer Tri-Carb 3100TR liquid scintillation counter	20 dpm	60	25 dpm 2000 pCi/g

Notes:

* or equivalent

Types of radiation: α - alpha, γ - gamma, β - beta

cm^2 – square centimeters

cpm – counts per minute

dpm – disintegrations per minute

N/A – not applicable

pCi/g – picocuries per gram

TABLE 7-3

EXAMPLES OF FIELD RADIOLOGICAL SURVEY INSTRUMENT CALCULATIONS

Measurement Technique	Calculation Type and Applicable Equations	Meter Note 1	Detector Note 1	Probe Area (cm^2)	Typical Detector Efficiency (%)	Surface Efficiency (%) Note 2	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 Note 3
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"x 2" 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"x 2" 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"x 1" 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 by 5 inches wide by 2 inches thick)	N/A						N/A						

TABLE 7-3

EXAMPLES OF FIELD RADIOLOGICAL SURVEY INSTRUMENT CALCULATIONS

Notes: Note 1; or equivalent.

Note 2; 0.25 will be assumed surface efficiencies unless otherwise noted in the TSP.

Note 3; 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.

α - alpha
β - beta
γ - gamma
μR/hr – microroetgen per hour
cm^2 – square centimeters
cm/s – centimeters per second
cpm – counts per minute
dpm – disintegrations per minute

MDC – minimum detectable concentration
MDCR – minimum detectable count rate
min – minutes
N/A – not applicable
NaI – sodium iodide
s – seconds
TSP – Task-specific Plan

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 standard operating procedures presented in the Base-wide Radiological Control Plan (TtFW, 2004a). Additional survey implementation details will be identified in each TSP.

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 cm (4 inches) from the surface area for gamma and 0.25 inch from the surface area for alpha/beta radiation. Instrumentation will be allowed to stabilize before background readings are taken. The average of all of the readings taken will determine the background. Background scan ranges, smears, 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.

Data collected in reference areas will be statistically evaluated using a graphical format, such as a frequency distribution chart. The purpose of the evaluation is to ensure that the data collected in the reference area is consistent with a normal distribution and that the variability of the background is not too high. Background variability may be considered high when differences in estimated mean concentration measured in potential reference areas are comparable to screening level DCGLs. NUREG-1505 (NRC, 1997b), Chapter 13, *Demonstrating Indistinguishability from Background*, provides detailed guidance for evaluating reference areas exhibiting high variability.

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 approximately 0.25 inch of 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 (m/s) and slowly moving the detector assembly in a serpentine (S-shaped) pattern, while maintaining the detector approximately 10 cm (4 inches) above the area being surveyed.

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 approximately 0.25 inch above the surface. Count time for conducting the measurement will be dependent upon the isotope of concern.

8.3.2 Static Surveys for Gamma Radiation

Static gamma measurements require positioning the detector assembly approximately 10 cm (4 inches) above the surface and completing a stationary 60-second survey.

8.4 EXPOSURE RATE MEASUREMENTS

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

8.5 SMEAR SAMPLE MEASUREMENTS

Smear sampling will be performed to assess the presence of radioactive contamination that is readily removed from a surface. Smear samples will be taken to evaluate the presence of alpha and beta surface activity. As called for in individual TSPs, smear samples may be collected to

evaluate tritium contamination. The procedures for collecting smear samples are discussed in Appendix B, Base-wide Sampling and Analysis Plan.

8.6 SURVEY AND SAMPLE LOCATIONS

Static measurements, smear 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.

8.7 EQUIPMENT AND MATERIAL SURVEYS

Equipment and materials surveys will be performed following the methods Sections 8.2 through 8.5. Table 8-1 provides 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 8-1, appropriate decontamination will be methods will be performed using methods described in the Base-wide RCP (TtFW, 2004a).

8.8 PERSONNEL SURVEYS

Properly trained staff will perform personnel surveys in a pre-designated 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 the Base-wide RCP (TtFW, 2004a).

8.9 MEDIA SAMPLING

Various samples may be collected for radiological analysis, including soil, water, brick, porcelain, wood, and others. Appendix B, Base-wide Sampling and Analysis Plan, describes the methods for collecting samples, sample numbering, sample labeling, sample shipment, and completion of the associated chain-of-custody and other required documentation. Media samples for gamma spectrometry and liquid scintillation analyses will be analyzed on site using instrumentation described in Sections 7.3.3 and 7.3.4. Samples for alpha spectrometry and beta analysis will be analyzed at an off-site laboratory. In addition, ten percent of the media samples collected will be analyzed at an off-site laboratory, as described in Appendix B.

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. In order 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 8-2).

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 the Base-wide RCP (TtFW, 2004a).

8.11 TRUCK SURVEYS

During the course of work at HPS, soils and debris that are not thought to be contaminated by radiation 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, there are some stockpiles of soil, debris, and miscellaneous materials that have not been surveyed because the likelihood of the presence of radioactive materials 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 the methods described in the Base-wide RCP (TtFW, 2004a).

8.12 GPS 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 will 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 a location point associated with it. After the survey, gamma data may be color coded and plotted on a survey map.

In addition, outdoor survey units can 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 (VSP) software (Gilbert et al., 2001). These points can be located using the GPS unit and then static readings and samples can be taken.

Although GPS cannot be used for indoor surveys, building locations will be recorded by taking GPS readings at the exterior building corners.

TABLE 8-1

EQUIPMENT AND MATERIAL SURFACE CONTAMINATION LIMITS

Radionuclide	Loose (dpm/100 cm^2)	Fixed (dpm/100 cm^2)
Alpha	20 α	100 α
Beta (Strontium-90)	200 β^-	1,000 β^-
Beta / Gamma	1,000 β^-, γ	5,000 β^-, γ

Notes:

Types of radiation: α - alpha, γ - gamma, β^- - beta
cm^2 – square centimeters
dpm – disintegrations per minute

TABLE 8-2

DERIVED AIR CONCENTRATION

Radionuclide	Radiation	DAC (μCi/mL)	10% DAC (μCi/mL)
Radium (Ra)-226	Alpha (α)	3.0×10^{-10}	3.0×10^{-11}
Plutonium (Pu)-239		3.0×10^{-12}	3.0×10^{-13}
Thorium (Th)-232		5.0×10^{-13}	5.0×10^{-14}
Strontium (Sr)-90	Beta (β^-)	8.0×10^{-9}	8.0×10^{-10}
Tritium (H)-3		2.0×10^{-5}	2.0×10^{-6}
Cobalt (Co)-60	Beta/gamma (β^-, γ)	7.0×10^{-8}	7.0×10^{-9}
Uranium (U)-235		6.0×10^{-10}	6.0×10^{-11}
Cesium (Cs)-137		6.0×10^{-8}	6.0×10^{-9}
Americium (Am)-241	Alpha/gamma (α, γ)	6.0×10^{-8}	6.0×10^{-9}

Notes:

Types of radiation: α - alpha, γ - gamma, β^- - beta
μCi/mL – microcurie per milliliter
CFR – Code of Federal Regulations
DAC – derived air concentration (10 CFR 20 Appendix B)

9.0 DECONTAMINATION, DISMANTLING, AND DISPOSITION

Decontamination, dismantling, and disposition activities will be performed, as identified in a TSP, as part of remedial action activities performed at HPS to clean up areas contaminated by radiation. 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. In order 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 HPS, 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 as a first alternative in decontaminating. Abrasive methods may need to be used 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 that will minimize creating mixed waste.

Decontamination activities will be conducted using SOPs as presented in the Base-wide RCP (TtFW, 2004a).

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 HPS:

- Piping removal
- Ventilation system removal
- Equipment, furniture, and material removal
- Soil removal
- Building demolition
- Structure removal

Specific control methods and more detailed information will be provided in the TSP.

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.

10.0 RADIOACTIVE MATERIALS MANAGEMENT

10.1 INTRODUCTION

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 cognizant regulatory agencies.

A qualified license representative will delegate the daily operating responsibility for related activities with the use of defined directives that comply with the corresponding NRC materials license and other applicable regulatory requirements. Actions necessary to carry out related decisions and policy include:

- Specific oversight of radioactive materials that result from site activities
- Acting as a primary point of contact for site-specific activities involving radioactive materials
- Establishment of administrative controls to manage radioactive materials according to regulatory requirements
- Acting as a primary point of contact with the NRC or Agreement States on radioactive materials present such as point sources, soil contaminants, naturally occurring radioactive material (NORM), etc.
- Establishing, in the event of multiple material license use, an agreement between each license owner, as to what tasks will be designated under each specific license, (including development of a document of "mutual agreement" - defining individual license responsibilities for which a copy of the final agreement will be made available for each licensee represented).

10.2 MANAGING RADIOACTIVE MATERIALS

The day-to-day management of radioactive material is governed by program criteria detailed in the Base-wide RCP (TtFW, 2004a). This manual reflects applications and techniques unique to exposure reduction goals and control. Specific SOPs are designed to govern the acquisition, receipt, storage, distribution, and use of radioactive material.

Existing materials at HPS that require the implementation of radioactive materials management include:

- Sealed radioactive sources used for radiation detection instrument checks
- Devices and contaminants from past operations at HPS
- Control of radioactive and mixed waste generated during current site operations

Radioactive material will be managed by the RSO or designated appointee. Off-site organizations and contractors, who plan to use radioactive materials in support of TtFW activities, must obtain approval. Approval can be obtained by directing a request, in writing, through the RSO or designated appointee. Requests must include:

- A detailed description of proposed radioactive material use
- A copy of the appropriate NRC or Agreement State License with a completed NRC Form 241, Radioactive Material Permit or exemption
- Name and address of the responsible local representative and contact information
- A copy of contract documentation describing the work to be done and inclusive dates
- Documentation acknowledging the RSO or designated appointee can perform periodic checks to ensure the user is complying with the requirements of the Base-wide RCP

10.3 RADIOACTIVE MATERIAL HANDLING

There should be no contact with radioactive material or exposure to ionizing radiation where an expected benefit is not realized. Exposures should be the lowest possible and consistent with technology, cost, and operational requirements.

10.3.1 Limitations

Designees responsible for the control of radioactive materials are required to limit its accessibility and use. Material management policies (i.e., that performed by TtFW and its contractors and affiliates) require an inventory accountability process. Clearly defined radiological safety requirements have been established for (1) operating, changing, and repairing systems containing, or designed to operate with radioactive material and (2) control of waste materials resulting from decontamination, dismantling, and remediation processes.

10.3.2 Authorizations

Work involving the handling and storage of radioactive materials at HPS will be performed under the specifications of the Base-wide RCP (TtFW, 2004a) and with authorization for such work from the RSO and license representative.

10.4 RADIOACTIVE MATERIAL CONTROL

In order to minimize unauthorized access to, and/or removal from the site of radioactive material(s), application of appropriate security protective measures will be exercised (i.e., combination and/or key lock safes for source storage, connex units with pad-locked doors for sample storage, "clam shell" encasings for drums, etc.). Licensed radioactive sources and

devices, as well as non-exempt quantities of radioactive materials in non-permitted sources, must be routinely inventoried and documented as such. Identification of locations where radioactive materials are present will be accomplished with the use of conspicuous posting compliant with Title 10 Code of Federal Regulations (CFR) Part 20.

The Base-wide RCP (TtFW, 2004a) will be periodically assessed for accuracy and applicability by the RSO or designated appointee (and in conjunction with the corresponding qualified License representative), to ensure that necessary requirements are in place to manage radioactive material. The degree of required management rules is dependent upon the quantity and type of material on hand, where the material is generated, and the location and configuration of available storage.

Only pre-authorized areas will be used to store radioactive materials at HPS. These areas will be selected with concurrence of RASO and the RPM. Security measures for these areas will be coordinated with the CSO.

Radioactive material handling activities must be performed in a manner to ensure:

- Access to areas and/or rooms is restricted where radioactive materials are known to be present
- Surveys of radioactive materials storage areas are completed at least weekly

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 measurement, and laboratory data will, to the extent practicable, be recorded both electronically and on paper. Data and information recorded on paper will be recorded using indelible ink. Records of field-generated data will be reviewed by the RTM 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 retrievable data storage device. No data reduction, filtering, or manipulation will be performed on the original electronic versions of data sets.

Changes or corrections on 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 Base-wide Plan shall meet the quality standards as outlined herein. All records must be retrievable and maintained for their prescribed retention time.

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.

The signature and initials of all personnel who sign records shall be on file. This file shall be updated when a change in personnel is warranted.

Principle personnel who create, review and approve radiological records must sign and date the record and follow quality standards specified in Section 13.

If working copies of records are used for reference, they will be stored separately from the original.

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), including multiples and subdivisions of these units.

11.3 DOCUMENTATION

Four types of documentation that will be maintained and assessed arefield operation records, laboratory records, data handling records, and work support documents.

11.3.1 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 and/or bound field notebooks will be used to record raw data and make references to prescribed procedures and changes in planned activities.
- Sample tracking records – At a minimum, these records will identify the samples, samplers, date of sampling, date of transfers, and receivers. Chain-of-custody (COC) forms will be used to document the progression of samples.
- QC records – QC records document the performance of QC practices in the field and include calibration and standards' traceability documentation that can be used to provide reproducible reference point to which similar measurements can be correlated. These records will contain information on the frequency, condition, level

of standards, and instrument calibration history. QC measurement records are more completely defined in Section 13.0 of this Base-wide Plan.

- Personnel files – Personnel files record the names and training certificates of the staff collecting the data and will be maintained in accordance with approved procedures.
- SOPs – SOPs describe the procedures used in the field to collect data and outline potential areas of difficulty in performing measurements.
- Deficiency and problem identification reports – These reports document problems and deficiencies encountered as well as suggestions for process improvement.
- Corrective action reports – Corrective action reports document what methods were used in cases where general field practices or other standard procedures were violated and include the methods used to resolve noncompliance.

11.3.2 Laboratory Records

Laboratory-specific records include, but are not limited to:

- Laboratory measurement results and sample data – Information contained in these records includes the number of samples, sample identification, requested analysis, sample measurement results, any deviations from the SOPs, time of day, and date.
- Sample management records – Sample management records, including COC records, document sample receipt, handling and storage, and scheduling of analysis. These records will verify that sample tracking requirements were maintained, reflect discrepancies in the samples (e.g., receipt of damaged samples), and note proper log-in of samples into the laboratory.
- Analytical methods – This documentation includes sample preparation and analysis, instrument standardization, detection and reporting limits, and method-specific QC requirements. Documentation demonstrating laboratory proficiency with each method used may also be a part of the data reporting package.
- QC records – This information includes the general QC records, such as initial demonstration of capability, instrument calibration, routine monitoring of analytical performance, calibration verification considered in the selection of analytical laboratories.
- Deficiency and problem identification reports – These reports document problems and deficiencies encountered as well as suggestions for process improvement.
- Corrective action reports – These reports document the methods used to resolve noncompliance in cases where general laboratory practice or other standard procedures were violated.

11.3.3 Data Handling Records

Data handling records document protocols used in data reduction, verification, and validation. Data reduction involves data transformation processes such as converting raw data into

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reportable quantities and units, using significant figures, and calculating measurement uncertainties. Data verification involves reviewing reports of data entered into 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 the approved SOP. Data validation will be done on samples sent for off-site analysis, as discussed in the SAP (Appendix B). Record copies of surveys, sampling, and analytical data (and their supporting data) will be protected and maintained in project record files.

11.3.4 Work Support Documents

Work support documents will include, but not be limited to the following:

- RWPs – The RWP will provide a complete document addressing existing radiological conditions, work scope and limitations, radiological limitations, PPE requirements, dosimetry requirements, ALARA considerations, and specific instructions to personnel.
- Work Plans – Substantial deviations from the Base-wide Plan may result in the generation of a stand-alone, job-specific work plan. Where prepared, these stand-alone work plans would define a scope and purpose, contain a series of steps to be carried out or goals to be accomplished.
- Task-specific Plans – These documents will be prepared for each survey and remediation performed under the Base-wide Plan. The TSPs will supplement the information provided in the Base-wide Plan, provide relevant location-specific data, and identify variances and/or additions to the Base-wide Plan.
- Reports – Documents the pertinent field activities performed under a specific work plan or TSP. These documents may include release criteria, objectives, survey results, instrumentation used, detection sensitivities, survey procedures, sample analyses and results, and conclusions. These reports may contain risk factors and dose assessments. Documentation will also include applicable survey data.

11.3.5 Preparation of Documents

Documents will be prepared using a standard form that has been verified as current and in good quality.

Documents will be prepared in accordance with the applicable guidance for the specific document, if any, and in accordance with the quality standards established in this Base-wide Plan.

Once a document has been created, reviewed, and signed, it is a completed radiological record. For inclusion in a final report, a supplemental record may be prepared. A supplemental record is a copy of the original record that does not contain strikeout/initials; technical errors or omissions

that were corrected using strikeout/initials will not be included in the supplemental record. This supplemental record must maintain traceability to the original document.

11.3.6 Review of Documents

Completed documents will be reviewed for accuracy of calculations, legibility, proper units, proper forms, etc. Documentation addressing conclusions must be reviewed to ensure the conclusions drawn are supported by the data provided with the document. The document should meet all quality standards before it is submitted for final review and approval.

Supervisory reviews will be performed focusing on identification of trends, validity of recorded data and information, and identification of originators.

Subsequent quality reviews will be performed to verify that documents are complete, legible, and in compliance with the quality standards outlined herein.

11.3.7 Approval of Documents

In accordance with the QC procedures specified in Section 13.0, all documents will be reviewed to verify that they are correct and in compliance with the requirements of this Base-wide Plan prior to transmittal.

11.4 RECORD RETENTION

Radiological records including, but not limited to, logbooks, data sheets, electronic files, and reports will be retained by TtFW for a minimum of 30 years from the date of the generation of the record.

12.0 ENVIRONMENTAL PROTECTION PLAN

Radiological activities carried out at HPS under this Base-wide Plan are not expected to use and/or affect natural resources, impact traffic flow or access, generate noise that will require the use of hearing protection in the immediate area, generate dust, or result in liquid and/or airborne discharges outside the work areas that would require sampling actions. However, in the event that planned activities may affect these issues, applicable guidance from this section will be incorporated into the TSPs. This section presents information regarding the environmental management practices to be conducted under this Base-wide Plan. The purpose of this Environmental Protection Plan (EPP) is to detail the means of compliance with the applicable or relevant and appropriate environmental regulatory requirements during the radiological surveying, sampling, and D&D activities at HPS. This EPP will help ensure that activities associated with the environmental management program are conducted in a systematic and well-documented manner.

12.1 LAND RESOURCES AND VEGETATION

The geology at HPS consists of Franciscan Formation bedrock; unconsolidated deposits of sand, gravel, and clays; and artificial fill. The artificial fill is present in approximately 400 acres that were reclaimed from the bay (NAVSEA, 2000) and filled on a level plane about 12 to 15 feet above mean sea level. Where activities occur outside of buildings, and/or equipment or debris is located outside of a building, precautions will be taken to ensure minimal impact to land resources and vegetation.

12.2 FISH AND WILDLIFE/THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Physical structures, such as riprap and docks, serve as artificial habitats for estuarine life. Marine life has been disturbed as a result of activities in the bay adjacent to HPS. Several hundred types of plants and animals, including the following, are believed to live at or near HPS: terrestrial and marine plants and algae; benthic and water column-dwelling marine animals such as clams, mussels, amphipods, and fish; insects; amphibians; reptiles; birds; and mammals (Levine-Fricke Recon, Inc., and PRC Environmental Management, 1997). No federally listed endangered or threatened species are known to permanently reside at HPS or the vicinity (Levine-Fricke Recon, Inc., and PRC Environmental Management, 1997); however, San Francisco Bay is a seasonal home to migrating fish and birds. Table 12-1 provides a listing of threatened and endangered species at or near HPS. Restricting vehicles and equipment to paved areas as much as possible will minimize disturbance of habitats.

12.3 WETLANDS AND STREAMS

Two freshwater streams, Yosemite and Islais Creeks, flow into San Francisco Bay adjacent to the border with HPS. Surface water resources at the site are limited to small groundwater seeps from exposed bedrock and the surface water in adjacent San Francisco Bay.

12.4 STORMWATER, SEDIMENT, AND EROSION CONTROL

12.4.1 Stormwater Pollution Prevention Plan

As required, a Stormwater Pollution Prevention Plan (SWPPP), which addresses installation and maintenance of appropriate Best Management Practices (BMPs) for controlling stormwater, will be prepared in accordance with the Stormwater Resources Control Board (SWRCB) requirements; however, a general National Pollutant Discharge Elimination System (NPDES) stormwater construction permit is not anticipated to be required. Appropriate radiological controls will be addressed in any SWPPP that includes intrusive activities in an impacted area.

12.4.2 Stockpile Control

Stockpiles will be stored in staging areas adjacent to the activity or in a designated area. Whenever possible, stockpiles will be located within the building the waste originated from. Stockpiles will be placed on a polyethylene liner. To provide dust control and prevent runoff, outdoor stockpiled material will be covered each night with 10-mil polyethylene liners. Stockpiles of radiologically contaminated materials will be secured when not attended.

12.4.3 Non-radiological Hazardous Materials

Releases to water and land will be prevented through the implementation of the BMPs presented in the *Erosion Control Field Manual* (Friends of the Estuary, 1998) and the *California Stormwater Best Management Practices Handbook* (Camp, Dresser, and McKee, 1993). Hazardous materials will be stored in a central area at least 100 feet from surface waters. Containers will be stored properly when not in use and will be placed in the appropriate storage cabinet or secondary containment structure to reduce the risks of fire and releases. In addition, refueling operations for construction equipment will be conducted in a designated area at least 100 feet from surface water bodies. Vehicle/equipment refueling operations will be supervised and appropriate spill control equipment will be available on site in the event of a release. Proximal storm sewer inlets will also be covered during the refueling or hazardous material transfer operations.

12.5 AIR QUALITY

The substantive requirements of the Bay Area Air Quality Management District (BAAQMD) rules relating to visible emissions, fugitive dust, and particulate matter emissions must be complied with; however, no permits are required. Fugitive dust emissions may occur during soil excavation and waste handling activities. Appropriate actions will be taken to limit exposure to emissions such as wetting stockpiles and covering stockpiles when not in use. Construction activities will comply with the substantive requirements of BAAQMD Rule 40 and regulations 6-305 and 8 pertaining to fugitive dust emissions and maintaining, covering, and stockpiling excavated soil. Dust will be controlled during excavation with water application. Ambient air monitoring will be performed upwind and downwind of the project area, as required, and the monitoring results will be used to determine if additional measures are required to control adverse impacts from airborne contaminants. Measures may include increased PPE levels for project personnel, reduction or stopping of excavation activities, and/or dust abatement using water application or by covering stockpiles with plastic sheets.

12.6 NOISE

Noise will be produced by heavy equipment used at the site during cleanup operations. However, the work area is not in the immediate vicinity of residential areas. Industrial tenants are present; however, noise levels are not expected to impact their operations. Therefore, noise is not expected to be a concern to surrounding populations.

12.7 CONSTRUCTION AREA DELINEATION

Prior to the commencement of activities within the individual buildings and/or open spaces, notices will be posted to indicate that access to the building will be restricted to only those personnel who are properly trained and have appropriate authorization to enter the delineated areas. Because other contractors may be conducting cleanup activities or monitoring in nearby areas, work areas will be defined and secured to prevent unauthorized entry. DON coordination will be required for work conducted in tenant-occupied spaces.

12.8 TRAFFIC CONTROL PLAN

This Traffic Control Plan provides guidelines and addresses measures for vehicular traffic control during activities at HPS.

12.8.1 Analysis of Potential Impacts

During implementation of this Base-wide Plan, HPS may host radiological activities that are traffic-related consisting of trucks delivering equipment and materials, personnel and support vehicles, and trucks transporting wastes off site. The project activities will require transportation

at various times and, therefore, the traffic will be assessed on a daily basis because the exact times of the slow traffic cannot be defined prior to the start of fieldwork. The project team will coordinate radiological activities that may generate traffic with the Caretaker Site Office (CSO) and the ROICC in order to avoid conflicts with other activities being performed concurrently at HPS. A schedule of proposed traffic locations and times will be reviewed with the CSO and ROICC during the weekly Contractor Quality Control (CQC) meetings.

The delivery and transportation of equipment and materials will only be allowed between 0630 and 1700 hours (no exemptions). Trucks of various capacities, some which may exceed 20 tons, may be entering and exiting HPS. Projects may require permitted oversized vehicles for the transportation of heavy and extra-wide construction equipment. Truck staging will only be allowed inside of HPS because no trucks will be allowed to idle along public streets.

Because of the limited duration of most construction activities, the impacts to transportation and traffic patterns are expected to be insignificant. Heavy construction equipment such as front-end loaders, excavators, and other support vehicles will remain at the site for the duration of the field activities following initial mobilization. Equipment will not leave the site until such time as it is no longer needed.

12.8.2 Traffic Safety Measures

In order to expedite the passage of traffic through or around the work area and within HPS, TtFW will install and maintain the necessary signs, lights, temporary railings, barricades, and other facilities for the sole convenience and direction of facility personnel and tenant traffic, as well as to prevent potentially hazardous conditions from existing. If necessary, TtFW will furnish competent flaggers whose duties will be to direct the movement of facility traffic through or around the work area and to give adequate warning to facility personnel and tenants of dangerous conditions to be encountered.

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

No materials or equipment will be stored where they may interfere with the free and safe passage of facility personnel and tenants. At the end of each day's work and at other times when construction operations are suspended, TtFW will remove equipment and other obstructions from that portion of the roadway for use by facility and tenant traffic. In addition, TtFW will adhere to facility speed limit requirements.

12.8.3 Traffic Controls

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

- Traffic flow will be maintained during construction activities on through roads.
- Loading and transportation of wastes will be scheduled during off-peak hours to minimize disruptions to facility traffic.
- Transportation demand management strategies, such as using carpools or vanpools for construction workers, will be encouraged.
- End dumps and other transportation trucks removing debris from HPS will be scheduled to avoid queuing along major streets. Close coordination between the TtFW Construction Manager, or his designee, and the truck dispatcher will be maintained during loading and unloading activities.
- A sufficient area for parking will be provided to passenger vehicles and haul trucks in the support area.
- Cones, flags, signs, and other traffic control measures will be used, as needed, to facilitate loading and unloading.

In order to prevent congestion of site access roads during loading and hauling operations, no trucks will be allowed to queue along any street. On-street parking will be prohibited for vehicles associated with the construction activities in order to maintain normal access and clear lanes. During non-construction periods, non-applicable signs will be covered with black plastic or temporarily removed.

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

- Proper design geometrics will be applied at access driveways and internal streets to accommodate trucks and fire apparatuses.
- Clear access points for trucks will be maintained at the project entrance to allow for efficient movement of construction-related traffic and expedite the entry and exit of construction vehicles in and out of the site.
- An adequate turning radius will be provided in work areas, including loading areas near the stockpiles.
- Sufficient area will be provided for parking vehicles on site during construction, including space for haul trucks.

- Close coordination will be maintained between the DON and other facility contractors to ensure safety and to minimize impacts to other activities within HPS.

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

12.9 GENERAL OPERATIONS

In accordance with TtFW procedures, the Construction Manager or designee will conduct weekly inspections. These inspections will be documented and will include the project areas and waste storage locations. The project area and waste storage locations will also be inspected during and after major storms to identify and respond to potential releases or sedimentation problems.

12.10 SPILL PREVENTION, RESPONSE, AND REPORTING

12.10.1 Spill Prevention

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

- **Fueling** – Vehicles will be fueled and serviced prior to moving onto the site. On-site fueling of equipment will be conducted within a designated area. No bulk quantities of fuel will be stored on site.
- **Wastewater** – Wastewater will be stored in temporary tanks or 55-gallon drums within a secondary containment area. Therefore, spills from the containers or tanks will be contained and will not be released to the surrounding areas.

12.10.2 Spill Response

In the event of a release of hazardous materials into the environment, according to the SHSP, TtFW will contain or control the release or evacuate the area if the spill is significant or represents an immediate health threat. Absorbent pads, shovels, and 55-gallon drums will be kept on site to address the possibility of spills.

12.10.3 Spill/Release Reporting

The steps below outline the chain of communications that will be followed if a spill of a hazardous substance occurs.

- Site personnel involved in the spill will immediately contact the Construction Manager or SHSS, who will notify the PjM or designee. At least one of these two individuals or their designees will be on site during radiological activities:

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SHSS:	Richard Quinn
Construction Manager:	Bill Williams

The TtFW SHSS or Construction Manager will contact the DON RPM, ROICC, and CSO identified below:

DON RPM:	Ralph Pearce (619) 532-0912
ROICC:	Peter Stroganoff (510) 749-5941
CSO:	Mike Mentink (415) 743-4729

- If a release of a waste or hazardous substance, regardless of quantity, could threaten human health or the environment outside the facility, the PjM, or his designee, will verify that the National Response Center [(800) 424-8802] and the local Emergency Response Coordinator (Fire Department) have been notified by the DON. Releases will be reported and written emergency notices will be submitted under the SARA, Title II requirements.
- In concert with the above actions, the following persons will be contacted by the PjM or Superintendent:

TtFW Regulatory Compliance Manager:	Keli McKay-Means Office: (360) 598-8108 Cellular: (425) 785-4389
TtFW CIH:	Roger Margotto Office: (619) 471-3503 Cellular: (949) 306-2517

12.11 PERSONNEL TRAINING/CERTIFICATION REQUIREMENTS

The following training and certification requirements will apply:

- Site personnel must have current OSHA Health and Safety/Emergency Response Hazard Communication and Resource Conservation and Recovery Act (RCRA) training.
- Field personnel will receive radiation awareness training.
- Site personnel performing non-radiological waste management functions must be trained, or under the supervision of an individual trained, in accordance with EPP requirements. Subcontractors performing waste management functions must supply proof of training.

- Site personnel performing U.S. Department of Transportation (DOT) functions, such as selecting, packaging, marking, labeling, preparing shipping papers, and loading non-radiological wastes, must be trained or under the supervision of an individual trained, in accordance with DOT requirements. Subcontractors performing DOT functions must supply proof of training.

12.12 UPDATING THE EPP

This EPP will be updated as needed to reflect changing site conditions.

TABLE 12-1

THREATENED/ENDANGERED SPECIES AT HUNTERS POINT SHIPYARD

Species	Common Name	Status at HPS	Designation
Onchorhynchus tshawytscha	Chinook salmon	Observed	SSC, SE, FT
Gavia immer	Common loon	Observed	SSC
Pelecanus erythrorhychos	American white pelican	May be present	SSC
Pelecanus occidentalis californicus	California brown pelican	Observed	SE, FE
Phalacrocorax auritus	Double crested cormorant	Observed	SSC
Bucephala islandica	Barrow's goldeneye	Observed	SSC
Charadrius alexandrinus	Snowy plover	May be present	SSC
Numenius madagascariensis	Long-billed curlew	Observed	SSC
Larus californicus	California gull	Observed	SSC
Sterna caspia	Caspian tern	May be present	SSC
Sterna elegans	Elegant tern	May be present	SSC
Circus cyaneus	Northern harrier	May be present	SSC
Pandion halieatus	Osprey	Observed	SSC
Falco peregrinus	Peregrine falcon	Observed	SE, FE
Asio flammeus	Short-eared owl	May be present	SSC
Athene cunicularia	Burrowing owl	Observed	SSC
Eremophila alpestris	Horned lark	May be present	SSC
Lanius ludovicianus	Loggerhead shrike	Observed	SSC
Geothlypis trichas	Common yellowthroat	May be present	SSC
Melospiza melodia	Song sparrow	May be present	SSC

Notes:

Designation Codes:
SSC – California Department of Fish and Game Species of Special Concern
SE – Listed as endangered by the State of California
FE – Listed as endangered by the federal government
FT – Listed as threatened by the federal government
HPS – Hunters Point Shipyard

13.0 QUALITY ASSURANCE/ QUALITY CONTROL

This section establishes the general procedures and methods for field inspections of the radiological activities performed base-wide. This plan also describes the actions that will be taken to ensure that the QC system remains effective for its intended use. This plan will be supplemented as necessary with additional requirements detailed in the TSPs. This plan combines the NFECSW Remedial Action Contract No. N68711-98-D-5713 requirements with the established QC system criteria specified in applicable SOPs and the TtFW Final CQC Program Plan (TtFW, 2004b).

13.1 ORGANIZATION AND RESPONSIBILITIES

The organization and authority for project personnel performing radiological and construction operations, including subcontractors, is defined in Section 3.0 of this Base-wide Plan.

13.2 SUBMITTALS

Section 11.0 describes the documentation expected to be produced and the assessment requirements for the activities performed under this Base-wide Plan. Section 11.0 also defines the review and approval process of data and reports. In addition, TtFW will institute and maintain a Submittal Register to track submittals from issuance to approval. A list of submittals will be developed prior to the initiation of project activities and will be revised as necessary. Submittals will be scheduled, reviewed, certified, and managed.

13.2.1 Submittal Requirements

The following requirements apply to submittals:

- Each submittal will be complete and in sufficient detail to allow determination of contract compliance.
- The PQCM will check items prior to submittal.
- A transmittal form certifying compliance with all contract requirements will accompany each submittal.
- Proposed deviation from the contract requirements will be clearly identified.
- Submittals will include items such as applicable drawings, descriptive literature, test reports, samples, operations and maintenance manuals, certifications, and warranties.

13.2.2 Review of Submittals

Submittals will be reviewed to ensure completeness, accuracy, and contract compliance. Submittal of a certification will be reviewed by appropriate technical disciplines and approved by the PQCM for conformance to the project specifications or certification criteria. If technical in nature, the PQCM will ensure that the document has received a thorough review by a technically qualified individual. Reviewers must possess sufficient experience and/or education to have produced the original document. Prior to acceptance, submittals requiring modifications or changes will be returned to the originating organization for correction and then resubmitted for review and approval by the PQCM, or designee, prior to acceptance. Approved submittals will be stamped, signed, or initialed and dated. During the preparatory phase, the PQCM or designee will ensure that required materials and equipment have been tested and approved, prior to the start of field activities which require those items or materials. A submittal log will be maintained to indicate the status of submittals. Submittals, which require DON review and approval, will be transmitted in accordance with the project distribution schedule. Submittals 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 DON will either return the transmittal sheet to the PQCM for further action, or accept the submittal as complete.

13.2.3 Submittal Process

Submittals will be provided to the DON and project personnel as determined by the distribution schedule. Each submittal will have a unique document control number. Submittal distribution will be scheduled in a manner to allow for sufficient review and approval time. Certain submittals may require accelerated processing to support DON objectives. However, in no case will the schedule take precedence over the production of a high quality document.

A transmittal form will accompany each submittal. Each transmittal will be identified with:

- The Contract and Contract Task Order (CTO) number
- Name and address of the submitting organization
- Date of the submittal
- Description of the item being submitted, including reference to the applicable specification section
- Approval of the submitting organization indicating conformance to the requirements

13.2.4 Revised Submittals

Revised submittals will be logged, reviewed, and processed in a manner consistent with the initial submittal.

13.3 TESTING/VERIFICATIONS

The PQCM will verify the performance of tests specified or required by the TSPs to assure that control measures are adequate to provide a product conforming to contract specifications. The PQCM or designee is responsible for verifying the completion of related tests. These tests include both operational and/or and acceptance testing as appropriate.

13.4 DOCUMENTATION

Verification/test results and associated field documentation, both passing and failing, will be recorded on the CQC Report and submitted to the RPM and ROICC/NTR.

13.5 FIELD INSPECTION PLAN

A DFW matrix will be used to delineate specific field activities, including those of subcontractors and suppliers, the inspection process, and the required meetings to ensure compliance with the contract. The DFWs establish the measures required to verify both the quality of work performed and compliance with specified requirements, and include inspecting materials and workmanship before, during, and after each DFW. The DFWs for work governed by this plan may either be prepared as generic DFWs for repetitive activities or may be task-specific and attached to the applicable TSP. General descriptions of inspection attributes and the required phases of control will be presented in a DFW prepared for the specific activity.

The controls defined will be adequate to cover planned operations and are keyed to the proposed sequence of activities. Project QC includes implementing the following three control phases for the required aspects of the work specified in each DFW:

- Preparatory phase
- Initial phase
- Follow-up phase

13.6 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/NTR. The meetings will be held at the project site. Attendees include but are not limited to the ROICC/NTR, RASO, the CSO, QAO, PjM, PQCM, RSO, and the SHSS. The following will be discussed at each meeting:

- Review the minutes of the previous meeting.
- Review the schedule.
  - Activities or testing accomplished since last meeting
  - Rework items identified since last meeting
  - Rework items completed since last meeting
- Review the status of submittals.
  - Submittals reviewed and approved since last meeting
  - Submittals required in the near future
- Review the work to be accomplished in the following 2 weeks and documentation required. Schedule the three phases of control and testing.
  - Establish completion date for rework items
  - Required preparatory phase inspections
  - Required initial phase inspections
  - Required follow-up phase inspections
  - Required testing
  - Status of off-site work or testing
  - Required documentation
- Resolve QC and production concerns or issues.
- Address items that may require revisions to the Project CQC Plan.

13.7 PREPARATORY PHASE INSPECTION

The PQCM will conduct preparatory phase inspections prior to starting the DFWs associated with a TSP. These inspections will include:

- Reviewing this Base-wide Plan, associated TSPs, and attachments
- Ensuring that materials, items and/or equipment have been tested, submitted, and approved
- Ensuring that provisions have been made to provide required control inspection and testing
- Examining the work area to ensure that required preliminary tasks have been completed and are in compliance with the approved requirements
- Conducting a physical examination of the required materials and equipment to ensure that they have been delivered to the site, conform to approved shop drawings or specifications, and are properly stored
- Reviewing the appropriate activity hazard analysis to ensure that safety requirements are met

- Discussing procedures applicable to the work
- Ensuring that the TSP for the work to be performed has been accepted by the DON

The PjM, RPM, ROICC/NTR, RASO, and the CSO will be notified at least 2 working days in advance of preparatory phase activity. This phase will include a meeting conducted by the PQCM and attended by the Construction Manager and any other personnel involved in performing the DFW.

The issues discussed during the preparatory phase meetings will be documented on a Preparatory Inspection Checklist. The PQCM will direct personnel performing work activities as to the acceptable level of workmanship required.

13.8 INITIAL PHASE INSPECTION

An initial inspection will be performed at the beginning of field activities defined in the TSP and will include:

- A check of preliminary work to ensure that it is in compliance with requirements
- A review of the Inspection Checklist documenting results of the preparatory meeting
- Verification of full contract compliance, including required control, inspection, and testing
- Establishment of the required level of workmanship, and verification to ensure work meets minimum acceptable standards
- A check of safety requirements to ensure compliance with the applicable AHA and BHASP

The PQCM will document initial inspections for each item using an Initial Inspection Checklist and attach it to the Daily QC Report. The exact location of the initial phase inspection will be documented.

13.9 FOLLOW-UP PHASE INSPECTION

During the completion of a particular work feature, follow-up inspections will be conducted to ensure continued compliance with requirements. The frequency of the follow-up inspections will depend on the extent of the work being performed. Follow-up inspections will be documented on a Follow-Up Inspection Checklist, which will be attached to the Daily QC Report. A final follow-up check will be conducted on any completed work phase prior to the commencement of a subsequent phase. Any deficiencies will be corrected prior to starting additional phases of work or will be identified on a list of items that do not conform to the specified requirements or are incomplete.

13.10 ADDITIONAL PREPARATORY AND INITIAL PHASES

The PQCM may conduct additional preparatory and initial inspections on the same DFWs under the following circumstances:

- If the quality of ongoing work is unacceptable as determined by the PQCM, PjM, RPM, QAO, ROICC/NTR, RASO, RSO, or CSO
- If there are substantial changes in the staff, on-site supervision, or work crew
- If work on a DFW is resumed after a substantial period of inactivity
- If other problems develop
- Prior to restarting an activity following a Stop Work Order

13.11 COMPLETION INSPECTION

Completion inspections will be performed as summarized in this section.

13.11.1 Field Quality Control Completion Inspections

The PQCM or designee will conduct a preliminary inspection prior to the pre-final inspection, when all of the work or an increment of work is deemed to be substantially complete. The work will be inspected for conformance to plans, TSP specifications, quality, and completeness. The PQCM will prepare a rework items list of work not properly completed or work that does not conform to plans and specifications. 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 and attached to the Daily QC Report.

13.11.2 Pre-final Inspection

The PjM will conduct the pre-final inspection. The RPM, ROICC/NTR, RASO, CSO, PQCM, and other primary management representative(s), as applicable, will attend. The PjM will schedule the pre-final inspection in response to notification from the PQCM prior to the planned inspection date. The PQCM is required to verify at this time that all specific items previously identified as being unacceptable, along with all remaining project work, will be complete and acceptable by the scheduled date for the pre-final inspection. At this inspection, the ROICC/NTR and RASO will develop a list of incomplete and/or unacceptable work performed under the contract and will provide this list to the TtFW site management team.

13.11.3 Final Acceptance Inspection

The PjM will schedule the final acceptance inspection based on notification from the PQCM of readiness. The RPM, ROICC/NTR, RASO, CSO, PQCM, and other primary management

representative(s), as applicable, will be invited. 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.

13.11.4 Inspection Documentation

The PQCM is responsible for the maintenance of the inspection records. Inspection records will be legible and clearly provide all necessary information to verify that the items or activities inspected conform to the specified requirements or, in the case of nonconforming conditions, provide evidence that the conditions were brought into conformance or otherwise accepted by the ROICC/NTR and RASO. All inspection records will be made available to the DON, including RASO.

13.12 DOCUMENTATION

Preparation, review, approval, and issuance of documents affecting quality will be controlled to the extent necessary to determine that the documents meet specified requirements. Project documents that may be controlled include but are not limited to:

- Meeting minutes, conference notes, and confirmation notes
- Submittal Register
- Submittal Log
- Inspection documentation
- Contractor Production Report
- Daily CQC Report
- Radiological Logs
- Testing Plan and Log
- NCRs
- NCR Log
- Design Change Notices
- FCRs
- Rework Items List
- Project Plans including task-specific attachments
- COC
- RWPs

- Laboratory documentation
- Drawings

13.13 QUALITY CONTROL DAILY REPORT

The PQCM is responsible for maintenance of current records of QC operations, activities, and tests performed, including the work of subcontractors and suppliers. The records will include factual evidence that required QC activities and tests were performed. A Daily QC Report will be completed by the PQCM to document construction activities. A Contractor Production Report will also be completed daily by the Site Superintendent. These documents will include:

- Contractor/subcontractor(s) and their area of responsibility
- Operating equipment, with hours worked, idle, or down for repair
- Work performed that day, giving location, description, and by whom
- Test and/or control activities performed with results and references to specifications/ plan requirements, including the control phase (preparatory, initial, follow-up) and deficiencies (along with corrective action)
- Material received, with statement as to its acceptability and storage
- Submittals reviewed, with contract reference, by whom, and action taken
- Off-site surveillance activities, including actions taken
- Job safety evaluations stating what was checked, results, and instructions or corrective actions
- A list of instructions given/received and conflicts in plans and/or specifications
- Contractor's verification statement
- Site visitors/purpose, deviations from plans, difficulties, and resolution

The records will indicate a description of trades working on the project, the number of personnel working, weather conditions encountered, and any delays encountered. Both conforming and nonconforming features will be covered with a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original of this report will be furnished to the ROICC/Navy Technical Representative by 10:00 a.m. on the first workday following the date covered by the report. Reports need not be submitted for days during which no work is performed. At a minimum, one report will be prepared and submitted for every 7 days of no work and on the last day of a no-work period. All calendar days will be accounted for throughout the life of the contract. The first report following a day of no work will summarize work for that day only. Reports will be signed and dated by the PQCM and other appropriate personnel, including subcontractors responsible for completion of activities.

13.14 CONFERENCE NOTES AND CONFIRMATION NOTES

Notes will be taken and prepared for meetings and conferences when directed by the RPM. Conference notes will be typed and the original report furnished to the DON within 5 days after the date of the conference for concurrence and subsequent distribution to all attendees. At a minimum, this report will include:

- Date and place the conference was held
- List of attendees, including name, organization, and telephone number
- Written comments presented by attendees attached to each report with the conference action noted: "A" for an approved comment, "D" for a disapproved comment, "W" for a comment that has been withdrawn, and "E" for a comment that has an exception noted
- 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 discussions, verbal directions, telephone conversations, and so forth in which TtFW personnel or their representatives participate on matters relating to this contract and work. These records entitled "Confirmation Notices," will be numbered sequentially and will fully identify participating personnel, subject discussed, and any conclusions reached. The PjM, or his designee, will forward a reproducible copy of the confirmation notices to the RPM, RASO, and ROICC/NTR within 5 working days.

13.15 NONCONFORMANCES

The PQCM documents any work or materials not conforming to the technical specifications or project/contract requirements on an NCR. The NCR will detail the nonconforming condition, the recommended corrective action(s), and the disposition of the corrective action(s). Qualified representatives from engineering, quality assurance and construction will review the NCR and either accept or reject the recommended corrective action or disposition. The NCR will remain open until the nonconforming condition has been satisfactorily resolved and verified by PQCM. Upon receipt of notification of detected nonconformance, NCRs for each item will be completed, and the ROICC/NTR and RASO will be notified of the condition and proposed corrective actions.

13.15.1 In-process Deficiencies

In-process deficiencies are those conditions discovered during the course of QC inspections that are intended to be corrected or brought into conformance with established acceptance criteria or requirements. In-process deficiencies will be noted briefly on the Daily QC Report and detailed

on the "Rework Items List." Items on this list that cannot be corrected will be considered as installed deficiencies and dispositioned as "use as is."

13.15.2 Installed Deficiencies

Installed deficiencies are those conditions discovered during the course of QC inspection of completed work that do not meet established acceptance criteria or requirements, and are not intended to or cannot be brought into conformance. These conditions will be noted on a Rework Items List in addition to a NCR for evaluation and disposition. The PQCM will issue the report summarizing the discrepancies.

In the event that the deficiency is not resolved within 30 calendar days after issuance of the NCR, a notice of non-response will be issued to the PjM. Each report will be consecutively numbered, logged, and updated by the PQCM. Resolution of installed deficient conditions will be approved by the PjM. Copies of completed reports will be sent to the ROICC/NTR.

13.15.3 Condition Requiring Stop Work

If corrective actions are insufficient, resolution cannot be reached, or results of prior work are indeterminate, work may be stopped. A Stop Work Order can only be issued by the PjM and the PQCM in writing. If there is a disagreement between the PQCM and the PjM, the difference will be brought to the attention of the appropriate program level manager for resolution.

The conditions of the Stop Work Order will be described in detail on a Stop Work Memo in addition to referencing the Deficiency Report, which describes the condition, and to allow evaluation of the problem(s) and proper corrective action(s). Work will not continue until the conditions that prompted the Stop Work Order are corrected, verified and approved by the PjM and PQCM. In accordance with 10 CFR 20, the RTMs and/or RSO have stop work authority for radiological activities when they observe a breach of radiological controls due to poor work practices, systemic failure, or acts of nature. If it should be necessary to issue a formal Stop Work Order, the RSO or RTM will process them through the PjM and PQCM.

13.15.4 Nonconforming Items

The nonconforming items will be controlled to prevent inadvertent use. All items noted as nonconforming will be clearly identified and when practical segregated from acceptable items.

13.15.5 Disposition

The disposition of NCRs will include the necessary actions required to bring the nonconforming condition to an acceptable condition and may include reworking, replacing, retesting, or

reinspecting. Implementation of the disposition may be done in accordance with the original procedural requirements, a specific instruction, or a FCR.

13.15.6 Field Change Requests and Design Change Notices

With the exception of the Sampling and Analysis Plan, site personnel will document changes to the approved plans in the field through the FCR form. (Changes to the Sampling and Analysis Plan will be done in accordance with Environmental Work Instruction #2 under TtFW's contract with the DON, and in consultation with RASO.) 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, as required
- Approval of the PjM, Construction Manager, Program Environmental Safety Manager, QCM, and RASO

13.16 CORRECTIVE ACTIONS

On detection of a non-conforming condition, the Construction Manager will immediately take corrective action. In addition to resolving identified non-conforming conditions, corrective action records will also address the initial cause of adverse conditions and establish methods and controls to prevent recurrence of the same or similar types of non-conformances. The PQCM will monitor the corrective actions to verify that they were properly implemented and accepted and that the NCR was closed out.

13.17 QUALITY MANAGEMENT

In addition to the required QC field inspections, the TtFW Quality Program requires a Quality Management overview of the site quality assurance/QC Program implementation. The PQCM will perform regular internal QC checks on the site implementation of the quality assurance/QC Program. Reports of any deficiencies will be reported to the PjM for corrective action.

Inspections will be performed and checked for the following:

- Possession and use of approved procedures, standards, and project specifications
- Conformance with appropriate procedures, standards, and instructions
- Thoroughness of performance
- Identification and completeness of documentation generated during performance

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APPENDIX A

EXAMPLE RADIATION WORK PERMIT

RADIATION WORK PERMIT (RWP)

RWP #: **2004-001 (HPS-Misc S & C -Routine, General)** Regular **X** Extended

SECTION I

Contract # **CTO No. 0072**	Date: **05/20/04**	Time: **1200 hrs.**

Location/Project: **Hunters Point Shipyard / Misc Surveillance & Control, Non-Intrusive and/or Non-RAD, Routine Ops**

Exposure Category: **D&D** Source Transfer Waste Processing Characterization

Job Description: **Field support (including routine surveillance) not designated as "RWP /Job Specific" and in areas suspected to require radiological controls.**

Estimated Start Date: **05/20/04** Estimated End Date: **12/31/04** Rev.: **0**

SECTION II

Existing Radiological Conditions:

Radiation Survey #: **HPS 2004 Series** Airborne Survey #: **N/A** Contamination Survey #: **HPS 2004 Series**

Existing General Area Radiation Level(s):	Existing **General** Contamination Levels:	Airborne DAC Level(s):
<1 mR/hr/γ		**N/A** % P
<1 mrad/hr/corrected β	***See "Remarks"** dpm/100cm^2 α	**N/A** % P
N/A mrem/hr/η	***See "Remarks"** dpm/100cm^2 βγ	**N/A** % H_3
Existing Maximum Radiation Level(s):	**Existing Maximum Contamination Level(s)**	**Hot Particle?**
<1 mR/hr/γ		
<1 mrad/hr/corrected β	***See "Remarks"** dpm/100cm^2 α	Yes
N/A mrem/hr/η	***See "Remarks"** dpm/100cm^2 βγ	**No**

Remarks:
***Reference survey / log report corresponding to site location in question (Contact: RTM or designee). "Existing" / "Maximum" contamination levels for accessible areas approved under this RWP: <1000 dpm/100cm2 βγ and < 20 dpm/100cm2 α. Posted "Contaminated Area" access prohibited**.**
**** Beyond initial RCT discovery and associated posting / set up.**

SECTION III

Radiological Limits:
Maximum Allowed WB Exposure Rate : **<1** mr/hr γ or mrem/hr η
Corrected : **N/A** mrad/hr Maximum Extremity Exposure Rate: **N/A** mr/hr
Maximum Allowed Contamination Level : **<20** dpm/100cm^2 α : **< 1000** dpm/100cm^2 βγ
Maximum Allowed Airborne Concentration Level: **N/A** % DAC
Remarks: **RCA requirements for access to a posted "Contaminated Area" shall be completed under the directives of a separate "job specific" RWP (unique to the assigned task / activity).**

Industrial Hygiene/Safety Concerns: **Job Specific: The SHSS, or designee, shall be briefed on planned activities prior to approved RWP work coverage. Using information gathered from the brief, the SHSS, or designee, shall then address any industrial hygeine/safety concerns associated with the stated task(s) and unique to the area of concern.**

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RADIATION WORK PERMIT (RWP)

RWP #: **2004-001 (HPS-Misc S & C -Routine, General)** Regular __X__ Extended

SECTION IV

WORKER REQUIREMENTS

CLOTHING:	DOSIMETRY:	INSTRUCTIONS:	RESPIRATORY:
☐ Coveralls ☐ Lab Coat ☐ Cloth Hood X Paper Coveralls* ☐ Plastic Suit X Plastic Booties* X Rubber Shoe Covers* ☐ Canvas Shoe Covers X Cotton Liners* ☐ Rubber Gloves X Nitrile Gloves* X Safety Glasses/Face Shield* ☐ Extra ☐ Other Clothing Stay Time (Heat Stress, Radiaton, Exposure Limits, etc.): __N/A__ hrs.	X TLD* ☐ Film Badge ☐ SRD ☐ Standard ☐ Elbows ☐ Gonad Pack ☐ Hot Cell Entry ☐ Extremity ☐ Head Pack ☐ Special ☐ Knees ☐ Varying Field ☐ Upper Field ☐ Ground Field ☐ Alarming Dosimetry ☐ None	☐ Contact HP for Line Breaks X Protect Cuts* X **Pre-Job Briefing** X **Post-Job Briefing** X **Contact RTM, or Designee, Prior to Work in New Areas** ☐ Modesty Required X **Site Specific Instructions** ☐ Equipment Monitor at Job End X **Clean Up Work Area During and After Job** X **Eating, Drinking, Smoking,Chewing Prohibited** X Frisk Upon Exiting Contaminated Area* X **Have Prescribed RTS/RCT Coverage or Stop Work** **Exit Area Immediately Upon Emergency or Injury. Notify RTM, or Designee, Immediatly**	☐ FFNP ☐ FFAL ☐ SCBA ☐ PAPR ☐ Dust Mask ☐ Half Face ☐ Bubble Hood Cartridges: ☐ Particulate ☐ Vapor ☐ Combination ☐ Other

Special Instructions: *** As determined by: 1) RTM, or designee - task related / 2) RCT – unusual circumstance.**

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SECTION V

RCT Requirements

1. Job Coverage: **Continuous** X * **Intermittent** X * **Start** X * **End of Job** X *
2. Air Sampling: **General Area** X * **Breathing Zone** X * Lapel ☐ AgZ ☐
   Tritium/C-14 ☐ Particulate ☐ Charcoal ☐ LoVol ☐ HiVol ☐
3. Exposure Rate Surveys: Start of Job ☐ Continuous Monitoring ☐ **Area Monitoring** X *
   Intermittent Monitoring ☐ End of Job ☐
4. Contamination Surveys: Start of Job ☐ Continuous Monitoring ☐
   Intermittent Monitoring X * **End of Job** X *
5. Is the ALARA Consideration Complete and Attached? Yes **No** Why? **Based on Section II / III Data**
6. Other: **No applying of make up, lip balm , or similar substances / acts while inside areas of concern. By signing to indicate RWP review, all such persons also acknowledge familiarity with prenatal exposure concerns as detailed in NRC Reg Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure". Report existing cuts / open wounds to the RCT prior to reporting to work area.**
   - **As determined by: 1) RTM, or designee - task related / 2) RCT – unusual circumstance.**

RWP #: **2004-001 (HPS-Misc S & C -Routine, General)** Regular **X** Extended

SECTION VI

Personnel Authorized to Perform Work & Acceptance of Responsibility

*My signature verifies that I have read and fully understand the RWP Requirements

Date	Name (Print)	Signature*	SSN (last 4 #'s)	Initial	Comments:

H	Approvals/Reviews	I	Termination
RTS Generating RWP: Date/Time:		Date: Time:	
SHSS Approval: Date/Time:		RTS/RTM (or designee)/RSO (if required):	
RTM (or designee) Approval: Date/Time:		Reason: Job Complete RWP Revision	
RSO Approval (if required): Date/Time:		RSO/RTM Review:	

 (Modified for HPS use: 052504)

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APPENDIX B

BASE-WIDE SAMPLING AND ANALYSIS PLAN

APPENDIX B
BASE-WIDE RADIOLOGICAL SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
Revision 0
February 16, 2005

HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

DCN: FWSD-RAC-05-0165

Prepared for
Base Realignment and Closure
Program Management Office West
1230 Columbia Street, Suite 1100
San Diego, California 92101

CONTRACT NO. N68711-98-D-5713
CTO NO. 0072

TETRA TECH FW, INC.
1230 Columbia Street, Suite 500
San Diego, CA 92101

Mary Schneider — 2/14/05
Mary Schneider — Date
TtFW Quality Control Program Manager

Narciso A. Ancog — 2/14/2005
Narciso A. Ancog — Date
NFECSW Quality Assurance Officer

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ABBREVIATIONS AND ACRONYMS

Base-wide Plan	Base-wide Radiological Work Plan
Base-wide SAP	Base-wide Radiological Sampling and Analysis Plan
BRAC PMO	Base Realignment and Closure Program Management Office West
cm^2	square centimeters
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain-of-custody
cpm	counts per minute
CTO	Contract Task Order
D&D	decommisioning and decontamination
DHS	Department of Health Services
dpm	disintegrations per minute
DoD	Department of Defense
DOE	Department of Energy
DON	Department of the Navy
DOT	Department of Transportation
DQA	data quality assessment
DQO	data quality objective
DTSC	Department of Toxic Substances Control
EDD	electronic data deliverable
EML	Environmental Measurements Laboratory
EPA	U.S. Environmental Protection Agency
EWI	Environmental Work Instruction
FSS	Final Status Survey
HDPE	high-density polyethylene
HNO_3	nitric acid
HPS	Hunters Point Shipyard
HRA	Historical Radiological Assessment
ICAL	initial calibration

ABBREVIATIONS AND ACRONYMS
(Continued)

L	liter
LCS	laboratory control sample
LLRW	low-level radioactive waste
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
mL	milliliter
mrem/y	millirem per year
MS	matrix spike
N/A	not applicable
NAVSEA	Naval Sea Systems Command
NEDTS	Navy Environmental Data Transfer Standard
NFECSW	Southwest Division, Naval Facilities Engineering Command
NFESC	Naval Facilities Engineering Service Center
NRC	Nuclear Regulatory Commission
pCi/g	picocuries per gram
PRG	Preliminary Remediation Goal
QA	quality assurance
QC	quality control
RAC	Remedial Action Contract
RASO	Radiological Affairs Support Office
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RSO	Radiological Safety Officer
RTM	Radiological Task Manager
RTS	Radiological Task Supervisor
SHSP	Site-Specific Health and Safety Plan
SOP	Standard Operating Procedure
TSP	Task-specific Plan
TtFW	Tetra Tech FW, Inc.

ABBREVIATIONS AND ACRONYMS
(Continued)

WRS	Wilcoxon Rank Sum

ELEMENTS OF EPA QA/R-5 IN RELATION TO THIS SAP

EPA QA/R-5 QAPP Element [a]		Tetra Tech FW, Inc. SAP
A1	Title and Approval Sheet	Title and Approval Sheet
A2	Table of Contents	Table of Contents
A3	Distribution List	Distribution List
A4	Project/Task Organization	7.0 Project Organization
A5	Problem Definition/Background	2.0 Background
A6	Project/Task Description	1.1 Objectives and Scope
A7	Quality Objectives and Criteria	8.0 Quality Assurance Objectives
A8	Special Training/Certification	Base-wide Work Plan, Section 3.3 and 12.1.1
A9	Documents and Records	11.0 Data Quality Management
B1	Sample Process Design	4.0 Sampling Strategy
B2	Sampling Methods	6.0 Field Methods and Sampling Procedures
B3	Sample Handling and Custody	6.6 Sample Packaging and Shipment 9.2 /10.2 Laboratory Sample Custody and Documentation
B4	Analytical Methods	5.0 Request for Analysis
B5	Quality Control	5.3 Field Quality Control Samples 9.0 Analytical Quality Control Procedures (Off-site Laboratory) 10.0 Analytical Quality Control Procedures (On-site Laboratory)
B.6	Instrument/Equipment Testing, Inspection, and Maintenance	9.5 and 10.5 Preventative Maintenance
B7	Instrument/Equipment Calibration and Frequency	9.4.1 and 10.4.1 Calibration
B8	Inspection/Acceptance of Supplies and Consumables	11.1.1 Hard-copy Report
B9	Non-Direct Measurements	11.1.2 Electronic Data
B10	Data Management	11.1 Data Management
C1	Assessment and Response Actions	12.0 Quality Assurance Oversight
C2	Reports to Management	12.0 Quality Assurance Oversight
D1	Data Review, Verification, and Validation	9.6 and 10.6 Data Review 11.3 Data Evaluation
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D3	Reconciliation with User Requirements	8.0 Data Quality Objectives

Notes:

[a] EPA. 2001. *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, QAMS.* March.

EPA U.S. Environmental Protection Agency
QA quality assurance
QAPP Quality Assurance Project Plan
SAP Sampling and Analysis Plan

1.0 INTRODUCTION

This Base-wide Radiological Sampling and Analysis Plan (Base-wide SAP) documents the sample collection and quality assurance (QA) procedures associated with surveys that will be implemented in support of radiological release of buildings and areas at Hunters Point Shipyard (HPS), San Francisco, California. Tetra Tech FW, Inc. (TtFW), formerly Foster Wheeler Environmental Corporation, has been contracted by the Department of the Navy (DON) to perform these activities at HPS for the Base Realignment and Closure Program Management Office West (BRAC PMO) under Naval Facilities Engineering Command, Southwest Division (NFECSW) Remedial Action Contract (RAC) No. N68711-98-D-5713, Contract Task Order (CTO) No. 0072.

The purpose of this Base-wide SAP is to establish procedures for sampling, including sample analysis, and the associated QA activities, which are integral to performing radiological surveys. These procedures will be used throughout the project by all field and laboratory personnel. Task-specific Plans (TSPs), which include task-specific sampling and analysis elements and data quality objectives (DQOs), will be prepared for each site/building that will be surveyed and/or remediated. Each TSP will provide location-specific supplemental information and identify exceptions and/or additions to this Base-wide SAP, if any. This Base-wide SAP or the TSPs will be revised or amended as described in Section 13.0.

Included in this Base-wide SAP (either directly or by specific reference to the Base-wide Plan) are sampling procedures, laboratory analysis, and QA/quality control (QC) requirements that will be used during this project. General DQOs for conducting radiological surveys are provided in this document (Section 8.0), and task-specific DQOs will be included in the TSPs. DQOs are developed using the guidance provided in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) [Department of Defense (DoD) et al., 2000].

Low-level radioactive waste (LLRW) generated during this project will be disposed of by the DON through their LLRW Program in accordance with applicable regulatory guidelines and *Environmental Work Instruction (EWI) #8, 3EN2.8, Low-Level Radioactive Waste (LLRW) Disposal Program* (NFECSW, 2001a). Disposal of LLRW will not be performed by TtFW for this project.

1.1 OBJECTIVES AND SCOPE

The objectives of this Base-wide SAP are to establish sampling procedures associated with surveys to evaluate areas that may contain residual radioactive contamination as a result of past activities at HPS. This includes guidance for the field sampling activities; describing and establishing consistent field sampling procedures; establishing data gathering, handling, and

documentation methods; and defining QA/QC measures to ensure consistency and confidence in the data obtained.

1.2 REGULATORY OVERSIGHT

The DON [represented by BRAC-PMO, Radiological Affairs Support Office (RASO), and NFECSW] is the lead agency responsible for this project, and the U.S. Environmental Protection Agency (EPA) is the lead regulatory agency, with state regulatory oversight provided by the California Department of Toxic Substances Control (DTSC) and the California Department of Health Services (DHS).

2.0 BACKGROUND

Site location, description, and history are detailed in Section 2.0 of the Base-wide Radiological Work Plan (Base-wide Plan) and the HPS Historical Radiological Assessment (HRA) [Naval Sea Systems Command (NAVSEA), 2004].

3.0 MAPS

Figure 2-1 of the Base-wide Plan displays the impacted buildings and sites associated with this project. Site-specific maps will be provided in the TSP.

4.0 SAMPLING STRATEGY

This section provides the approach to sample collection during radiological surveys at HPS. Several types of radiological surveys will be conducted at HPS. Surveys will be used to support release of materials, equipment, open areas, utilities and/or buildings; support remedial actions; and identify radionuclides and levels of contamination present. Types of surveys for radiological release of buildings and areas include reference (background) area, scoping, characterization, remedial action support, and final status. In addition, personnel, equipment and materials, and truck surveys will be conducted to ensure that personnel and equipment are free of radiological contamination. Detailed information on each type of survey is presented in Section 4.1 of the Base-wide Plan.

Types of samples to be collected throughout this project are swipe and media samples. Swipe sampling will be performed to assess the presence of radioactive contamination that is readily removed from a surface. Media samples consists of the following, but is not limited to:

- Soil and sediment
- Solid material of concrete, brick, porcelain, and wood
- Water from sinks, drain piping, sewer systems, rinsate, and low-point accumulation areas inside of buildings

Media samples will be analyzed by the on-site radiological laboratory. Ten percent of media samples will be randomly selected to be sent to an off-site radiological laboratory for gamma spectroscopy analysis for QA purposes. Data from the on-site and off-site gamma spectroscopy analysis will be compared and considered acceptable if the results are less than or equal to 10 percent. If results are not within 10 percent, then the data from both laboratories will be reviewed to determine the discrepancy. In addition, analyses not performed by the on-site laboratory such as alpha spectroscopy and strontium-90, may be performed by the off-site laboratory.

Sample collection procedures are provided in Attachment 1 of this Base-wide SAP. Type and frequency of samples will be detailed in the TSP.

5.0 REQUEST FOR ANALYSIS

This section describes the analytical methods, sample containers, and preservative requirements. Additionally, field QC samples to be collected for this project will be discussed in this section.

5.1 ANALYTICAL METHODS

The following EPA analytical methods [the *Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA/600/4-80-032)* (EPA, 1980); and the *Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300* [Department of Energy (DOE), 1997] will be used to analyze samples at the off-site laboratory during this project:

Soil/Solid/Sediment Samples

- Gamma spectroscopy by EPA Method 901.1M (modified for soil) or equivalent
- Strontium-90 by DOE Sr-01/Sr-02 Method or equivalent
- Alpha spectroscopy by DOE HASL-300 Method or equivalent

Water Samples

- Gamma spectroscopy by EPA Method 901.1 or equivalent
- Strontium-90 by EPA Method 905.0 or equivalent
- Alpha spectroscopy DOE HASL-300 Method or equivalent

The following instrumentation, as described in Table B.5-1, will be used to analyze samples at the on-site laboratory:

- Gamma spectroscopy analysis by C1402-98 Standard Guide for High-Resolution Gamma-Ray Spectrometry and/or site Standard Operating Procedures (SOPs)
- Gross alpha/beta by gas-flow proportional counter or ZnS(Ag) detector
- Low-energy beta by liquid scintillation counter

5.2 SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

A list of the sample containers, preservatives, and holding time requirements for each analytical method is provided in Table B.5-2.

5.3 FIELD QUALITY CONTROL SAMPLES

Field QC samples applicable to this project will include field duplicates for water samples. Field duplicates consist of two distinct samples (an original and a duplicate) of the same matrix collected at the same time and location to the extent possible and using the same sampling

techniques. The purpose of field duplicates is to measure the consistency of field sampling. Field duplicates will be collected at a frequency of one for every ten samples taken and will be analyzed for the same analytes as the original sample. Field duplicates are uniquely identified so that the identity of the field duplicates is "blind" to the analytical laboratory. Exact locations of field duplicate samples and their identifications will be recorded in the field logbook.

TABLE B.5-1

ON-SITE LABORATORY INSTRUMENTATION

Laboratory Instruments				
Measurement/ Technique	**Type of Instrumentation***	**Typical Background**	**Typical Efficiency (%)**	**Detection Sensitivity**
Gamma spectroscopy	Canberra Genie 2000 HpGe	N/A	N/A	0.05 pCi/g (for Cs-137)
	EG&G Ortec Beryllium Window			
Gross alpha/beta on swipes (Swipes)	Protean IPC9025 Low-background gas-flow proportional counter	1-5 cpm β 0-0.5 cpm α	~62 β ~27 α	4-10 dpm/100 cm^2 β 2-5 dpm/100 cm^2 α
	Tennelec Low Series 5 XLB background gas-flow proportional counter	1-5 cpm β 0-0.5 cpm α	~33 β ~33 α	10 dpm/100 cm^2 β 5 dpm/100 cm^2 α
	Ludlum Model 2929 ZnS(Ag) detector	>80 cpm β >3 cpm α	16 β 26 α	100 dpm/100 cm^2 β 10 dpm/100 cm^2 α
Liquid scintillation analysis	Perkin Elmer Tri-Carb 3100TR Liquid scintillation counter	20 dpm	60	25 dpm 2000 pCi/g

Notes:

* or equivalent

Types of radiation: α - alpha, γ - gamma, β - beta

cm^2 – square centimeters

cpm – counts per minute

dpm – disintegrations per minute

N/A – not applicable

pCi/g – picocuries per gram

TABLE B.5-2

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Analyte	Analytical Method	Container	Preservative	Holding Time *
SOIL/SOLID/SWIPE SAMPLES				
Gamma-emitting radionuclides (off-site laboratory)	EPA Method 901.1M or equivalent	250-mL or 500-mL plastic container	None	6 months
Strontium-90 (off-site laboratory)	DOE Method Sr-01/Sr-02 or equivalent	250-mL or 500-mL plastic container	None	6 months
Alpha spectroscopy (off-site laboratory)	DOE HASL-300 Method or equivalent	250-mL or 500-mL plastic container	None	6 months
Gamma-emitting radionuclides (on-site laboratory)	C1402-98 Standard Guide for High-Resolution Gamma-Ray Spectrometry and/or on-site laboratory SOPs	250-mL or 500-mL plastic container	None	N/A
Gross alpha and beta (on-site laboratory)	Gas Flow Proportional Counter or ZnS(Ag) Detector	Cloth or paper disc swipe	None	N/A
Low-energy beta (on-site laboratory)	Liquid Scintillation Counter	Cloth, paper, or polyfoam swipe	None	N/A

TABLE B.5-2

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Analyte	Analytical Method	Container	Preservative	Holding Time *
WATER SAMPLES				
Gamma-emitting radionuclides (off-site laboratory)	EPA Method 901.1 or equivalent	Two 1-L HDPE	pH ≤ 2 w/ HNO_3	6 months
Strontium-90 (off-site laboratory)	EPA Method 905.0 or equivalent	Two 1-L HDPE	pH ≤ 2 w/ HNO_3	6 months
Alpha spectroscopy (off-site laboratory)	DOE HASL-300 Method or equivalent	Two 1-L HDPE	pH ≤ 2 w/ HNO_3	6 months
Gamma-emitting radionuclides (on-site laboratory)	C1402-98 Standard Guide for High-Resolution Gamma-Ray Spectrometry and/or on-site laboratory SOPs	250-mL or 500-mL plastic container	None	N/A

Notes:

* - Holding time is defined as the time by which the analyses should be completed. Holding times have not been established for radiological sample analysis; however, 6 months is usually used as a recommended holding time.

DOE - Department of Energy
EPA - U.S. Environmental Protection Agency
HDPE - high-density polyethylene
HNO_3 - nitric acid
L - liter
mL - milliliter
N/A - not applicable
SOP - Standard Operating Procedure

6.0 FIELD METHODS AND SAMPLING PROCEDURES

The following sections provide the sampling procedures and sample handling protocols to be used for this project.

6.1 SAMPLING PROCEDURES

Samples will be collected in accordance with the SOP, HPO-Tt-009 Sampling Procedures for Radiological Surveys, presented in Attachment 1.

6.2 RADIOLOGICAL SCREENING OF SAMPLING EQUIPMENT

Prior to decontamination, sampling equipment will be screened using a hand-held alpha/beta survey meter. If radioactive contamination exceeding the release limits for surfaces identified in Table E.1-1 is detected, the equipment and local area will be secured and the Radiological Safety Officer (RSO) will be notified.

6.3 DECONTAMINATION PROCEDURES

Decontamination of non-disposable sampling equipment that has been screened as discussed in Section 6.2 will be performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by steam cleaning or by washing with a nonphosphate detergent such as Liquinox® or equivalent. Decontamination water will be collected in approved Department of Transportation (DOT) containers.

The following steps will be applied for the general decontamination of non-disposable sampling equipment:

1. **Wash with nonphosphate detergent and water solution** — This step will reduce the amount of gross contamination from the equipment. Use of a container, approximately 75 percent full of solution, is suggested for this step. This detergent solution will be prepared as directed by the manufacturer.
2. **Rinse with potable water** — This step will rinse all the detergent solution away from equipment. Use of a container, approximately 75 percent full of potable water, is suggested for this step. Periodic changing of this water is required.
3. **Rinse with potable water** — Repeat Step 2. Subsequent to this final rinse, place decontaminated equipment on a clean surface area (plastic sheeting) to air dry.
4. **Radiological screening of equipment** — When dry, survey the post-decontaminated equipment using a hand-held alpha /beta survey meter. If radioactive contamination exceeding the release limits identified in Table B.6-1 is detected, immediately secure the equipment and local area and notify the Radiation Safety Officer.

5. **Sample investigation-derived waste** — Drummed decontamination fluids will be sampled to characterize the waste for disposal. Drums will be stored in a designated storage area pending receipt of the analytical data. Samples will be collected from each wastewater container.

6.4 SAMPLE NUMBER

For the collection of samples for radiological analysis by the on-site laboratories or in the field by portable laboratory instruments, Sections 6.4 through 6.6 will be implemented. A sample is defined as a soil, solid, liquid, or swipe that is collected for characterization or demolition and decontamination activities for subsequent release of a building and its' contentsconcrete slab, and ground surface. This also includes samples that are collected for characterization and subsequent disposal purposes; for instance, swipe samples collected from duct work prior to removal and disposal. These guidelines will not be applicable to radiological survey equipment or any swipe or air samples that are collected for health and safety purposes (i.e. worker exposure or equipment decontamination).

Each sample will be identified by an alphanumeric designator of up to 20-digits (UU-V-WWW-XXX-YY-ZZZ) as follows:

UU:	2-character designation of the project CTO number (for example, 72)
V:	1-character designation of the radiological subcontractor NWT (N) or MKM (M) collecting samples
WWW:	Designation of the site identification (specified in the TSP) (for example, Building 322 would be 322)
XXX:	Designation for the survey unit
YY:	Alphanumeric designation of the grid within the survey unit
ZZZ:	Designation of the consecutive sample number (for example, 004)

For example, in the sample identification number 72-N-322-001-A1-004, "72" represents the project CTO number, N represents the radiological subcontractor, "322" represents the site identification, "1" represents the survey unit, "A1" represents the survey grid, and "004" represents the fourth sample collected for the grid. If no grid is associated with the sample, then YY will be listed as "00".

The sample number will be recorded in the field logbook, on the labels, and on the chain-of-custody (COC) record at the time of sample collection. A complete description of the sample and sampling conditions will be recorded in the field logbook and referenced using the unique sample identification number.

6.5 SAMPLE LABELING

Sample labeling is necessary to prevent misidentification of samples. Since sample containers may be placed on the detector in the instrument or other sample containers may be small, a label on the side of the container is not appropriate. Instead, sample container lids will be labeled using permanent markers. If a plastic bag is used to collect samples, then the sample bag will be directly marked with indelible ink. When this sample is then transferred to a container, the lid of the container will be labeled.

Each sample will be labeled with the following:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Sampler's initials

If containers are too small to fit all of the above sample information, at a minimum, the container will be labeled with the 3-character designation of the consecutive sample number (004). For swipe samples, each swipe will be labeled with the 3-character designation of the consecutive sample number. All swipes will be individually bagged, and the bag will be labeled with the above information.

6.6 FIELD DOCUMENTATION

In order to maintain the integrity and traceability of samples, information pertinent to field sampling will be recorded in a field logbook. Samples will be properly labeled and will be accompanied by completed COC documentation. Associated documentation will be recorded in indelible black or blue ink.

6.6.1 Chain-of-custody

To establish the documentation necessary to trace sample possession from the time of collection through analysis, a COC record will be completely filled out and will accompany every sample. An example COC is presented in Attachment 2. Samples will be delivered to the on-site laboratory for analysis or analyzed in the field by portable laboratory instruments (see the Base-wide Plan) as soon as practicable.

The following items will be recorded on the COC record as applicable:

- Project name (Hunters Point Shipyard)
- Project location/Site ID (building number, site number)

- Project number (1990.072D)
- Purchase order number (only applicable for off-site laboratory samples)
- Sample ID
- Sampler name
- Sampler signature
- Project contact (radiological project manager for on-site laboratory samples and TtFW project chemist for off-site laboratory samples)
- Airbill number (if applicable)
- Date (of sample collection)
- Time (of sample collection to the nearest minute, 24-hour clock)
- Sample type (matrix – "s" for solid/soil, "w" for water/liquid, and "wp" for swipe)
- Turnaround time (not applicable for on-site laboratory and 21 day for off-site laboratory)
- Sample location codes (maximum of 20-character length description of where sample was collected – "Wipe 1 Floor", "Grid 5", "Duct 2")
- Sample depth in feet (start, end)
- QC type:

  REG: regular sample

  FD: field duplicate
- Composite description (as applicable)
- Laboratory name
- Number of sample containers
- Laboratory ID (not applicable for on-site laboratory and off-site laboratory will complete upon receipt of samples)
- Analyses required (gamma spectroscopy, liquid scintillation counting, strontium-90)
- Comments
  - Observations specific to sample
- Transfer signature (to relinquish samples)
  - The sampler will be the first person to relinquish sample possession
- Courier/laboratory representative signature (for commercial carrier, record name of commercial carrier here)
- Date/time (of custody transfer)
- Laboratory instructions

- Data package requirement - Level III or IV (not applicable to on-site laboratories)

6.6.2 Field Logbooks

A permanently bound field logbook with consecutively numbered pages will be assigned to each sampling team for this project. Entries will be recorded in indelible black or blue ink. At the end of each workday, the logbook pages will be signed by the responsible sampler, and unused portions of the logbook pages will be crossed out, signed, and dated.

If it is necessary to transfer the logbook to another person or team, the person relinquishing the logbook will sign and date the last page used, and the person receiving the logbook will sign and date the next page to be used.

At a minimum, the logbook will contain the following information:

- Project name and site location
- Date and time
- Personnel in attendance
- General weather information
- Work performed
- Field observations
- Sampling performed, including specifics such as location, type of sample, type of analyses, and sample identification
- Descriptions of deviations from the Base-wide Plan
- Problems encountered and corrective action taken
- Identification of field QC samples (as applicable)
- Verbal or written instructions
- Other events that may affect the samples

In addition to the field logbook, a spreadsheet (Sample Status Log) may be used in the field to record sample information.

6.6.3 Document Corrections

Changes or corrections on project documentation (logbooks, and COC records) will be made by crossing out the erroneous item with a single line and 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 should be entered legibly and in a way to clearly correspond to the crossed-out item.

6.7 SAMPLE PACKAGING AND SHIPMENT

Sampling packaging and shipping will be performed in accordance with the SOP in Attachment 1. Section 9.2 describes the COC procedures when the samples arrive at the laboratory.

TABLE B.6-1

RELEASE CRITERIA *

Radionucide	Surfaces (dpm/100 cm^2)		Soil[c] (pCi/g)	
	Equipment, Waste[a]	Structures[b]	Outdoor Worker[d]	Residential[d]
Am-241	100	23.9	5.67	1.87
Cs-137	5,000	5,000	0.13[e]	0.13[e]
Co-60	5,000	5,000	0.0602	0.0361
Pu-239	100	24.7	14.0	2.59
Ra-226	100	100	2.0[f]	2.0[f]
Sr-90	1,000	1,000	42.3	0.331
Th-232	1,000	6.49	19.0	3.1
H-3	5,000	5,000	1.42	2.28
U-235	5,000	86.6	0.417	0.205

Notes:

Criteria for other nuclides will be listed in TSPs, if needed.

a. These limits are based on U.S. NRC Regulatory Guide 1.86. Limits for removable surface activity are 20 percent of these values.

b. These limits are based on 25 mrem/y, using D&D Version 2 or Reg. Guide 1.86, whichever is lower.

c. EPA PRGs for two future use scenarios.

d. The on-site and off-site laboratory will ensure that the minimum detectable activity (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%. The MDA is calculated per sample by considering background counts, amount of sample used, and counting time.

e. Decay-corrected PRG for industrial reuse provided by EPA Region IX.

f. Limit is 1 pCi/g above background; not to exceed 2 pCi/g total, per agreement with EPA.

* Release criteria for water generated as a result of remedial activities will be negotiated with regulators, and therefore, are currently not available.

cm^2 – square centimeters
CFR – Code of Federal Regulations
D&D – decommissioning and decontamination
dpm – disintegrations per minute
EPA – U.S. Environmental Protection Agency
mrem/y – millirem per year
NRC – Nuclear Regulatory Commission
pCi/g – picocuries per gram
PRG – Preliminary Remediation Goal
TSP – Task-specific Plan

7.0 PROJECT ORGANIZATION

This section identifies the key individuals from the DON and TtFW who are responsible for the oversight and/or implementation of the proposed field activities. The project organization chart is shown in Figure B.7-1. The responsibilities of the team members associated with the sampling activities are presented in Table B.7-1.

7.1 POINTS OF CONTACT

The following is a list of the key contacts for the project:

Agency	Contact	Title
NFECSW Attn: Code 06CH.RP 1230 Columbia Street, Suite 1100 San Diego, CA 92101	Mr. Ralph Pearce (619) 532-0931 ralph.pearce@navy.mil	DON Remedial Project Manager (RPM)
NAVSEA DET RASO Building 1971 NWS P.O. Box Drawer 260 Yorktown, VA 23691-0260	Ms. Laurie Lowman (757) 887-4692 lowmanll@raso.navy.mil	Radiation Site Manager
NAVSEA DET RASO Building 1971 NWS P.O. Box Drawer 260 Yorktown, VA 23691-0260	Mr. Matthew Slack (757) 887-4692 slackml@raso.navy.mil	Assistant Radiological Site Manager
NFECSW ROICC 2450 Saratoga Street, Building 110, Suite 200 Alameda Point, Alameda, CA 94501-7545	Mr. Peter Stroganoff (510) 759-5941 peter.stroganoff@navy.mil	Resident Officer in Charge of Construction (ROICC)
NFECSW 1220 Pacific Highway San Diego, CA 92132-5190	Mr. Narciso Ancog (619) 532-2540 narciso.ancog@navy.mil	Quality Assurance Officer
TtFW Hunters Point Shipyard 270 Nimitz Avenue (Building 270) San Francisco, CA 94124	Mr. Gerry Slattery (415) 216-2730 (415) 860-6740 (cellular) gslattery@ttfwi.com	Project Manager
TtFW 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705	Ms. Mary Schneider (949) 756-7586 mschneider@ttfwi.com	QC Program Manager

Agency	Contact	Title
TtFW 1940 E. Deere Avenue, Suite 200 Santa Ana, CA 92705	Ms. Lisa Bienkowski (949) 756-7592 lbienkowski@ttfwi.com	Project Chemist

TABLE B.7-1

PERSONNEL AND RESPONSIBILITIES

Key Position	Responsibility
Quality Assurance Officer	• Reviewing and approving Sampling Analysis Plan • Providing DON oversight of the TtFW Quality Assurance Program • Providing quality-related directives through Contracting Officer Representative • Providing technical and administrative oversight of TtFW surveillance audit activities • Acting as point of contact for matters concerning quality assurance and the DON's Laboratory Quality Assurance Program • Coordinating training on matters pertaining to generation and maintenance of quality of data • Authorizing the suspension of project execution if quality assurance requirements are not adequately followed
Project Chemist	• Developing Sampling and Analysis Plan • Evaluating and selecting qualified subcontract laboratories • Implementing data QC procedures and performing audit of field performance • Reviewing off-site laboratory data prior to use • Ensuring that proper review of on-site laboratory data is performed • Coordinating data validation of off-site laboratory data • Reviewing data validation reports • Preparing analytical reports and supporting project report preparation

TABLE B.7-1

PERSONNEL AND RESPONSIBILITIES

Key Position	Responsibility
Remedial Project Manager	• 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 TtFW project team, as needed • Integrating CERCLA issues at HPS with ongoing radiological activities • Coordinating with RASO and RPMs of other projects being performed in radiologically impacted areas to ensure that proper controls are in place • Acting as lead interface with agencies on non-radiological issues • Together with the Radiological Site Manager, negotiating radiological release criteria with regulatory agencies
Radiological Site Manager	• Reviewing and approving project work plans and procedures • Acting as lead interface with regulatory agencies on radiological survey plans and reports • Together with the RPM, negotiating radiological release criteria with regulatory agencies • Reviewing and approving on-site laboratory analytical data • Reviewing and approving project reports • Ensuring compliance with applicable MARSSIM requirements • Recommending changes in TtFW scope to the RPM, as appropriate • Supporting public meetings

TABLE B.7-1

PERSONNEL AND RESPONSIBILITIES

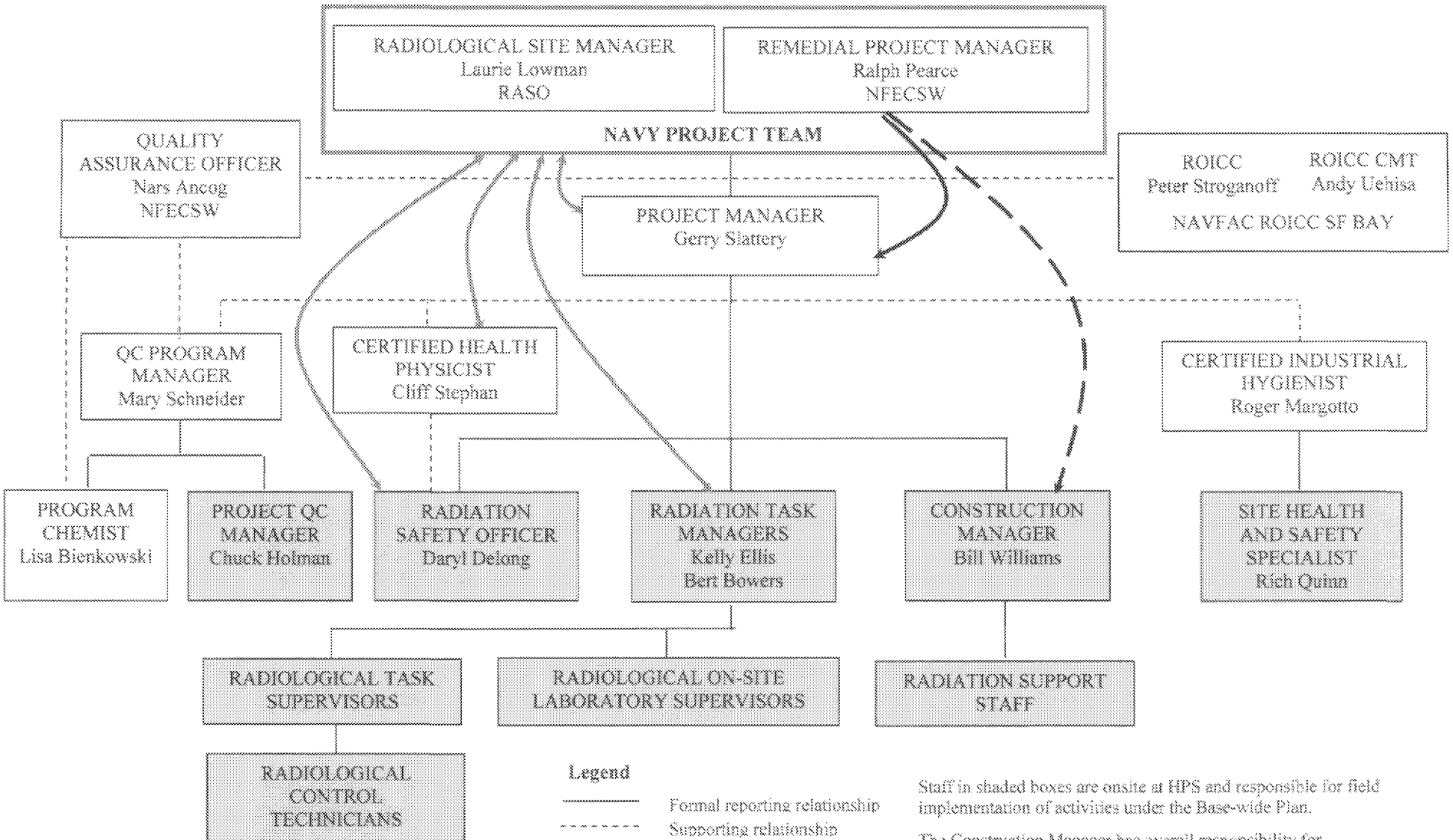
Key Position	Responsibility
Project Manager	• Coordinating work activities of subcontractors and TtFW personnel and ensuring that all personnel adhere to the administrative and technical requirements of the project • Monitoring and reporting the progress of work and ensuring that project deliverables are completed on time and within budget • Ensuring adherence to the requirements of the contract, project scope of work, and the project plans • Ensuring that all work activities are conducted in a safe manner in accordance with the Site-Specific Health and Safety Plan (SHSP) • Attending required meetings, including the pre-construction conference, weekly QC meetings, pre- and post-construction site inspections, and other scheduled and unscheduled meetings • Serving as the senior contact between the DON and TtFW for actions and information related to the work • Ensuring effective implementation of the radiological record management program • Ensuring that all personnel assigned to perform field work are appropriately monitored for exposure to ionization radiation • Coordinating regulatory site visits

Notes:

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
DON - Department of the Navy
HPS - Hunters Point Shipyard
MARSSIM - Multi-Agency Radiation Survey and Site Investigation Manual
NFECSW - Southwest Division, Naval Facilities Engineering Command
QC - quality control
RASO - Radiological Affairs Support Office
RPM - Remedial Project Manager
SHSP - Site-Specific Health and Safety Plan
TtFW - Tetra Tech FW, Inc.

FIGURE B.7-1

ORGANIZATION CHART



Staff in shaded boxes are onsite at HPS and responsible for field implementation of activities under the Base-wide Plan.

The Construction Manager has overall responsibility for coordinating the activities of onsite technical staff.

8.0 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 around each survey situation. This section summarizes DQO elements applicable to most of the surveys to be performed under this plan. Specific DQOs for each survey will be established in the relevant TSPs.

8.1 STATE THE PROBLEM

The first step in the DQO process is to simply state the problem. The problem is "Existing data is not sufficient to support release of impacted areas at HPS."

- A scoping survey is needed to provide data to plan the release or remediation of a building or area.
- A characterization survey is needed to provide additional data to plan the release or remediation of a building or area.
- A remedial action support survey is needed to provide data while implementing the remediation of a building or area.
- A Final Status Survey (FSS) is needed to provide data for free release of a building or area.

8.2 IDENTIFY THE DECISION

- For a scoping survey, the decision is, "Does the survey defined in the TSP identify the radionuclides of concern and assess general levels and extent of contamination?"
- For a characterization survey, the decision is, "Does the survey information defined in the TSPs identify the nature and extent of the contamination, which may lead to remediation?"
- For a remedial action support survey, the type of decision is, "Does the remedial action support survey indicate that the remediation is complete (as defined in the TSPs)?"
- For a FSS, the decision is, "Do the FSS results demonstrate compliance with the release criteria?"

8.3 IDENTIFY INPUTS TO THE DECISION

Inputs will vary, depending on the specific survey, and will be detailed in the TSP. However, in general, some or all of the following data will be used.

- Gamma scan survey
- Alpha/beta scan surveys
- Systematic and biased static alpha, beta (buildings and structures), and gamma static readings
- Systematic and biased solid and swipe sampling
- Systematic and biased exposure rate measurements

For a scoping survey, additional inputs to the decision are the information in the HRA and the radiological survey data collected during the implementation phase.

For a characterization survey, additional inputs are again the information in the HRA 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 a FSS, additional inputs are the radiological survey results and the release criteria.

8.4 DEFINE STUDY BOUNDARIES

Study boundaries will depend on the particular survey performed. For a building or land area, it will be the physical boundaries of those spaces. For remedial action support surveys, it will be the extent of the remedial action work area and associated support areas. Study boundaries will be presented, on a case-by-case basis, in TSPs.

8.5 DEVELOP A DECISION RULE

For each applicable survey, developing a decision rule is as follows:

- 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."
- 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."
- For a remedial action support survey, 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 re-evaluate the remedial alternative and continue remediation if necessary."

- For a FSS, the decision rule is, "If the survey results demonstrate compliance with the release criteria, then document the results in the FSS report. If the survey results do not demonstrate compliance with the release criteria, then additional assessment and/or remediation are necessary."

The release criteria for buildings, structures, material and land areas at HPS are listed in Section 6.0 of the Base-wide Plan. Limits for a specific building, area or for multiple radionuclides will be given in the TSPs.

In evaluating this decision, unless otherwise indicated in the TSPs, MARSSIM Scenario A will be applied. In Scenario A, the null hypothesis (H_o) is tested that residual contamination exceeds the release criterion; also, the alternative hypothesis (H_a) is tested to determine if the residual contamination meets the release criterion. Details on the null hypothesis are given in Section 8.6.

8.6 SET LIMITS ON DECISION ERRORS

For those surveys where decision errors would be used, there are two types of decision errors that can be made. The first type of decision error, called a Type I error, occurs when the null hypothesis is rejected when it is actually true. A Type I error is sometimes called a "false positive." The probability of a Type I error is usually denoted by α. The Type I error rate is often referred to as the significance level or size of the test.

The second type of decision error, called a Type II error, occurs when the null hypothesis is not rejected when it is actually false. A Type II error is sometimes called a "false negative." The probability of a Type II error is usually denoted by β . The *power* of a statistical test is defined as the probability of rejecting the null hypotheses when it is false. It is numerically equal to $1-\beta$, where β is the Type II error rate.

This survey is designed to limit Type I and Type II errors to 5 percent. It is important to minimize the chances of concluding that a survey unit meets the release limits (reject the null hypothesis) when it actually exceeds the limits (Type I Error) and concluding that a survey unit exceeds the release limit (accept the null hypothesis) when it actually meets the limit (Type II Error).

8.7 OPTIMIZE DATA COLLECTION

Guidelines for optimizing the data collection process are presented below:

- Review Outputs and Existing Data for Consistency

  Radioactive source readings will be used to check instruments for consistency prior to use in each daily shift. The instrument will only be used after readings are compared and agree within +/- 20 percent of predetermined responses. The

Radiological Task Supervisor (RTS) (or designee) will review the information each day to verify that equipment is operating satisfactorily.

The Radiological Task Manager (RTM), or qualified designee, who is not involved in the direct data collection process will review the survey data on a daily basis. This will ensure an ongoing independent review for consistency of survey data collected.

- Develop Data Collection Design Alternatives

  The MARSSIM guidelines will be used and a 95 percent confidence level for detecting radioactivity above the release criteria will be assumed with Type I and Type II errors limited to 5 percent.

- Document Operational Details and Theoretical Assumptions

  Operational details for the radiological survey process have been developed for and are included as part of the Base-wide Plan. The theoretical assumptions are based on guidelines contained in MARSSIM. General information regarding types of radiation measurements, instrument detection capabilities, selecting the quantities and locations of data to be collected, investigation levels, and release criteria are contained in the Base-wide Plan. Site-specific operational details and theoretical assumptions will be identified in relevant TSPs.

9.0 ANALYTICAL QUALITY CONTROL PROCEDURES (OFF-SITE LABORATORY)

This section describes laboratory qualification, sample custody and documentation, QC procedures, QC samples, preventative maintenance, data review, and deliverables for the off-site laboratories. (Analytical QC procedures for the on-site radiological laboratory are presented in Section 10.0)

9.1 LABORATORY QUALIFICATION

The analytical laboratories selected to analyze samples for this project will be, at a minimum, certified by the California DHS for all of the analytical methods required for the project. Additional state certifications may also be required for off-site radiological testing as required by the disposal facility. In addition, the laboratory must successfully complete the Naval Facilities Engineering Service Center (NFESC) Laboratory Evaluation Program prior to sampling activities and maintain current status throughout the duration of the project.

The laboratory selected for the project must be capable of providing the required project QC and data deliverables required by this SAP.

9.2 LABORATORY SAMPLE CUSTODY AND DOCUMENTATION

The integrity and traceability of samples from the time they are collected through the time data are reported are essential in any sampling and analysis program. The handling of the samples and transferring of custody must be well-documented given the evidentiary nature of the analytical data. A sample is considered to be in one's custody if it meets any of the following criteria:

1. In actual possession or in view of the person who collected the sample
2. Locked in a secure area
3. Placed in an area restricted to authorized personnel

The samples will be delivered to the person in the laboratory authorized to receive samples (referred to as the sample custodian). Upon receipt of a sample, the sample custodian will inspect the condition of the sample and the custody seal, reconcile the information on the sample label against that on the COC record, assign a unique laboratory tracking number, log the sample in the laboratory logbook, and store the sample in a secured sample storage room.

The TtFW Project Chemist will be informed immediately of any inconsistencies between the COC record and the sample containers received. Any deviations from accepted sample handling procedures will be documented, and the TtFW Project Chemist will be informed.

Changes or corrections on any 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.

9.3 LABORATORY QUALITY CONTROL PROCEDURES

The analytical laboratory must have written SOPs defining the instrumentation, instrumentation maintenance, tuning, calibration, minimum detectable activity (MDA), QC requirements, blank requirements, and step-by-step procedures for each analytical method. The SOPs must be available to the analysts performing the work. The SOPs must meet or exceed the requirements of the analytical methods cited in this SAP and in the *Quality Systems Manual for Environmental Laboratories* (DoD, 2000). The laboratory must maintain logs of all activities that have an impact on the quality of the laboratory results.

Any portion of the method that is subcontracted by the laboratory to another laboratory or sent to another facility of the same network of laboratories must have the prior approval of the TtFW Project Chemist.

The laboratory must maintain the instruments in working condition required by the methods specified for the analyses. Sufficient redundancy in equipment must be available in the laboratory to handle downtime situations.

Method substitution because of instrumental failure will not be permitted without approval from the TtFW Project Chemist.

9.4 LABORATORY QUALITY CONTROL SAMPLES

The following subsections describe in detail the laboratory QC samples required by this project.

9.4.1 Calibration

All instruments and equipment must be calibrated in accordance with the specified methods, unless different instructions are included in this document. Each instrument must be calibrated with the standard solutions appropriate to the type of instrument and the calibration range established for the method.

Initial calibrations (ICALs) are performed when the method is first used and again whenever the continuing calibrations fail to meet their respective acceptance criteria. In addition, if the instrument undergoes significant maintenance, the ICAL must be repeated.

Continuing calibrations verify that the instrument performance has remained within the limits set at the time of the ICAL. The frequency of continuing calibrations is specified in referenced methods.

9.4.2 Method Blanks

Method blanks are prepared in the same manner as the samples, using the same reagents and glassware used for samples. The purpose of the method blank is to ensure that the equipment and reagents used in preparing the samples are free of contaminants that could interfere with the analysis. The method blank must be prepared and analyzed for each batch of 20 project samples or less per matrix (aqueous and solid) type.

The method blank must not exhibit analytes at concentrations greater than half the MDA. If contaminants are found that either contribute to the apparent concentration of a particular target analyte or interfere with the analysis, the analysis must be stopped, the source of contamination identified and corrected, and the analysis repeated. Contamination in the method blank above half the MDA will require that the entire associated batch of extracts or digestates be reprepared and reanalyzed. Hence, it is very important to make sure that no such contamination is present.

9.4.3 Laboratory Control Samples

Laboratory control samples (LCSs) are purchased samples containing known concentrations of specific target analytes. LCSs can also be prepared by spiking known amounts of target analytes into a well-characterized blank matrix. The matrix will be analyte-free, laboratory reagent-grade water for water samples and clean sand or equivalent for soil samples.

The LCS is prepared and run at a frequency of one per 20 project samples per matrix with the associated samples, using the same reagents and volumes. All analytes in the LCS must meet recovery criteria. If the criteria are not met, the entire batch of samples must be reprepared, together with a new LCS, and reanalyzed.

9.4.4 Matrix Spike

The matrix spike (MS) serves to determine whether matrix effects are affecting recoveries. For aqueous radiological analyses, only a single MS may be performed per batch. (MS is not applicable to non-aqueous samples for radiological analyses.) A MS is prepared by spiking a known amount of solution to two portions of a sample being run in a batch. Once the spike is added to the MS samples, these samples are carried through the complete sample preparation process along with the other samples in the batch. The MS recoveries are compared against each other and against the known amount of the spike. From this data, both accuracy and precision can be determined. To prepare a project-specific MS, field personnel will collect additional sample volumes as necessary at a frequency of one per 20 samples. Field personnel will designate samples for MS analysis on the COC record.

9.4.5 Duplicates

One type of duplicate, laboratory, will be performed. The laboratory duplicate is created by the laboratory, where two aliquots are intentionally taken from the same sample and analyzed in parallel. This analysis serves to measure the precision of laboratory operations.

9.5 PREVENTIVE MAINTENANCE

All instruments must be maintained in accordance with the manufacturers' recommended procedures. The laboratory must define in its QA plan the frequency and type of maintenance for each instrument. The laboratory must also record all maintenance activities in an instrument logbook.

In addition to preventive maintenance, the laboratory must keep a sufficient supply of replacement parts on hand for those parts known to require frequent changes due to wear and tear or contamination.

Whenever preventive or corrective maintenance is applied to an instrument, the laboratory must demonstrate the instrument's return to operating conditions and must recalibrate the instrument prior to resumption of sample analyses.

9.6 DATA REVIEW

All data reported by the laboratory must be reviewed in accordance with the laboratory SOPs and as described in the following subsections.

9.6.1 Analyst Review

Each analyst that generates a data set is responsible for ensuring that 100 percent of the data comply with the method- and project-specific requirements and that any deviations or failure to meet criteria are documented for the project file.

9.6.2 Peer Review

One hundred percent of all data sets must be reviewed by an independent peer analyst. Peer reviews must be performed by an analyst that is qualified to perform the subject analytical method. The peer review must be comprehensive and include the following:

- Check 100 percent of manual entries for transcription errors
- Check 100 percent of manual calculations for accuracy
- Spot-check computer calculations to verify program validity
- Check for compliance with method- and project-specific QC requirements

- Check for completeness of raw data or supporting materials
- Confirm spectral assignments
- Check descriptions of deviations from method or project requirements
- Check for appropriate use of significant figures and rounding
- Check reported values for dilutions
- Evaluate reasonableness of results

9.6.3 Technical Review

Technical reviews by the responsible supervisor or designated alternate must be performed on 100 percent of reported data. The same individual may not perform peer and technical reviews on the same data set. The technical review must include the following:

- Check for compliance with method- and project-specific requirements
- Check the completeness of the reported information
- Check the information in the report narrative
- Evaluate the reasonableness of the results

If the responsible supervisor is the only qualified peer reviewer for a method, the requirement for the technical review is waived.

9.6.4 Management Review

One hundred percent of all data must receive management approval prior to release. The scope and content of management's review is at the laboratory's discretion. Authority to release data may be delegated to a technical supervisor or other party, if the term of the delegated authority is documented in the QA program file.

9.6.5 Quality Assurance Review

QA reviews of data from each section of the laboratory must be conducted on a routine basis. Annually, at least 10 percent of data reports generated using each analytical method must be reviewed by a member of the QA staff. The QA reviews must include the following:

- Check for compliance with required QC practices
- Check for compliance with approved SOPs
- Check for compliance with method and project requirements

QA data reviews may be conducted after the subject data have been reported to TtFW.

9.7 DELIVERABLES

The following sections describe the deliverable documents that will be submitted to TtFW by the analytical laboratory.

9.7.1 Hard-copy Deliverables

Two copies of the hard-copy data will be submitted to TtFW by the laboratory. The report pages will be sequentially numbered. The report will contain a table of contents referencing individual sections in the data package, original white copy of COC records, a copy of all corrective action reports, and a narrative documenting the resolution of all corrective actions and nonconformances. All TtFW samples will be cross-referenced to the associated QC samples. When revisions to data reports are required, the revised pages will be stamped with the notation "amended or revised report."

To allow third-party validation, two types of data packages will be required. They will be referred to as EPA Level III-equivalent or IV-equivalent packages. For this project, TtFW will request that 80 percent of the data be submitted in an EPA Level III-equivalent data package and 20 percent submitted in an EPA Level IV-equivalent data package.All data packages will be assembled in the following sequence:

- Cover page (with laboratory service identification number, TtFW project name, and TtFW project number)
- Original COC records (including cooler temperature and sample condition)
- Sample receipt forms
- Cross-reference table
- Case narrative
- Radiological raw data sequence:
  - Sample result forms, including method blanks
  - Sample raw data after each result form (EPA Level IV only)
  - QC summaries (raw data for EPA Level IV only)
  - ICAL
  - Calibration checks, including related continuing calibration verifications (CCVs)
  - Instrument run log
  - Sample preparation log

9.7.2 Electronic Deliverables

The electronic data deliverable (EDD) will be in ASCII format. This will be compatible with the Navy Environmental Data Transfer Standard (NEDTS). The laboratory will verify that the EDD and the hard-copy reports are identical. Both the EDD and the hard-copy report will present results to two or three significant figures. For radiological results, three significant figures will be used for all results. The EDD for each sample delivery group is due at the same time as the hard-copy report, 30 calendar days after the last sample of the sample delivery group has been delivered to the laboratory. Due to the amount of time required for some radiological analyses, the 30 calendar days may be extended up to 60 calendar days.

10.0 ANALYTICAL QUALITY CONTROL PROCEDURES (ON-SITE LABORATORY)

This section describes laboratory qualification, sample custody and documentation, QC procedures, QC samples, preventative maintenance, data review, and deliverables for the on-site laboratory.

10.1 LABORATORY QUALIFICATION

The analytical laboratory selected to analyze samples for this project will be capable of performing on-site radiological testing required for this project. California DHS certification and NFESC evaluation are not required for the on-site radiological laboratory per written confirmation to TtFW from DHS and EPA.

The on-site laboratory used for the project must be capable of providing the required turnaround times, project QC, and data deliverables required by this SAP.

10.2 LABORATORY SAMPLE CUSTODY AND DOCUMENTATION

The integrity and traceability of samples from the time they are collected through the time data are reported are essential in any sampling and analysis program. The handling of the samples and transferring of custody must be well-documented given the evidentiary nature of the analytical data. A sample is considered to be in one's custody if it meets any of the following criteria:

1. In actual possession or in view of the person who collected the sample
2. Locked in a secure area
3. Placed in an area restricted to authorized personnel

The samples will be delivered to the person in the laboratory authorized to receive samples. Upon receipt of a sample, the sample condition is inspected, verification of the information on the sample container is checked against that on the COC record, the sample is logged in the laboratory logbook, and the sample will be stored in a secured sample storage room.

10.2.1 Corrections to Custody Documentation

Changes or corrections on any 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.

10.3 LABORATORY QUALITY CONTROL PROCEDURES

The analytical laboratory must have written SOPs defining the instrumentation, calibration, method detection, and QC requirements. The SOPs must be available to the analysts performing the work. The SOPs must meet or exceed the requirements of the analytical methods cited in this SAP. The laboratory must maintain logs of all activities that have an impact on the quality of the laboratory results.

The laboratory must maintain the instruments in working condition required by the methods specified for the analyses. Sufficient redundancy in equipment must be available in the laboratory to handle downtime situations.

10.4 LABORATORY QUALITY CONTROL SAMPLES

The following subsections describe in detail the laboratory QC samples required for the on-site laboratory.

10.4.1 Calibration

All instruments and equipment must be calibrated in accordance with the manufacturer's requirements and/or laboratory SOPs. Each instrument must be calibrated with the standard appropriate to the type of instrument and the calibration range established for the method.

ICALs are performed when the method is first used and again whenever the continuing calibrations fail to meet their respective acceptance criteria. In addition, if the instrument undergoes significant maintenance, the ICAL must be repeated. Calibration of all equipment will be performed in accordance with the on-site laboratory's SOPs.

Continuing calibrations verify that the instrument performance has remained within the limits set at the time of the ICAL. The frequency of continuing calibrations is specified in referenced methods.

10.4.2 Instrument/Calibration Backgrounds

Daily instrument backgrounds are run to ensure that contaminants from previous runs are out of the system and do not contaminate succeeding runs. Instrument backgrounds are performed before sample analyses are performed, and after samples containing high concentrations of potentially interfering materials are found.

10.4.3 Method Backgrounds

Method backgrounds are performed on a daily basis in the same manner as the samples, using the same container geometry used for samples. The purpose of the method backgrounds is to ensure that the equipment is free of contaminants that could interfere with the analysis.

10.5 PREVENTIVE MAINTENANCE

All instruments must be maintained in accordance with the manufacturers' recommended procedures. In addition to preventive maintenance, the laboratory must keep a sufficient supply of replacement parts on hand for those parts known to require frequent changes due to wear and tear or contamination.

Whenever preventive or corrective maintenance is applied to an instrument, the laboratory must demonstrate the instrument's return to operating conditions and must recalibrate the instrument prior to resumption of sample analyses. All vendor maintenance documentation will be kept and filed on site with individual instruments.

10.6 DATA REVIEW

All data reported by the laboratory must be reviewed in accordance with the SOPs and as described in the following subsections.

10.6.1 Analyst Review

Each analyst that generates a data set is responsible for ensuring that 100 percent of the data comply with the method- and project-specific requirements and that any deviations or failure to meet criteria are documented for the project file.

10.6.2 Technical Review

Technical reviews by the responsible supervisor or designated alternate must be performed on 100 percent of reported data. The technical review must include the following:

- Check for compliance with method- and project-specific requirements
- Check the completeness of the reported information
- Check the information in the report narrative
- Evaluate the reasonableness of the results

10.6.3 Management Review

Laboratory data will be reviewed by a Radiation Task Manager or their qualified designee prior to release to DON. Written documentation of the delegation of authority to release data to DON will be placed in the QA file.

10.6.4 Quality Assurance Review

QA reviews of data from the laboratory will be conducted. The QA reviews will include the following:

- Check for compliance with required QC practices
- Check for compliance with approved SOPs
- Check for compliance with method and project requirements

QA data reviews may be conducted after the subject data have been reported to TtFW.

10.7 DELIVERABLES

The following sections describe the deliverable documents that will be submitted to TtFW by the analytical laboratory.

10.7.1 Hard-copy Deliverables

Hard-copy data will be submitted to TtFW by the laboratory. If revisions to data reports are required, the revised pages will be stamped with the notation "amended or revised report."

10.7.2 Electronic Deliverables

The on-site laboratory will provide TtFW with a spreadsheet or equivalent of the results of the radiological analysis.

11.0 DATA QUALITY MANAGEMENT

It is important that complete and relevant data and documentation are properly maintained and provided to the appropriate agencies. The methods for maintaining, tracking, and managing project documentation and records (hard-copy and electronic media) to provide a complete, defensible record of the radiological condition of each site investigated are described in this section. The DON will receive summaries of data as collected, plus draft and final data reports. The data management system will ensure that sufficient data and information are properly maintained and available to ensure an independent evaluation of the results of the survey, including repeating measurements at some future date.

Sample collection, field measurement, and laboratory analytical result data will, to the extent practicable, be recorded both electronically and on paper. Data and information reported on paper will be recorded using indelible ink. Records of field-generated data will be reviewed by Radiation Task Manager or designee knowledgeable in the measurement method for completeness, consistency, and accuracy. Electronically recorded data will be compared to paper records of the same data sets to ensure consistency and to resolve discrepancies noted. Electronic copies of original electronic data sets will be preserved on a retrievable data storage device. No data reduction, filtering, or management will be performed on the original electronic versions of data sets. Two main types of data sets include:

- Hard-copy Data – Relevant raw data and documentation, including, but not limited to, logbooks, data sheets, electronic files, and final reports, will be maintained for 7 years by the laboratories. The records custodian will be notified 30 days before disposal of any relevant laboratory records. The project's prime contractor will maintain copies of chain-of-custody records and laboratory deliverables for 30 years after which time, the records may be disposed. Off-site laboratory reports will be logged in upon receipt and filed in chronological order.
- Electronic Data – Two types of electronic data will be generated for radiological surveys performed. Electronic spreadsheets will be used to summarize radiological survey data and on-site laboratory analytical results. In addition, off-site laboratories will provide EDDs as described in Section 9.7.2. Both types of electronic data will be uploaded, as applicable, into a Microsoft Access database which is based on the NEDTS format. The uploaded data will be processed to compare the fields against a list of required values. If any errors are returned by the program, the file will be manually edited or regenerated by the laboratory as applicable.

11.1 DOCUMENTATION TYPES

Three types of documentation that that will be maintained and assessed are: (1) field operation records; (2) laboratory records; and (3) data handling records.

11.1.1 Field Operation Records

The information contained in field operation records will document overall field operations and may consist of the following:

- Field measurement records – These records show that the proper measurement protocol was performed in the field. At a minimum, this documentation will include the names of the persons conducting the activity, measurement identification, measurement locations, measurement results, maps and diagrams, equipment and HPS *Base-wide Radiological Control Plan* (TtFW, 2004a) SOPs used, and unusual observations. Data record forms and/or bound field notebooks will be used to record raw data and make references to prescribed procedures and changes in planned activities.
- Sample tracking records – These records identify the samples, samplers, date of sampling, date of transfers, and receivers. COC forms will be used to document the collection of all samples when they are transferred to on-site or off-site laboratories for analysis.
- QC measurement records – QC measurement records document the performance of QC measurement in the field and includes calibration and standards' traceability documentation that can be used to provide reproducible reference points to which similar measurements can be correlated. These records will contain information on the frequency, condition, level of standards, and instrument calibration history.
- Deficiency and problem identification reports – These reports document problems and deficiencies encountered, as well as provide suggestions for process improvement.
- Corrective action reports – Corrective action reports document what methods were used in cases where general field practices or other standard procedures were violated and include the methods used to resolve noncompliance.

11.1.2 Laboratory Records

The following list describes some of the laboratory-specific records that may be compiled when available and appropriate:

- Laboratory measurement results and sample data – These records contain information on the sample analysis used to verify that prescribed analytical methods and SOPs were followed. Information contained in these records includes the number of samples, sample identification, sample measurement results, any deviations from the SOPs, time of day, and date.
- Sample management records – Sample management records document sample receipt, handling and storage, and scheduling of analysis. These records will verify that sample tracking requirements were maintained, reflect anomalies in the samples (receipt of damaged samples), and note proper log-in of samples into the laboratory.

- Test methods – This documentation includes sample preparation and analysis, instrument standardization, detection and reporting limits, and method-specific QC requirements. Documentation demonstrating laboratory proficiency with each method used may also be a part of the data reporting package.
- QC measurement records – This information includes the general QC records, such as initial demonstration of capability, instrument calibration, routine monitoring of analytical performance, and calibration verification considered in the selection of analytical laboratories.
- Deficiency and problem identification reports – These reports document problems and deficiencies encountered, as well as suggestions for process improvement.
- Corrective action reports – These reports document the methods used to resolve noncompliance in cases where general laboratory practice or other standard procedures were violated.

11.1.3 Data Handling Records

Data handling records document protocols used in data reduction, verification, and evaluation. Data reduction involves data transformation processes such as converting raw data into reportable quantities and units, using significant figures, and calculating measurement uncertainties. Reports of data entered into electronic data management systems will be reviewed by the appropriate supervisory personnel knowledgeable of and with access to the original data to verify data transcription accuracy in accordance with approved SOPs. Record copies of surveys, sampling, and analytical data (and their supporting data) will be protected and maintained in project record files.

11.2 DATA ASSESSMENT

Assessment of survey data is used to evaluate whether the data meet the objectives of the survey, and whether the data are sufficient to determine compliance with release limits. The assessment process consists of three phases: data verification, data validation (for off-site laboratory data), and data quality assessment (DQA). TtFW will take a graded approach to the assessment process so that the level of effort associated with the assessment of HPS survey data will be consistent with the objectives of the survey.

11.2.1 Data Verification

Data verification ensures that the requirements stated in the planning documents are implemented as prescribed. It compares the collected data with the prescribed activities documented in the SOPs. Data verification activities include inspections, QC checks, surveillance, technical reviews, performance evaluations, and audits as determined appropriate. Verification will be performed on sets of analytical data produced for the final release of facilities, land areas, and other structures.

11.2.2 Data Validation

All sample data submitted to the off-site laboratory will be validated by an independent data validation company. Data will be validated at 80 percent EPA Level III and 20 percent EPA Level IV. The validation will be in accordance with *Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation* (NFECSW, 2001b), and the QC criteria specified in the referenced methods and 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. Data not meeting method and/or SAP specifications will be flagged as estimated ("J") or rejected ("R").

The data validation company will have the following qualifications:

1. A minimum of 5 years of experience in the environmental data validation business
2. Prior experience on DON RAC or Comprehensive Long-term Environmental Action projects
3. DON data validation experience specific to radiological data review
4. Active peer review program

Personnel must have the following qualifications:

1. Data Reviewer:
   - Bachelor of science degree or higher in chemistry or a physical science
   - 5 years of combined experience with approximately 2 years in data validation and 3 years conducting laboratory analysis in an environmental laboratory using the EPA-approved methods being validated
2. Peer Reviewer:
   - Bachelor of science degree or higher in chemistry or a physical science
   - 5 years of combined experience with approximately 2 years in data validation and 3 years conducting laboratory analysis in an environmental laboratory using the EPA-approved methods being validated

11.2.3 Data Quality Assessment

DQA is a scientific and statistical evaluation that indicates if the data are of the right type, quality, and quantity to support their intended use. DQA provides the assessment needed to decide if the planning objectives are achieved.

11.3 REPORTING

The TtFW Project Chemist will ensure that analytical data are reported. Analytical results will be provided in a timely manner in accordance with contractual requirements. Reports and documents generated from the sampling event and analytical process (COC records, analytical reports) will be submitted to the TtFW Project Chemist. Analytical reports from laboratory information management systems, copies of appropriate logbook pages, copies of QA files, and spreadsheets, are acceptable formats. Subsequently, the reports and documents generated from the sampling event will be compiled in an acceptable report format to the DON.

12.0 QUALITY ASSURANCE OVERSIGHT

QA oversight for this project will include system audits of field activities and of the laboratories performing analysis.

12.1 FIELD AUDITS

The TtFW and NFECSW QA Officers may schedule audits of field activities at any time to evaluate the execution of sample collection, identification, and control in the field. The audit will also include observations of COC procedures, field documentation, instrument calibrations, and field measurements.

Field documents and COC records will be reviewed to ensure that all entries are printed or written in indelible black or blue ink, dated, and signed.

Sampling operations will be reviewed and compared to this SAP and other applicable SOPs. The auditor will verify that the proper sample containers are used, the preservatives are added or are already present in the container, and the documentation of the sampling operation is adequate.

Field measurements will be reviewed by random spot-checking to determine that the instrument is within calibration, the calibration is done at the appropriate frequency, and that the sensitivity range of the instrument is appropriate for the project.

In addition, analytical procedures performed by the on-site laboratory may be inspected to ensure compliance with SOPs.

12.1.1 Corrective Action

Nonconformance identified during the field audit will be recorded on a Nonconformance Report. All nonconformance and corrective actions will be processed in accordance with TtFW Procedure QC-3. This procedure is presented in Attachment 5 of the *Final Contractor Quality Control Program Plan* (TtFW, 2004b).

The TtFW QC Program Manager will monitor corrective action documentation, verify implementation of the corrective action, track and analyze the corrective action, and closeout corrective action documentation upon completion of the corrective action.

12.2 OFF-SITE LABORATORY AUDITS

Off-site laboratories selected to perform the analyses are required to have successful completion of the NFESC laboratory evaluation process throughout the project. This process consists of a laboratory QA plan review, performance evaluation samples, a data package review, and an on-

site audit. Because of this requirement, TtFW will not perform an on-site audit or visit, unless it is deemed necessary.

Laboratory oversight by TtFW will include a thorough review of the preliminary report and hard-copy data packages. The information that may be obtained from the data packages consists of the following:

- Correctness of COC procedures
- Adherence to method holding times
- MDAs
- Spiking levels, frequency, and recovery
- Accuracy of analytical methods through the LCSs and surrogates

12.2.1 Corrective Action

The laboratory will have a QA/QC and corrective action program that addresses all out-of-control situations. Following completion of analyses, laboratory personnel will verify compliance with the minimum QC requirements of the project and the laboratory QA/QC plan. If any of the parameters fall outside the control limits, corrective action will be implemented.

Initial corrective action is to verify that no obvious calculation errors have occurred. If appropriate, reanalysis will be performed. If the reanalysis confirms the initial out-of-control limits result, the chemist will notify the laboratory supervisor, who will initiate the corrective action process. Corrective actions may include, but are not limited to, the following:

- Examination of sample for nonhomogeneity
- Verification of sample preparation
- Checking of standard preparation logbook
- Verification of instrument performance
- Checking of reagent-grade water purity for method blanks
- Monitoring method performance for procedure verification

Notification and prompt involvement of the TtFW Project Chemist in the corrective action process are absolutely necessary in determining an appropriate resolution. Corrective action records will document all steps taken in the corrective action process, beginning with a description of the problem and ending with a final resolution. A copy of the corrective action report will be sent to the TtFW Project Chemist immediately and will be maintained in the project files at TtFW.

All corrective action reports will be maintained by the laboratory in a project file and delivered to TtFW as part of the hard-copy deliverable.

13.0 SAP REVISION OR AMENDMENT

When circumstances arise that impact the original project DQOs, such as a significant change in work scope, this SAP (or the TSPs) will be revised or amended. The modification process will be based on EPA guidelines, direction from the DON and QA Officer, and will be in conjunction with *Environmental Work Instruction (EWI) #2, 3EN2.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs)* (NFECSW, 2001c).

14.0 REFERENCES

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United States Environmental Protection Agency (EPA). 1980. *Gamma Emitting Radionuclides by Gamma Ray Spectrometry, Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA/600/4-80-032).* August.

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ATTACHMENT 1

SAMPLING STANDARD OPERATING PROCEDURE (SOP)

FINAL

HUNTERS POINT SHIPYARD PROJECT

Standard Operating Procedure

SAMPLING PROCEDURES FOR RADIOLOGICAL SURVEYS

HPO-Tt-009

DCN: FWSD-RAC-O5-0473

Revision 0

Approved By:

Mary Schmidt	2/16/05
Chemist	Date
Daryl E. DeLong	2/18/2005
Radiation Safety Officer	Date
Fred Blystone	2/18/05
Project Manager	Date

REVISION HISTORY

Revision (Date)	*Rev. No*	*Prepared By*	*Description of Changes*	*Affected Pages*
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1.0 PURPOSE

This procedure will be used by Tetra Tech FW, Inc. (TtFW) personnel and its subcontractors at Hunters Point Shipyard (HPS) to perform swipe sampling and sampling of various types of media including soil, sediment, solid material (such as concrete, brick, porcelain, wood), and water. This procedure also details sample packaging and transporting samples to the laboratory.

2.0 SCOPE

This procedure shall be implemented by TtFW staff and subcontractor personnel when taking samples on field projects related to radiological surveys at HPS.

3.0 MAINTENANCE

The Program Chemist is designated as the procedure owner and is responsible for updating this procedure. Final approval authority rests with the Project Manager.

4.0 RESPONSIBILITIES

The following personnel (or their qualified designee) will be directly involved with the sampling procedures discussed herein.

Program Chemist - The Program Chemist is responsible for updating this procedure as necessary. In addition, the Program Chemist will coordinate with the Radiation Task Manager (RTM) to ensure that samples are collected in conjunction with this procedure.

Radiation Task Manager - The RTM is responsible for ensuring that the conditions of this procedure are complied with during project sampling operations. The RTM shall ensure, by periodic personal observation, that samples are collected appropriately and chain-of-custody (COC) is controlled as described in this procedure. The RTM will also ensure that Radiological Control Technicians (RCTs) are qualified by training and experience to perform the requirements of this procedure and ensure that personnel under their cognizance observe proper precautions. The RTM will make a copy of this procedure available to the RCTs.

Radiation Safety Officer - The Radiation Safety Officer (RSO) is responsible for training personnel working with radioactive material. The RSO is responsible for the overall implementation and compliance with this procedure during all project operations. The RSO shall conduct periodic reviews, via personal observation of conducting radiation and contamination surveys, to ensure adherence to the requirements of this procedure.

Radiological Task Supervisor - The Radiological Task Supervisor (RTS) shall be responsible for assisting in the assignment of personnel that will perform the tasks required by this procedure. The RTS is responsible for the control of radioactive material samples, supervision of RCT's performing the requirements of this procedure, and to ensure that personnel under their cognizance observe proper precautions.

Radiological Control Technician - The Radiological Control Technician (RCT) shall be responsible for the performance of the requirements of this procedure and documentation of work performed. The RCT shall ensure compliance with this and any other referenced procedure.

5.0 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) of the surface, unless otherwise noted in the applicable work-planning document (e.g. a 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 from buildings or surrounding areas collected for analytical purposes. 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.

6.0 SAMPLING PROCEDURE DETAILS

6.1 GENERAL PROCEDURES

Field instruments used for measurements required by this procedure shall be checked with standards and verified to have current calibration.

Anytime this procedure is in effect, the RTM (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).

6.2 SAMPLING PROCEDURE PROCESS

Sample activities will be recorded in the field logbook as directed by the Base-wide SAP.

6.2.1 SWIPE SAMPLING

Swipe samples will be obtained in accordance with HPO-Tt-006, *Radiation and Contamination Surveys*. Swipe samples will be documented in the sample logbook as applicable. Sample COC records shall be completed in accordance with the Base-wide SAP.

6.2.2 SOIL SAMPLING

Because standard surface soil contamination criteria for radionuclides are applicable to the average concentration in the upper 15 centimeters (cm) of soil, the sampling protocol described here is based on obtaining a sample of this upper 15 cm. Special situations, such as sampling at depths greater than 15 cm, 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 Task-specific Plans 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, using a trowel or other digging instrument.

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 or plastic 500-mL marinelli container.

4. If sample containers are not readily available, samples may be collected in a plastic bag for subsequent transport to the laboratory for sample preparation.

5. Tape the cap of the container in place or seal the ziplock plastic bag.

6. Label the sample container in accordance with Base-wide SAP.

7. Document all samples collected in the sample logbook as applicable. Sample COC records shall be completed in accordance with the Base-wide SAP.

8. Transport samples 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 6.3 of this procedure.

9. Clean or decontaminated tools will be used at each sampling location. Sampling tools will be decontaminated as described in the Base-wide SAP.

6.2.3 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. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.
3. Place as much material as practical into a 250-milliliter (mL)-wide mouth plastic bottle or plastic 500-mL marinelli container.
4. Follow steps 4 through 9 of Section 6.2.2 to complete sample collection.

6.2.4 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 or plastic 500-mL marinelli container.

2. Follow steps 4 through 9 of Section 6.2.2 to complete sample collection.

6.2.4.1 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. As much material as possible should be collected and placed into a 250-milliliter (mL)-wide mouth plastic bottle or plastic 500-mL marinelli container

3. Follow steps 4 through 9 of Section 6.2.2 to complete sample collection.

6.2.4.2 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 HPO-Tt-006, *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-milliliter (mL)-wide mouth plastic bottle or plastic 500-mL marinelli container.

3. Follow steps 4 through 9 of Section 6.2.2 to complete sample collection.

6.2.5 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. Tape the cap of the container in place.

4. Follow steps 5 through 9 of Section 6.2.2 to complete sample collection.

6.3 SAMPLE PACKAGING AND TRANSPORT

Samples will be delivered for analysis to an on-site laboratory via a box, cooler, or similar container (ice is not required if only radiological analysis will be performed) along with the completed COC. Upon arrival at the on-site laboratory, the sampler will sign the "Relinquished By" on the COC, and the laboratory manager will sign the "Received By" on the COC. The white copy of the COC will be submitted with the final analytical report of data from the on-site laboratory to the TtFW project chemist, the pink and yellow copies will be maintained by the on-site laboratory for their project files, and the manila copy will be submitted to the TtFW project chemist. A copy of the manila may also be kept in the TtFW project file on site.

Ten percent of the solid or liquid samples analyzed by the on-site laboratory will be sent to an off-site laboratory for QA purposes. Additional samples may be sent for off-site analysis, as described in applicable work planning documents. A new COC will be generated by the laboratory manager for samples designated for off-site laboratory analysis. Samples designated for transport off site will be packaged in accordance with applicable Department of Transportation (DOT) and International Air Transport Association (IATA) procedures. At a minimum, sample containers will be placed in a box, cooler, or similar container for shipment and packaged with bubble wrap or other materials as necessary to prevent container breakage.

For samples transported by an off-site laboratory courier, two custody seals will be taped across the lid of the box or cooler: one seal in the front and one seal in the back. The appropriate section(s) of the COC will be completed by the assigned courier. The box/cooler and the top two copies (white and pink) of the COC will then be released to the courier for transportation to the laboratory.

For samples shipped via a commercial carrier, the COC will include the airbill number, and the "Received By" box will be labeled with the commercial courier's name. The top two copies (white and pink) of the COC will be sealed in a resealable bag and then taped to the inside of the sample cooler lid or placed inside the box. The yellow copy of the COC will be maintained by the on-site laboratory and the manila copy will be submitted to the TtFW project chemist. A copy of the manila may also be kept in the TtFW project file on site. The box/cooler will be taped shut with strapping tape as necessary. Two custody seals will be taped across the lid: one seal in the front and one seal in the back. The pouch for the airbill will be placed on the box/cooler and secured with clear tape. The airbill will be completed for priority overnight delivery and placed in the pouch. If multiple boxes/coolers are being shipped, then the original airbill will be

placed on the box/cooler with the COC, and copies of the airbill will be placed on the other boxes/coolers. The number of packages should be included on each airbill (1 of 2, 2 of 2). Saturday deliveries should be coordinated in advance with the designated off-site laboratory and placement of "Saturday Delivery" stickers on each box and/or cooler to be shipped should be confirmed with the commercial courier prior to release. Prepared packages will also be surveyed prior to shipment.

7.0 RECORDS

Sample collection records will include field logbooks and COCs. These records will be completed and maintained in accordance with the Base-wide SAP.

8.0 REFERENCES

Number	*Title*
DCN: FWSD-RAC-04-2686	*Draft Base-wide Radiological Sampling and Analysis Plan, Revision 1, October 14, 2004*
HPO-Tt-006	*Radiation and Contamination Surveys*

9.0 ATTACHMENTS

None.

ATTACHMENT 2

EXAMPLE CHAIN-OF-CUSTODY

TETRA TECH
1230 Columbia Street, Suite 500
San Diego, CA 92101 (619) 234-8696

NUMBER

CHAIN-OF-CUSTODY RECORD

PROJECT NAME	PURCHASE ORDER NO.
PROJECT LOCATION	PROJECT NO.
SAMPLER NAME	AIRBILL NUMBER
PROJECT CONTACT	PROJECT CONTACT PHONE NUMBER

ANALYSES REQUIRED

LABORATORY NAME

LABORATORY ID (FOR LABORATORY)

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)
COMPANY	TIME	COMPANY
RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)
COMPANY	TIME	COMPANY
RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)
COMPANY	TIME	COMPANY

LABORATORY INSTRUCTIONS/COMMENTS

COMPOSITE DESCRIPTION

SAMPLE CONDITION UPON RECEIPT (FOR LABORATORY)

TEMPERATURE: _____ SAMPLE CONDITION: ? INTACT ? BROKEN

COOLER SEAL: ? INTACT ? BROKEN

SAMPLING COMMENT:

White - Laboratory; Pink - Laboratory; Canary - Project File; Manila - Data Management