FINAL

REMOVAL ACTION WORK PLAN/REMEDIAL DESIGN

Non-Time Critical Removal Action
Installation Restoration Site 12
Three Solid Waste Disposal Areas
(SWDAs A&B, 1207/1209, and 1231/1233)
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number N68711-01-D-6011
Contract Task Order 0010

Document Control Number NAV010-002-H
Revision 0

February 26, 2007

Submitted to:

U.S. Department of the Navy
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Acronyms and Abbreviations

BAAQMD	Bay Area Air Quality Management District
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
Class II AB	Class II aggregate base
CSO	Caretaker Site Office
DART	detector array rack towed
DoN	Department of the Navy
DTSC	Department of Toxic Substances Control
EE/CA	Engineering Evaluation and Cost Analysis
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
IT	IT Corporation
LEL	Lower Explosive Limit
MARSSIM	Multi-Agency Radiation Surveys and Site Investigation Manual
mg/kg	milligrams per kilogram
NAVSTA	Naval Station
Navy	U.S Department of the Navy
NTCRA	Non-Time Critical Removal Action
NWT	New World Technologies
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyls
PDR	personal data rams
POTW	publicly-owned treatment work
ROICC	Resident Officer in Charge of Construction
SAP	Sampling and Analysis Plan
SHSP	Site Health and Safety Plan
SF PUC	San Francisco Public Utilities Commission
SOP	Standard Operating Procedure
SWDA	solid-waste disposal area
SWPPP	Stormwater Pollution Prevention Plan
TI	Treasure Island
TtEMI	TetraTech EM, Inc
USA	Underground Services Alert
VOC	volatile organic compound
WMP	Waste Management Plan
yd^3	cubic yard

1.0 Introduction

This Work Plan describes the proposed Non-Time Critical Removal Action (NTCRA) activities for three solid-waste disposal areas (SWDAs) located at Installation Restoration (IR) Site 12, Old Bunker Storage Area, at the former Naval Station (NAVSTA) on Treasure Island (TI) (Figures 1 and 2). The NTCRA will reduce potential risks to human health by excavating and removing contaminated soil and debris from three of the SWDAs within IR Site 12 (SWDA A&B, SWDA 1207/1209, and SWDA 1231/1233 [Figure 3]) to a maximum depth of four feet below ground surface (bgs). The action is meant to substantially eliminate the pathways of exposure to hazardous substances for future and current residents and utility workers to the chemicals of concern in soil, including dioxin, lead, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and methane (within SWDA A&B only). This proposed NTCRA will be undertaken under the National Oil and Hazardous Substance Pollution Contingency Plan (Title 40 of the Code of Federal Regulations, Part 300), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and (Ca-HSC Section 25323).

This Work Plan was prepared under Contract Task Order (CTO) 0010 of Shaw Environmental Inc.'s (here in referred to as Shaw) Environmental Multiple Award Contract N68711-01-D-6011. All work performed under this Work Plan will follow the provisions of the *Program Health and Safety Plan for Environmental Remedial Actions, Revision 1 (Shaw, 2003).*

1.1 Scope of Work

Proposed remedial actions detailed in this Work Plan are in support of:

- Scope of Work, NTCRA for Three Solid Waste Disposal Areas, Installation Restoration Site 12, March 29, 2006 (Department of the Navy [DoN], 2006a)
- Scope of Work – Revision 1, NTCRA, August 21, 2006 (DoN, 2006b)

These scopes of work are based on the Site 12 Engineering Evaluation and Cost Analysis (EE/CA) (SulTech, 2006) and the Action Memorandum for Solid Waste Disposal Areas at Installation Restoration Site 12 (DoN, 2007 - pending). As of this writing, updates to Site 12 Action Memorandum are being finalized. This NTCRA scope of work includes the excavation of soil to a depth of 4 feet bgs in three SWDAs: SWDA A&B, SWDA 1207/1209, and SWDA 1231/1233 (Figures 4, 5, and 6, respectively). The excavation areas include residential housing common areas, backyards, and roadways. Soil beneath "hardscape", consisting of cement driveways along Westside Drive within SWDA A&B and cement beneath backyard storage sheds, will not be excavated. Sidewall and final excavation bottom samples will be collected and

analyzed for lead, dioxin, PCBs, and PAHs. Shaw will also monitor the excavations for radiological contamination through soil screening methods and soil sampling. The excavated areas will be backfilled following bottom sampling and generally restored to pre-removal action conditions.

1.2 Work Plan Organization

This Work Plan is divided into nine sections and five appendices. The Work Plan sections include:

- Section 1, Introduction, which provides background information including, project team organization, and removal action objectives;
- Section 2, Site Conditions, which provides a description of Site 12 and a summary of previous investigations;
- Section 3, Pre-Construction Activities, which describes the activities to be initiated prior to construction. Some of these activities include community relations, pre-construction meetings, permitting, traffic control, utility clearance, environmental protection, and waste characterization;
- Section 4, Construction Activities, which describes activities to be performed during the removal action. Some of these activities include land survey services, demolition, excavation in SWDAs, excavation outside SWDAs, and site restoration;
- Section 5, Waste Management, which describes waste management of liquids, soil, and miscellaneous construction debris;
- Section 6, Demobilization, which describes demobilization of construction equipment and staging areas;
- Section 7, Schedule, which provides an outline of the construction schedule;
- Section 8, Post-Construction Summary Report, which outlines the main features to be included in the Site 12 Post-Construction Summary Report; and,
- Section 9, References, which includes references used in this Work Plan.

The appendices include:

- Appendix A, which is the Stormwater Pollution Prevention Plan (SWPPP). The SWPPP describes work practices that will be employed to control stormwater runoff for construction sites / excavation areas.
- Appendix B, which is the Environmental Protection Plan (EPP). The EPP describes work practices that are designed to maintain the environment in its natural state and following construction, return sites to their pre-construction conditions to the extent practical;

- Appendix C, which is the Radiological Sampling and Analysis Plan. The plan was written to meet the requirements outlined in the Multi-Agency Radiation Survey and Site Investigation Manual.
- Appendix D, which is a Waste Management Plan (WMP). The WMP documents the requirements in the generation, storage, sampling and analysis, waste typing, transportation, treatment and ultimate disposal of all waste for the task order.
- Appendix E, which is the Site Health and Safety Plan (SHSP). The SHSP addresses health and safety hazards associated with the Site 12 NTCRA activities.
- Appendix F, which is the Sampling and Analysis Plan (SAP). The SAP details soil and waste sampling requirements, analytical methods, and quality assurance/quality control procedures to be used throughout the project.
- Appendix G, which is the Quality Control Plan (QCP). The QCP addresses lines of communication, technical review procedures, activity documentation, definable work features, quality control staff and their responsibilities, proposed outside organizations (vendors, subcontractors) and their responsibilities and reporting requirements, project inspection requirements, required submittals, and other procedures to be followed to ensure technical quality throughout this project.
- Appendix H, which contains Shaw October 12, 2006 memorandum outlining development of site specific action levels for airborne dust and lead.
- Appendix I, which contains a description of restrictions upon interrupting station operations, and Appendix J which contains selected Shaw SOPs.

1.3 Project Team Organization

The project team will consist of managers, administrators, and professionals necessary to coordinate and implement the removal activities under this CTO. A defined chain of command has been established for office and field operations. A project organization chart with contact numbers and project responsibilities is provided in Figure 7.

1.4 Removal Action Objectives

The objectives of this removal action are to:

- Provide for the protection of human health and the environment; and
- Restrict the pathway and reduce the potential for a resident or utility worker to contact chemical-contaminated soil near the ground surface (between 0 and 4 feet bgs) within the SWDAs at Site 12 under the current land use configuration.

The construction activities detailed in this Work Plan will achieve these objectives while providing a safe work environment for both the U.S Department of the Navy (Navy) contractors and housing area residents.

2.0 Site Conditions

2.1 Site History and Description

Site 12 is located on the northwest portion of TI and occupies 93-acres of land. Site 12 is relatively flat and consists of approximately 900 multiplex housing units with backyards and common area front yards, side yards and surrounding greenbelts. The area was originally used as a parking lot during the 1939-1940 Golden Gate International Exposition. After Navy occupation of the island in 1940, Site 12 was developed as bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields. The area was also used for disposal and burning of solid waste. Beginning in the 1960s, areas of Site 12 were incrementally developed into housing for Navy personnel and their dependents.

Site 12 contains four housing areas that include the 1100 housing area, the 1200 housing area, the 1300 housing area, and the 1400 housing area. Collectively there are 149 residential buildings in Site 12. Each building has between four and eight residential units. The majority of buildings within the SWDA's are unoccupied pending Navy environmental restoration activities, as summarized below, and as depicted in Figures 4, 5 and 6.

- SWDA A&B: Includes Buildings 1119, 1121, 1123, 1123, 1125, 1319, 1321, 1323, and 1325. Eight out of nine buildings are vacant; Building 1325 is occupied.
- SWDA 1207/1209: Includes Buildings 1205, 1207, 1209, 1211, 1213, and 1222. Three out of six buildings are vacant; Buildings 1205, 1211, and 1213 are occupied.
- SWDA 1231/1233: Includes Buildings 1229, 1231, 1233, 1235, and 1237. Four out of six buildings are vacant; Buildings 1235 and 1237 are occupied.

2.2 Summary of Previous Investigations and Remedial Actions

Numerous investigations and removal actions have been conducted at Site 12 over the last several years. Previous investigations and removal actions directly relevant to the removal action proposed in this Work Plan are summarized below. Details and additional references to previous investigations/removal actions may be found in the Site 12 EE/CA (SulTec, 2006).

2.2.1 Previous Investigations

In 1992 and 1995, Tetra Tech EM Inc. (TtEMI) conducted Remedial Investigations throughout Site 12, including aerial photo interpretations and subsurface sampling and analyzes. These investigations identified several areas of suspected debris disposal. One of these debris disposal areas (a debris burn pit area located on the north end of the island in an area which was subsequently developed into residential Buildings 1207 and 1209) was further characterized as having high lead concentrations in soil.

Between 1999 and 2003 more focused investigations in and around Site 12 led to the current understanding of Site 12 and the scope of the removal action included in this Work Plan.

- 1999 - A 1999-removal action at the location of the SWDA 1207/1209 burn pit revealed that debris and chemical contamination associated with debris could be more widespread than indicated in the Remedial Investigations. Consequently, previously identified debris disposal areas, namely SWDA A&B (including Building 1133), and SWDA 1231/1233 were further investigated for debris and chemicals of concern (lead).

- 2000 - In early August 2000, investigations in the vicinity of Building 1235, 1205, and 1211 led to the expansion of the 1231/1233 SWDA to include Building 1235 and the 1207/1209 SWDA to include Building 1211. There were no significant detections at the backyards of Building 1205. In June 2000 the Navy collected soil gas samples from 70 locations within Site 12. Volatile organic compounds were reported at concentrations that exceeded screening criteria at only one location (Building 1323) in SWDA A & B. Methane gas was detected at numerous locations in the SWDAs particularly along the Gateview Avenue area in SWDA A. As a follow-up, in May 2001, the Navy collected step-out soil gas samples in the SWDAs as well as the Northpoint Drive and Gateview Avenue area. Based on this follow-up investigation it was determined that the source of the methane gas was likely to be leaking natural gas pipelines in the area.

- 2001 - In March 2001, IT Corporation (IT) investigated debris and chemical contamination in and around SWDAs A & B, 1207/1209 and 1231/1233. As part of this effort, a natural gas line within SWDA A&B was disconnected, thereby removing it as a potential source of the methane gas. Later, in May 2001 the Navy performed trenching and soil sampling at 15 buildings (Buildings 1101, 1103, 1105, 1107, 1117, 1246, 1248, 1252, 1254, 1401, 1408, 1410, 1411, 1412, and 1413) which were scheduled for future leasing to the Treasure Island Homeless Development Initiative (TIHDI). The investigation identified two small areas (a small front yard shared by Building 1252 units C and D, and a small area behind Building 1413) and three larger areas of contamination (Building 1254, Buildings 1246 and 1248, and Buildings 1101, 1103, and 1107).

- 2002 - In January 2002, soil gas from near the previously abandoned natural gas pipeline in SWDA A was re-sampled. The result of this soil gas investigation was that in the majority of the soil gas sample locations methane was no longer present at concentrations exceeding the screening criterion. Two locations, however, west of Buildings 1319 and 1321 continued to have methane gas concentrations which exceeded the screening criterion.

  Additionally, the results from a soil gas investigation conducted in 2002 also showed elevated concentrations of 1,1,2,2-tetrachloroethane within soil gas samples collected from either side of the roadway, directly in front of Building 1323 (SulTec, 2006) within SWDA A&B. In addition, indoor air samples collected from Building 1323 indicated elevated concentrations of chloromethane. Consideration of the relatively

low concentrations of chloromethane detected in soil gas, however, has suggested soil gas is not a source of the chloromethane detected in indoor air at Building 1323 (SulTec, 2006).

- 2003 - From September to October 2003, based on results from previous trenching and sampling investigations, the Navy conducted additional trenching and sampling, excavating 581 exploration trenches, seven step-out trenches and seven step-out hand auger locations, to evaluate potential risks to human health and make decisions about further remedial efforts at Site 12 (Shaw 2004). The investigation was limited to the common areas outside of the SWDAs, specifically excluding areas previously remediated, areas scheduled for future remediation, and streets, sidewalks, parking areas. The results of this investigation were used to further refine the SWDA boundaries.

2.2.2 Previous Removal Actions

Four removal actions and one interim action have occurred at Site 12 since 1999. These actions are outlined below.

- A soil removal action for lead was conducted in the vicinity of Buildings 1207 and 1209, between the months of June and August 1999. About 2,200 yd^3 (cubic yards) of soil were excavated and replaced with clean fill. Confirmation soil sample data indicated concentrations of lead and other contaminants remaining in the excavation sidewalls were below the contaminants' target levels (TtEMI, 1999a).

- In November of 1999, a second soil removal action was conducted within SWDA A&B in the vicinity of Building 1133. Approximately 3,100 yd^3 of soil was excavated and replaced with clean fill. In addition to lead, the excavated soil included other contaminants such as total petroleum hydrocarbon, aluminum, and copper. Confirmation soil sample data indicated concentrations of lead and other contaminants remaining in the excavation sidewalls were below the contaminants' target levels (TtEMI, 1999b).

- A third soil removal action was conducted in the area of Halyburton and Bigelow Courts (Figure 2) in July 2000. The removal action was for PCBs (and a small quantity of PAHs). Most of the removal was around Halyburton Court. The remainder of the removal action was in and behind several backyards of Building 1101 on Bigelow Court, and a small spot between Buildings 1411 and 1413 in Flounder Court (Figure 2). Approximately 11,300 yd^3 of contaminated soil were excavated and replaced with clean fill. During this removal action, indications of debris disposal were observed between Buildings 1101 and 1103 on Bigelow Court. Confirmation soil sample data indicated concentrations of PCBs and PAHs and other contaminants remaining in the excavation sidewalls were below the contaminants' target levels (SulTec, 2006).

- A fourth soil removal action was conducted between October and November 2001 in the areas of Buildings 1252, 1254, 1246, 1248, and 1413. The main chemicals of concern near Building 1254 were PCBs. Elevated PAHs were reported in soil near

buildings 1252, 1246, 1248, and 1413. Approximately 800 yd^3 of soil were excavated. The area was then backfilled with clean fill. Confirmation soil sample data indicated concentrations of PCBs and PAHs and other contaminants remaining in the excavation sidewalls were below the contaminants' target levels (SulTec, 2006)

- Following several meetings with the California Environmental Protection Agency (EPA), Department of Toxic Substances Control (DTSC) in October 2000, the Navy agreed to take interim actions within the SWDAs of Site 12. Interim actions included fencing off some areas and placing ground cover in other areas. In January 2001 unoccupied buildings within SWDAs A&B, 1207/1209 and 1231/1233 were fenced off and the buildings were secured. At several occupied buildings near the edge of SWDAs 1207/1209 and 1231/1233 ground cover (sod and pavers) was installed.

2.3 Engineering Evaluation and Cost Analysis

The above investigations and removal actions led the Navy to conclude chemical - and solid waste-impacted soil has been found to occur in greatest concentrations within four SWDAs within Site 12. These include sites known as SWDA A&B, SWDA 1207/1209, SWDA 1231/1233, and SWDA Bigelow Court.

Five removal action alternatives were developed to address potential human health risks associated with chemical- and solid-debris -contaminated soil within the four SWDAs and were presented in the EE/CA (SulTec, 2006):

- Alternative 1: Soil excavation to 2 feet bgs with additional excavation to 6 inches below the elevation of any utility to a maximum of 4 feet bgs. Soils below hardscape (*i.e.* sidewalks and driveways) *would not* be excavated. Soils beneath roadways *would* be excavated.

- Alternative 2: Soil excavation to 2 feet bgs with additional excavation to 6 inches below the elevation of any utility to a maximum of 4 feet bgs. Soils below hardscape and unpaved areas including roadways *would* be excavated.

- Alternative 3: Soil excavation to 4 feet bgs. Soils below hardscape such as sidewalks and driveways *would not* be excavated. Soils beneath roadways *would be* excavated

- Alternative 4: Soil excavation to 4 feet bgs. Soils below hardscape and unpaved areas including roadways *would be* excavated.

- Alternative 5: Capping

2.4 Action Memorandum

The Navy finalized their decision to excavate and dispose of debris and contaminated soil from three of the four know SWDAs in general accordance with Alternative 3 after regulatory review

of and public comments on the EE/CA. The Navy's decision was documented in the Action Memorandum (DoN, 2007 – *pending*).

The Action Memorandum addressed three of the four SWDAs addressed in the EE/CA: SWDA A&B, SWDA 1207/1209, and SWDA 1231/1233. The remaining SWDA, Bigelow Court, as well as any institutional controls for Site 12, will be addressed in the Remedial Investigation/Feasibility Study phases of the CERCLA process (DoN, 2007 – *pending*).

This Work Plan has been developed to support the Navy's decision and the preferred alternative, Alternative 3. Accordingly, the following sections detail methods and materials to be used during excavation, soil screening and confirmation sampling, and site restoration.

3.0 Pre-Construction Activities

The following subsections describe activities to be initiated prior to beginning removal action construction.

3.1 Community Relations

An ongoing community outreach program will continue as part of the Site 12 housing area removal action. Meetings will also be held on a regular basis throughout the course of the project to provide updates on work progress and address any questions or concerns that residents may have. Shaw will update and attend meetings of the Restorations Advisory Board, with the Treasure Island Development Authority, the TIHDI, and John Stewart Company. Additionally, Shaw will prepare material for and notify the public of a public information session discussing the project. In addition, the U.S. Navy Base Environmental Coordinator for Treasure Island, Mr. Jim Sullivan, will be available via telephone or e-mail to respond to resident questions or concerns throughout the project duration.

3.2 Meetings

Meetings will be held routinely leading up to and throughout the project to update regulatory agencies and field workers as to the work schedule, quality control issues, and health and safety. Regulatory meetings will include monthly Base Closure Team (BCT) meetings and BCT technical meetings. Shaw will also provide support to the Navy for management briefing meetings.

Shaw will also conduct meetings routinely with our field and technical staff to ensure the project is proceeding safely and project objectives are being met. These meetings will include:

3.2.1 Pre-Construction Meeting

A pre-construction meeting will be scheduled prior to mobilization of construction equipment and personnel. The purpose of the meeting will be to discuss project-specific issues, roles of all project personnel, project schedule, health and safety concerns, and other issues that require discussion before field mobilization. The pre-construction meeting will be attended by representatives of the Navy, the Remedial Action Contractor - Shaw, the Comprehensive Long-Term Environmental Action, Navy contractor – TtEMI, Inc., San Francisco utilities, San Francisco Fire and Police Departments, and subcontractors as appropriate

3.2.2 Construction Quality Control Meetings

A Construction Quality Control meeting will be held once a week to twice per month basis throughout the course of fieldwork as described in this Work Plan. At a minimum the Navy

Resident Officer in Charge of Construction (ROICC) and the Remedial Action Contractor Quality Control officer will attend this meeting. As appropriate, other site personnel, subcontractor, and vendor representatives will attend as necessary. The agenda for the meetings will encompass the project status review, work accomplished, scheduling issues, identification of action items, and corrective measures.

3.2.3 Health and Safety Meetings

Daily health and safety meetings (tailgate meetings) will be held before starting work. All construction staff as well as subcontractors will attend these meetings and sign a tailgate summary and attendance form. The meetings will be held by the site health and safety officer and will cover various safety issues. Any subcontractor, inspector, agency, or Navy personnel that visit the site during the course of the day will be required to review and sign the tailgate summary form prior to proceeding to the site.

Shaw will also meet with TI excavation area tenants who have decided to remain in their residences during the work. The purpose of the pre-construction meeting will be to review emergency egress procedures and other health and safety topics.

3.3 Mobilization

Mobilization for this project will begin approximately one week prior to beginning construction and will continue for an estimated two week ramp-up period after construction begins. Mobilization for the Site 12 NTCRA will include procurement of materials and equipment, waste characterization sampling and analysis, establishment of construction and technical staff as well as equipment sufficient to execute the activities described in this Work Plan. During the ramp up period, staging areas for construction equipment, materials and wastes will be developed. Construction equipment, which may include water trucks, excavators, backhoes, front-end loaders, dump trucks, and bulldozers will be delivered and inspected in accordance with program health and safety requirements. All truck, machinery, and equipment will be decontaminated in accordance with Navy standards before it arrives at TI. Mobilization also includes the procurement of permits and performance of surveys, as well as the installation of environmental protection measures.

3.4 Permitting and Notification

Permits and notifications are required prior to initiating various phases of removal action activities. Permits may include the following:

- Hot work permits from Shaw's Health and Safety officer.
- A Treasure Island Dig Permit will be submitted by Shaw and approved by both the Navy and San Francisco Public Utilities Commission (SF PUC) before excavation work begins. .

As necessary, the following notifications will be made.

- Underground Services Alert (USA) buried utility clearance.
- A notification of excavation activities to the Occupational Safety and Health Administration.
- The Regional Water Quality Control Board, Bay Area Region will be notified of our construction as required in the SWPPP (Appendix A)
- Written notification will be sent to the Bay Area Air Quality Management District of the Navy's intent to remove contaminated soil (Bay Area Air Quality Management District Regulation 8, Rule 40).

3.5 Traffic Control

Construction work will be performed throughout Site 12 and may directly or indirectly impact vehicle parking areas, roadways, and pedestrian walkways. Figure 8 depicts the traffic pattern to be used during the field work; traffic routes are discussed below in Section 3.5.2. To the extent possible, Shaw and the Navy will take all necessary steps to minimize the impact on local traffic. Haul trucks entering and exiting NAVSTA TI will be required to follow specified traffic routes as shown on Figure 8. Traffic controls (*e. g.*, detours, markers, and signs) will be positioned before initiating work.

Traffic control will not be necessary on the Bay Bridge. Shaw expects a maximum of 60 truck per day will exit TI via the eastern span of the Bay Bridge; on average, approximately 40 trucks per day will exit TI. The truck off-haul schedule will run from approximately 7:30 a.m. to 5:00 p.m. Thus, at a maximum frequency, there will be a nine to 10 minute spacing between trucks leaving TI. In comparison, approximately 150 trucks per day arrived and left TI to support soil import activities performed by Shaw in December 2006/January 2007. The soil import trucks were active between 7:00 a.m. and 4:00 p.m., similar work hours to those planned for this excavation project, and no disruption of Bay Bridge traffic due to the truck traffic was observed by or reported to Shaw during the soil import activities.

3.5.1 Traffic Control Notifications

The following parties will receive this Work Plan and/or sections of the Work Plan that and the included traffic control discussion and will be notified at least two working days in advance of any construction activities that will alter traffic flow:

- San Francisco Fire Department – Treasure Island
- San Francisco Police Department – Treasure Island
- The Treasure Island Development Agency
- The ROICC

If it becomes necessary to modify the vehicular patterns described herein during the performance of the excavation work, Shaw will notify the ROICC representative before the proposed modification date.

End dump trucks will be accessing and leaving TI via the Bay Bridge. Shaw will be in contact with Caltrans throughout the project to minimize traffic impacts associated with the trucks which may impact Bay Bridge travelers and area residents.

3.5.2 Traffic Routes

Figure 8 shows the proposed traffic routes for haul trucks entering and leaving TI. This includes trucks hauling waste soil and other construction debris from TI to offsite disposal facilities and for trucks hauling clean backfill material to TI. As shown on Figure 8, trucks entering TI will head east on California Avenue to their staging area along Avenue N. Trucks will stage within this area until they are needed within the excavation areas. From the staging area they will proceed northward to the truck loading area within Site 6 or to loading areas for SWDA A&B or SWDA 1231/1233 along Perimeter Road. Trucks loaded within the Site 6 stockpile area will proceed off site via Avenue N. Trucks loaded with materials from SWDA 1231/1233 may proceed off site via Avenue N or continue westward on Perimeter Road and leave TI via Avenue of the Palms. Trucks loaded with materials from SWDA A&B will proceed off site via Perimeter Road and Avenue of the Palms. During excavation of SWDA 1207/1209, small volume dump trucks and transfer trucks will be loaded with excavated material within the SWDA and covered, then will drive to the Site 6 stockpile area via Bayside Drive, Gateview Avenue, 13th Street, and Avenue I. The dump and transfer trucks have been selected for use because they are small enough to not significantly affect normal traffic along the streets.

Truck routes and staging areas were designed to limit impacts of the removal action on TI residents. Residents may access the center of this island using 9th Street or California Avenue. However, limited street closures will need to occur throughout the project. For the safety of site residents, Perimeter Road will be closed to pedestrians Monday through Thursday. The road will be used by end dumps and other equipment during the week and secured during non-work hours to discourage non-permitted entrance by residents into the excavation work areas.

Sections of Perimeter Road will be accessible to the public on non-excavation work days (*i.e.* Friday, Saturday, and Sunday), however. As shown on Figure 9, Shaw will install gates at four locations along Perimeter Road. The gates will be open during excavation days to allow end dump traffic; the gates will be closed on non-work days to both restrict access to excavation areas and allow safe access to Perimeter Road.

As shown on Figure 8, the staging area for trucks serving all three excavations will be along Avenue N and within the parking lot north of Building 570. No public-use parking will be

allowed within these areas during work hours. Additionally, to facilitate excavation within SWDA 1207/1209, Shaw will close the northernmost section of Bayside Drive to through traffic and will restrict public parking along Bayside Drive between January 2007 and June 2007 (approximately). Parking restrictions to be enacted during the excavation, backfill, and restoration work are described in Table 1 and within the approved SHSP (Appendix E).

Shaw will place appropriate signs to alert TI residents and drivers to changed conditions due to construction traffic. Truck drivers and Shaw personnel will operate using standard traffic patterns and rules, and will not exceed area speed limits.

3.6 Utility Clearance

Prior to beginning excavations, buried utilities will be identified and, to the extent possible, located. During previous removal actions within Site 12, Shaw has found that utilities are installed with plastic or clay pipe and are not locatable using conventional geophysical methods. Therefore, geophysical equipment will not be used to identify buried utilities. Utility location clearance will be based on review of Navy utility drawings by Shaw personnel, field observations, and notification to USA. Prior to beginning excavation, proposed excavation areas will be marked in the field using white paint. The marked area will be larger than the proposed excavation to ensure adequate coverage of utility clearance. Utility line locations identified during review of Navy utility drawings will be marked by Shaw using color-coded surveyor paint and American Public Works Association (APWA)-approved colors. Field observations of surface expressions (cleanouts, risers, manholes) will be used as guides during the utility marking work. Additionally, local utility providers will be notified through USA (at a minimum of 48 hours prior to beginning fieldwork) to field locate their buried utilities within the proposed excavation boundaries. A meeting or conference call may be scheduled with all interested utilities that may potentially be affected by the excavation.

3.6.1 Utility Protection

Prior to beginning excavations, Vic Zurzynski, the SF PUC manager at NAVSTA TI will be notified through the excavation permitting process. Shaw will coordinate all field work activities closely with the SF PUC and Michael Mentink (Navy Caretaker Site Office [CSO]).

During excavation activities in the vicinity of identified utilities, a construction laborer (spotter) may be used to guide excavation equipment and view excavations for buried utilities as soil is removed. Hard pipes (steel, small PVC) will be maintained as much as possible during the excavation. Brittle pipes (vitrous clay) will be demolished and replaced. Abandoned utilities (especially transite pipe) may either be removed to a depth of 4 feet or left in place; these utilities are no longer active and will not be replaced. In the event an active utility line is broken or damaged, the NAVSTA TI utility manger will be contacted and, as appropriate, affected people

will be notified. Utilities will be repaired by Shaw, Hetch-Hetchy Electrical, and/or other subcontractors as appropriate. Broken or damaged utilities will be replaced in-kind or with other materials which meet current industry standards (*i.e.* clay drainpipes may be replaced with acrylonitrile butadiene styrene piping, steel water pipes may be replaced with PVC piping).

Few power poles are located in the vicinity of planned excavation areas. Excavations in the vicinity of power poles will be performed incrementally so that the power poles are not undermined. Based on a field evaluation of subsurface conditions in the vicinity of power poles, Hetch-Hetchy Electrical may be contacted to provide support for power poles prior to excavation.

Shaw does not anticipate any planned interruptions to utilities during excavation within the three SWDAs. However, in the event of an unexpected interruption, Shaw will work with the SF PUC, Navy CSO, Hetch-Hetchy Power, and/or other subcontractors to remedy the outage so disruption to site residents is minimal. If interruptions are required based on field conditions, the interruptions will be made during normal working hours and according to the general requirements described in Section 2.4.1 of the March 29, 2006 SOW.

3.7 Site Survey / Environmental Conditions Report

Prior to starting work, an environmental pre-construction survey will be performed by Shaw with the Base Realignment and Closure Remedial Project Manager, CSO representative, and ROICC representative. Photos of the existing environmental conditions on and adjacent to the site will be taken to document pre-construction conditions. Additionally, a California-registered land surveyor will be used to document site conditions prior to excavation, excavation boundaries, and post excavation drainage conditions. A field geologist using a tape measure and/or hand-level will record other features. Land survey services will be performed in accordance with Shaw (formerly IT Corporation) Standard Operating Procedure (SOP) 23.1, *Revision 0, Land Surveying Standard Operating Procedure* (IT, 1995).

3.8 Preparation of Residential Buildings

Shaw will perform measures to limit and suppress dust in the air to “zero visible dust” to limit the impact of fugitive dust to the occupied residential buildings in the excavation area. Measures may include taping and sealing windows and doors with plastic sheeting or covering parts of the building with tarps. Tarps will be installed so that emergency egress is not restricted. In instances where excavation will occur at locations both in front and behind a building, residents will be temporarily displaced. As an additional dust control measure, Shaw will install mesh screens on the temporary fences installed south of Buildings 1235 and 1233, and east of Building 1205.

Based on the tenant occupancy information available to Shaw as of this writing and the planned excavation methods, dust control measures will be installed on the following buildings and or units:

Solid Waste Disposal Area (Figure)	Building Number - Street Association	Unit Numbers	Dust Control Measures / Comments
SWDA A&B (Figure 4)	Building 1325 – Westside Drive	All Units (Units A through D)	Doors and windows on the front of all of Building 1325's units will be tarped for approximately 1 month during excavation and backfill work. Resident will have access to their units through the backyards.
SWDA 1207/1209 (Figure 5)	Building 1205 – Bayside Drive	Units D, E, and F	The fronts of Units D, E, and F will have doors and windows tarped for approximately 3 weeks during the excavation and backfill work in front of the building. Resident will have access to their units through the backyards.
	Building 1211 – Bayside Drive	All Units (Units A through F)	All windows and doors on the front and back of Building 1211 will be tarped. Building residents will be temporarily displaced for approximately 5.5 months during excavation work around the building.
	Building 1213 – Bayside Drive	All Units (Units A through F)	All windows and doors on the front and back of the building will be tarped. Building residents will be temporarily displaced for approximately 5.5 months during excavation work around the building.
SWDA 1231/1233 (Figure 6)	Building 1235 – North Point Drive	All Units (Units A through F)	All windows and doors on the back of the building will be tarped for approximately 2.5 months during excavation and backfill work behind the building. Residents who may be temporarily be displaced to Units D or E will only have access through the front.
		Units A, B, and C	All windows and doors on the front and back of these units will be tarped for approximately 2.5 months.
	Building 1237 – North Point Drive	All Units (Units A and B)	Windows and doors on the back of the Building 1237 Units A and B will be tarped for approximately 2.5 months during excavation and backfill work behind the building. Residents will only have access through the front.

Specific impacts associated with dust control measures, traffic restrictions/parking, and temporary displacements are further summarized in Table 1 and within the approved SHSP (Appendix E).

3.9 Environmental Protection

All excavation work performed under this Work Plan will be performed in accordance with the EPP as presented in Appendix B and the SWPPP in Appendix A. Provisions in these plans include protection of air resources, noise control, protection of surface water and groundwater resources, protection of land resources such as landscaping beyond the work area, and historical finds.

4.0 Construction Activities

The following subsections describe activities to be performed during the Site 12 NTCRA construction.

4.1 Radiological Soil Screening

Radiological contamination is not a site Contaminant of Concern (COC). However, screening of excavated soils for radiological contamination was recommended for the Site 12 SWDAs in the Historical Radiological Assessment Report for NAVSTA TI prepared by Weston in 2006 (DoN, 2006a). Weston identified Radium-226 (^{226}RA) as the radionuclide of concern. Accordingly, soil to be excavated within the SWDAs will be field screened and sampled for ^{226}Ra during the excavation. Radiological screening will be performed by New World Technologies (NWT); Shaw will collect 240 soil samples for radiological analysis. Radiological contaminants are not a contaminant of concern and the field tests are meant to characterize the soil prior to disposal; the purpose of bottom sampling is to document remaining radiological soil impacts, if any. Soils will be screened for radiological materials in accordance with the Radiological Sampling and Analysis Plan (Appendix C) which meets the requirements outlined in the Multi-Agency Radiation Surveys and Site Investigation Manual (MARSSIM) and will be reviewed and approved by Radiological Affairs Support Office.

Historic site uses, historic radiological sampling of the work areas, and regulatory references detailed in Appendix C indicate that the excavation areas should be classified as MARSSIM Class 2 areas. As such, each of the three SWDAs will undergo a 50 percent scan survey for gamma radiation. Up to 16 soil samples will be collected from each vertical foot of excavated soil within each of the three SWDAs. Samples collected from depths of 1, and 3 feet bgs will be analyzed by a mobile laboratory stationed at TI during the project. Samples collected from the excavation bottom (*i.e.* 4 feet bgs) will be analyzed at an off-site laboratory. All 240 samples will be analyzed for radiological contamination using gamma spectroscopy. Soil sampling is discussed in Section 4.6.4.3 and is detailed in the SAP (Appendix F). Screening equipment will measure ^{226}RA readings in the excavation areas against up to 16 reference (*i.e.* ambient) readings measured by NWT within a designated background area.

Radiological screening will be performed by NWT using detector array rack towed (DART) equipment. The DART equipment consists of a Ludlum Model 4612 Counter and 12 Ludlum Model 44-10 sodium iodide (NaI) probes supported by global positioning system (GPS) equipment. The equipment is mounted on a trailer and will be towed across excavation areas using an all terrain vehicle. The detectors are capable of screening a one-foot thick layer of soil, based on NWT's understanding of soil conditions at TI. Therefore, the excavations and

radiological screening will proceed as follows: 1) surface soil within the excavation areas will be sampled and screened using the DART, 2) if DART results indicate the surface one foot of soil does not contain radiological contamination, the screened one foot thick soil layer will be excavated and off-hauled. Soil screening/sampling and excavation will proceed in sequential one foot thick layers until the final depth of four feet bgs is reached. Soil sampling for radiological contamination will be performed at 16 locations collected from each one foot thickness (*i.e.* lift) of screened soil. Soil screening and sampling will be performed in accordance with the Radiological Sampling and Analysis Plan (Appendix C) and the MARSSIM class 2 survey unit rationale. Accordingly, one survey unit is defined as the entire surface area of a one-foot excavation surface within one SWDA; therefore, there will be five survey units in each SWDA, from the surface to 4 feet bgs. Each survey unit will be field screened over 50% of its surface area and sixteen soil samples will be collected at evenly spaced locations within that 50% area for laboratory analysis.

This process will be used as the excavation progresses to a total depth of 4 feet bgs. If DART screening suggests radiological contamination, the elevated measurement location will be recorded by the GPS equipment and flagged. Hand-held equipment featuring NaI detectors will be used by NWT to perform one-minute static readings at the flagged location to confirm the initial measurements. Additional soil samples may be collected in areas confirmed to contain elevated radiation readings. Any radiological contaminated soils will be excavated by Shaw and stockpiled within Site 6 for further characterization.

4.2 Waste Characterization and Disposal

Soil within proposed excavation areas will be characterized for waste disposal purposes before excavation activities begin. Based on the findings of the pre-excavation sampling, excavation areas may be subdivided so that excavation equipment may target areas of soil which share common waste disposal requirements. In general, excavated soil and other debris will be loaded directly onto end dumps which will proceed directly to the appropriate disposal site. During this removal action it is possible that unforeseen conditions (for instance, the observed presence of hydrocarbon staining or odors) which may require additional waste characterization. Waste characterization will be performed as described in the WMP (Appendix D). Offsite transportation shall be performed by a licensed contractor.

Concrete waste and asphalt waste generated during the removal of patios, sidewalks, gutters, and roadways will be recycled or disposed of offsite. All other debris will be disposed of offsite in accordance with appropriate regulations.

Liquid waste (waste water) generated during decontamination activities and any water generated during excavation dewatering activities, if any, will be characterized prior to disposal. Waste water will be disposed to the NAVSTA TI Publicly Owned Treatment Works (POTW) unless

analytical data indicates it exceeds disposal thresholds. If analytical results indicate contaminant concentrations exceed disposal thresholds, the water will be disposed of offsite in accordance with appropriate regulations.

Soil which DART equipment suggests is contaminated with radiological materials will be excavated and transported to the Site 6 stockpile area. The soil will be covered during transport. The stockpiled soil may be further characterized in accordance with Navy direction.

4.3 Site Safety and Security

A trained and qualified Health and Safety Officer or their suitable and qualified designee will be onsite during all excavation and removal activities and will have authority to stop work if conditions warrant. All work will be performed in accordance with the approved SHSP (Appendix E). To assist in identification of project team members, field crews will wear blue Tyvek® for all aspects of the field work.

Safe and secure work areas will be maintained for the housing area residents and environmental contractors during all phases of construction. A subcontracted security guard will patrol SWDA area building areas and resident storage areas. As outlined below and as discussed in detail within the SHSP (Appendix E), activities to maintain safe and secure work areas include perimeter air monitoring, establishment/maintenance of construction area exclusion zones, providing for tenant safety around exclusion zones, and dust control.

4.3.1 Exclusion Zones

Construction area exclusion zones will be delineated with yellow caution tape, barricades, or fencing prior to beginning construction. The exclusion zone will remain in place during demolition, excavation, and backfill activities. In areas where multiple building backyards face a large common area, the entire common area may be an exclusion zone. This large area will serve for equipment storage and decontamination area for multiple work areas.

4.3.2 Tenant Safety

During construction activities adjacent to occupied buildings, tenant backyards and common areas will be within the exclusion zone. Access to the exclusion zone will be restricted to authorized Navy and Navy contractor personnel, except in the event of an emergency when area residents may need to enter an exclusion zone as an escape route, as discussed below. Temporary fencing will be installed where needed around exclusion zones to limit access. Proposed temporary fence locations are shown on Figures 4, 5, and 6.

Egress from at least two parts of occupied building units will be maintained during the excavation work to allow for emergency exits. During non-working hours, appropriately sized temporary ramps, steps or other suitable measures will be placed at appropriate locations so that

egress from occupied building units is not restricted. During working hours, excavation personnel will be available to assist emergency egress. Additionally, tarps which will be installed at select locations (as discussed below) to control dust will be perforated to ensure emergency exits are not blocked. The tarps will be installed in a manner that allows children to perform emergency egress.

4.3.3 Dust Control

During all phases of construction dust control practices will be followed to limit and suppress dust in the air to "zero visible dust" At the excavation areas and at the Site 6 soil management area. Dust control will include maintaining a clean work environment, covering soil in transit, covering stockpiles of imported and waste soil, and spraying water on active construction sites as necessary. Mesh screening may be fitted to temporary fencing in select areas as an additional dust control measure. The effectiveness of dust control measures will be monitored and verified through air monitoring, as discussed below. If air monitoring suggests engineering controls are not fully managing construction generated dust, work will be stopped and engineering controls will be re-evaluated.

4.3.4 Air Monitoring

High-volume perimeter air monitoring will be performed during excavation activities to provide data to verify effective dust control and corresponding non-exposure of site workers and Site 12 residents to PAHs, PCBs, and lead. In addition, air quality monitors will monitor particulate concentrations in air at multiple locations within each SWDA and at select locations adjacent to occupied and potentially impacted residences. Air sampling methods and procedures are detailed in the approved-SHSP (Appendix E).

Four high-volume air sampling stations will be operated by Shaw during the excavation work. One air sampling station will be located on the upwind side of Site 12 to collect "background" samples. Three additional air sampling stations will be established downwind of the three excavations, one station at each excavation. Based on our experience, we expect the upwind sample station to be positioned west of SWDA A&B. We expect the downwind samplers to be positioned on the southeast sides of their respective excavation area. However, Shaw will monitor wind direction on a daily basis and may reposition air sampling stations during the project to account for varying conditions and to maintain and/or optimize their downwind positions.

Individual samples for PCBs and PAHs will be collected in accordance with EPA Methods TO-4A and TO-13, respectively using separate GMW PS-1 PUF samplers. Lead samples will be collected at each station using a third high-volume sampler identified as a GMW TSP sampler. Lead samples will be collected in accordance with EPA Method IO-2.1.

The sample schedule at each of the four stations will be as follows:

- Daily samples will be collected for PCBs, PAHs, and lead for three days before excavation work begins. Data from these samples will be used as background measurements.
- Daily samples for PCBs, PAHs, and lead will also be collected during each of the first four days (*i.e.* first full work week) of excavation.
- Following the first week of excavation, Shaw will collect daily high volume samples for lead only at the four Site 12 locations. Samples for PAHs and PCBs will not be collected during the remainder of the excavation work unless lead data and/or air quality monitoring (discussed below) suggest airborne contaminant concentrations are of concern. Shaw will collect daily lead samples from the upwind sample station throughout the duration of excavation work. High-volume lead samples will be collected at SWDA excavation-downwind locations for the full duration of excavation work at their respective SWDA.
- Shaw will collect daily high volume samples for lead, PAHs, and PCBs on each of three days following site restoration to confirm the effectiveness of the removal action.

In addition to high-volume sampling for specific analytes, Shaw will operate air quality (*i.e.* airborne dust) monitoring equipment at locations upwind and down wind of each excavation and at selected residences to assess dust concentrations. Air quality meters will also be positioned at each air sampling station and within the Site 6 stockpile area. Air quality monitoring equipment will consist of personal data rams (PDRs) calibrated to record total dust concentrations. Two PDRs will be used at each excavation: one will be stationed outside and downwind of the excavation and a second PDR will be carried by a worker or within construction equipment (at locations considered to be most likely to be exposed to lead-impacted dust). PDRs will also be operated at appropriate locations upwind and adjacent to occupied residences within the excavation area. Buildings scheduled for air quality monitoring include Building 1325, 1205 and 1224, 1235 and 1237. At least two meters, one within the work area and one near the downwind perimeter, will be monitored within Site 6. PDR monitoring results will be checked frequently during each day and Shaw will revise the construction/engineering controls to limit further emissions, if airborne dust concentrations:

- Exceed 2.5 milligrams per cubic meter (mg/m3) for a sustained interval (5 readings sustained for one minute or more above the action level during a 15 minute time span) within the exclusion zone or
- Exceed 1.0 mg/m3 at or beyond the exclusion zone perimeter.

These limits are based on a thorough review of site data for lead by a Shaw Certified Industrial Hygienist (CIH). These conservative site-specific action levels (SSALs) are protective of worker and resident health and ensure compliance with Bay Area Air Quality Management District

(BAAQMD) Regulation 11, Rule 1 which limits ground level lead emissions and BAAQMD Regulation 6-305 for particulate matter and visible emissions. Shaw's CIH prepared a memorandum on October 12, 2006 which outlines the development of these SSALs. The memorandum is included as Appendix H.

In addition, periodic air monitoring of methane and lower explosive limit (LEL) concentrations will be performed during excavation of soils within SWDA A&B using a combustible gas meter and a Flame Ionization Detector (FID) in accordance with BAAQMD Regulation 8-40-604. The measurements will be collected to ensure 1) worker and resident safety and 2) methane emissions do not exceed BAAQMD standards discussed in Section 4.6.1. Accordingly, if LEL concentrations exceed 10 percent at any time during excavation within the methane affected part of SWDA A&B, the work area will be sprayed with water to reduce methane concentrations in air and the exaction work will resume.

Lastly, a meteorological (MET) station will be operated by Shaw during the project. The MET station will provide summaries of weather conditions (such as fog, humidity) which may affect air monitoring results.

4.4 Land Survey Services

As noted above, a land surveyor will be used to prepare a survey map of site conditions prior to excavation. During and after the excavation, a land surveyor will document excavation boundaries, final confirmation sample locations, and post excavation drainage conditions. All survey points will include elevation. A field geologist using a tape measure and/or hand-level will record other features, as necessary. Features to be surveyed include:

- Backyard Fence Lines - Backyard fence lines and gate locations will be surveyed prior to demolition. After backfilling, fence alignments will be re-staked to allow for restoration along the same pre-construction alignment.
- Pre-excavation Ground Surface Elevation - Ground surface elevations will be surveyed prior to excavation to document pre-excavation topographic conditions.
- Initial Excavation - Initial excavation areas are as provided in Figures 4, 5, and 6. At most locations the area of proposed initial excavation can be field located with a tape measure based on distance from cultural features (fence lines, buildings, sidewalks, *etc.*). However, if such features are not available or reliable, the initial excavation extent may be located by the land surveyor.
- Excavation Extent - The excavation lateral and vertical extent will be surveyed to a datum to document compliance with Work Plan objectives. These measurements will be recorded on as-built plans.

- Final soil confirmation sample locations – Final soil sample locations, including final excavation sidewall, bottom, and radiological samples, will be surveyed to a datum to document both compliance with Work Plan objectives and the location(s) of areas where site contaminants exceeding clean-up goals may remain, if any.
- Post-excavation Ground Surface Elevation - Ground surface elevations will be surveyed following backfilling or restoration to document post-excavation topographic conditions (including verification that local drainage is away from buildings).
- Miscellaneous Features - Locations of features that require demolition and subsequent restoration will be recorded prior to demolition. These features include sidewalks, walkways, buried utilities, and possibly backyard patios and front porches. The locations of these features will be documented accurately and efficiently. Where appropriate, permanent landmarks might be marked (*e.g.* spray-painting porch locations on building foundations, painting walkway endpoints on curbs). Standardized features such as patios and porches will be measured by field personnel and recorded in daily reports. Identified buried facilities, such as utilities, may be professionally surveyed or, if survey crews are not available within the construction schedule, measured by field geologists.

4.5 Site Preparation

The following site preparation activities will be performed, when appropriate, at each excavation location.

4.5.1 Site Access

Many work areas will be accessible for construction equipment through existing roadways. In some areas it may be necessary to access work areas through common areas not included in this removal action. During wet weather, access through common areas may require construction of a temporary road. Temporary access roads will be constructed of clean imported material that may include drain rock, pea gravel, sand, or engineered (compacted) fill. Other activities associated with providing site access may include fencing off the access roads, removal of vegetation, removal of moveable features (tot-lots, mail boxes, *etc.*). Following construction activities, the temporary access road will be removed, the area re-graded and restored as described in Section 4.7, (Site Restoration).

4.5.2 Demolition

In preparation for construction, all features (mostly backyard fences, Westside Drive, lengths of Bayside Drive, and vegetation) within the proposed excavation areas will be demolished/removed. Debris will either be direct loaded onto end dumps or be transported by dump trucks or other appropriate equipment to a loading area.

<u>Tenant Property -</u> Prior to demolition, effected tenants will be notified (through the community relations program) of the construction schedule and advised to remove all personal property from

the construction area. Storage facilities (*i.e.* Conex boxes) will be provided for backyard movable property. Residents will also be advised to salvage any personal potted backyard landscaping but may not remove any landscaping rooted in the ground. Any remaining landscaping will be removed and disposed with the other vegetation. Tenants must provide their own locks and will load their own belongings.

Backyard Fencing - Backyard fencing and fence posts (and concrete bases) will be removed using appropriately sized construction equipment (backhoe or excavator). Fence debris will be loaded into end dump trucks or smaller dump trucks / front end loaders and transported to a waste soil/debris staging area for offsite recycling or disposal.

Cyclone fencing - Cyclone fencing comprising the current SWDA boundaries (Figures 2, 3, and 4) will be removed where needed to provide access to equipment. Fence posts will be excavated and cyclone fencing will be cut or crushed into manageable lengths for offsite disposal or re-use.

Vegetation - Shrubs/bushes will be removed using appropriately sized construction equipment (backhoe or excavator) by pulling them from the ground and/or digging them out. The roots will then be excavated using appropriately sized equipment. Remnant roots will be loaded into dump trucks and transported to a waste soil/debris staging area for offsite disposal with the associated contaminated soil. The main body of the vegetation may also be loaded into dump trucks and transported to the Site 6 waste soil/debris staging area for offsite disposal. For larger trees, selective removal of upper branches may be required prior to removing the tree. Precautions will be taken to ensure that overhead utilities and other above ground structures are protected during tree removal.

Concrete and Asphalted Surfaces- Certain parts of the project will require demolition of backyard patios, front porches, sidewalks, curbs, gutters, and other concrete or asphalted surfaces. Prior to demolition these features will be located using a survey or field measurements. Generally, these features can be pulled from the ground as a single unit, broken up, and loaded into end dumps or dump trucks and transported to a waste soil/debris staging area for offsite recycling. However, in-situ demolition with a jackhammer or other equipment may be needed.

- *Backyard Patios and Front Porches* - In some locations which patios or porches are connected to adjacent units, the features may be saw cut along the unit boundary prior to demolition.
- *Sidewalks and Walkways* - In areas where it is necessary, sidewalks and walkways will be saw cut or separated along cold joints or expansion joints prior to demolition.
- *Curbs and Gutters* - In areas where it is necessary, curbs and gutters will be saw cut or separated along cold joints or expansion joints prior to demolition.

- *Asphalted Areas* - Saw cut edges will not be required until restoration of the asphalt. Asphalt will be selectively excavated using excavation equipment. Removed asphalt will be loaded into dump trucks and transported to a waste soil/debris staging area for offsite recycling.

4.6 Excavation

Depending on accessibility of construction equipment and digging conditions, excavations will be performed by a combination of mechanical equipment (excavators, mini-excavators, and backhoes) and hand digging. All areas will be excavated to 4 feet bgs. To allow for radiological screening of soils, the excavations will progress in one foot intervals. Surface soil will be sampled and screened using the DART equipment before the first foot of soil is excavated. Once the surface layer of soil is verified free of radiological contamination it will be excavated and transported away from the area. Soil present at depths between 1 and 2 feet bgs with then be sampled and screened using DART equipment before they are excavated.

Excavation of soil and debris within most of the three SWDAs will proceed according to this schedule (*i.e.* one foot of depth excavated followed by DART screening) until four feet of soil is excavated. However, select areas will be excavated on an expedited schedule to minimize inconvenience to area residents. For instance, land in front of Building 1205 (SWDA 1207/1209, Figure 5) will be excavated to four feet bgs without performance of radiological screening at one foot intervals. At this location, and other areas where expedited excavation may be recommended based on field conditions, the four feet of excavated (non-screened) soil will be deposited in a one foot-thick layer within a nearby part of the respective SWDA. Radiological screening will be performed on the soil within the stockpile area and, following screening; soil will then be loaded onto trucks and removed from the site. Backfill operations will begin shortly after excavation and collection of confirmation samples within these “expedited removal” areas to reduce the time the select excavations are open and to minimize inconvenience to affected residents.

Based on the findings of pre-excavation characterization samples and the waste disposal characteristics of soil within excavation areas, Shaw may subdivide excavation areas using wooden stakes or other markers before excavation begins. The markings will allow Shaw to excavate and direct load soils which have the same disposal criteria and will facilitate orderly off site transport and documentation of waste management.

Upon completion of excavation to the initial boundaries, the excavation bottom and sidewalls will be visually inspected for evidence of solid waste. If solid waste is observed in the excavation sidewalls, the type of solid waste and approximate area will be noted. Photographs will be taken as appropriate. Confirmation soil samples will be collected from the excavation by Shaw and selectively analyzed for lead, PAHs, PCBs, dioxins, and radiological contamination.

Confirmation sampling methods, rationale, and schedule are discussed in section 4.6.4.3 of this Work Plan and are detailed in the SAP (Appendix F). Lead is a primary driver of the excavation and sidewalls samples analyzed for lead will be analyzed on an expedited (*i.e.* 48 hour) turn-around schedule. Excavations may be extended laterally if sidewall-sample analytical results suggest remaining contaminant concentrations exceed action levels. Action levels are detailed in Section 4.6.4.4. Excavation bottom samples will be used to document remaining soil contaminant concentrations and excavation depths will not exceed 4 feet bgs. Because excavation depths will not be increased based on bottom sample analytical results, backfilling may begin following bottom sample collection. Restoration will be scheduled to occur after backfilling within each of the excavations has been completed. Shaw will restore backyard fences, porches and patios at occupied building units only; excavation areas at unoccupied residences will be restored with grass seed.

Excavations will be completed in three SWDAs within Site 12: SWDA A&B, SWDA 1207/1209, and SWDA 1231/1233. Prior to excavation, initial excavation boundaries of the SWDAs, as provided in Figures 4, 5, and 6 will be located and marked. The three excavations may be conducted simultaneously. Excavation area limits, and methods to be used for waste transport and restoration within the three SWDAs, are summarized separately in the following subsections.

Excavation procedures are further described in Section 4.6.4.

4.6.1 SWDA Area A&B - Excavation

Figure 4 depicts the excavation area within SWDA Area A&B. Shaw will remove a large section of Westside Drive within SWDA A&B, including the gutters and sidewalks. Shaw will excavate soil beneath the road to a maximum depth of 4 feet bgs. The concrete driveways and carports along the road will remain in place and the soil beneath this “hardscape” will not be excavated. Shaw will also remove paving and excavate to four feet bgs beneath an asphalt roadway extending from near Perimeter Road to Lester Court.

In addition, Shaw will also excavate all of the backyards of Building 1321 and the back yards of Units G and H of Building 1119. Shaw will also excavate all of the backyards and common areas surrounding Buildings 1121 and 1123; the front yards of Building 1125 Units A, B, and C and a section of land immediately east of Building 1125 Unit A; the front yards of the western units of Building 1319 (units D, E, and F); and common areas in front of Buildings 1321, 1323, and 1325.

Methane has been detected in soil gas samples collected west of Buildings 1319 and 1321 within SWDA A&B (Figure 4). Historic sample data for the area reviewed by the Navy indicates methane and other organics are present in the material at less than 50 parts per million by weight

(ppmw). This information, as well as the scheduled excavation duration of less than three months, qualifies the area as exempt from controls on contaminated soil aeration (BAAQMD, Regulation 8, Rule 40-301). Despite the area's exemption, periodic air monitoring of methane and lower explosive limit (LEL) concentrations will be performed during excavation of soils within this area using a combustible gas meter and a Flame Ionization Detector (FID) in accordance with BAAQMD Manual of Procedures, Volume IV, ST-7. The measurements will be collected to ensure 1) worker and resident safety and 2) methane emissions of less than 459 cubic meters per day, the most stringent emissions control standard for non-exempt excavation projects. Accordingly, if LEL concentrations exceed 10 percent at any time during the excavation, work in the area will be stopped briefly to allow methane concentrations to dissipate.

If methane concentrations are detected at the excavation bottom following excavation, the Navy will make a risk management decision on whether to deepen or expand the excavation, as further discussed in Section 4.6.4.4.

If methane concentrations are detected at the excavation bottom following excavation, the Navy will make a risk management decision on whether to deepen or expand the excavation, as farther discussed in Section 4.6.4.4.

4.6.1.1 SWDA A&B - Waste Transport

Soil excavated within SWDA A&B will be either loaded directly onto end dump trucks stationed temporarily on Perimeter Road, or will be placed in temporary stockpiles by the excavation equipment and loaded onto end dumps stationed temporarily on Perimeter Road by loaders or back hoes. Once they are full, end dumps will proceed offsite.

4.6.1.2 SWDA A&B Restoration

The excavation area within Westside Drive will be backfilled with clean fill, compacted, and a gravel surface will be placed on top. The asphalt road, concrete sidewalks, and concrete gutters will not be replaced.

Following the completion of excavation and waste transport out of the area, common areas and yards will be backfilled to pre-excavation grades. Backfill procedures and requirements are detailed in Section 4.7.1. Final restoration of land in front of the building will be performed in concert with restoration of other SWDA A&B areas. Porches, patios, and fencing at occupied residences will be restored. Backfill and restoration methods are described in Section 4.7.

4.6.2 SWDA 1207/1209 - Excavation

The excavation limits planned for SWDA 1207/1209 are shown on Figure 5 and include backyards and common areas behind Buildings 1211 and 1213. All of Building 1207's six

backyards will also be excavated, as well as the front yards of Units A, B, C, and D of Building 1207. The front yards of Units E and F in Building 1205 and all of the front yards and the car port areas of Building 1222 will be excavated. The front yard of Units A and F of Building 1211 and Units C through H of Building 1209 will be excavated. Also, the land in between Buildings 1209 and 1211, and all of the front yards of Building 1213 will be excavated.

Shaw will remove the portions of Bayside Drive within the SWDA in front of Building 1209 and between Building 1207 Unit C and Building 1222 Unit F to a maximum depth of 4 feet bgs. Gutters, sidewalks, and carports along the portion of road will be removed and soils beneath them will be included in the excavation. The work will require closing of the road within the work area for the duration of the project.

The excavation will proceed simultaneously with excavations in the other SWDAs. Excavation in front of Buildings 1205 and 1207 will be expedited to minimize inconvenience to building residents. Shaw will excavate in front of Buildings 1205 and 1207 to a depth of 4 feet without screening or sampling for radiological contamination. The excavated soil will be placed temporarily in a one foot high stockpile within the SWDA. The stockpiled soil will be screened using the DART equipment and sampled prior to offhaul or transport to a waste soil/debris staging area. During excavation in their vicinity, Shaw will work to minimize impacts to carports in front of Buildings 1205 and 1211.

4.6.2.1 SWDA 1207/1209 Waste Transport

Wastes excavated from within SWDA 1207/1209 will be loaded onto small-volume dump trucks and transfer trucks which will transport the materials to a stockpile area within Site 6 (Figure 8). Excavated materials and debris, including concrete from demolished gutters, sidewalks and carports, as well as excavated soil, will be temporarily placed in separate stockpiles within Site 6. Loaders operating within Site 6 will load the materials into end dumps for offsite transport and disposal/recycling.

Waste transport plans for SWDA 1207/1209 varies from plans for SWDA A&B and SWDA 1231/1233 because the SWDA is relatively low compared to Perimeter Road. Because the excavation areas are situated well below Perimeter Road's grade, direct loading of end dump trucks stationed along Perimeter Road is not feasible using standard construction equipment. Small capacity dump trucks and transfer trucks have been selected to transport materials from SWDA 1207/1209 because they are small enough to not affect traffic on surface streets on their route to stockpile areas within Site 6. Traffic routes are discussed in Section 3.5.2 of this Work Plan.

4.6.2.2 SWDA 1207/1209 Restoration

Following the completion of excavation and waste transport out of the area, common areas and yards will be backfilled to pre-excavation grades. Backfill procedures and requirements are detailed in Section 4.7.1. Final restoration of land in front of the building will be performed in concert with restoration of other SWDA 1207/1209 areas. Porches, patios, and fencing at occupied residences will be restored. Backfill and restoration methods are described in Section 4.7.

The excavation within Bayside Drive will be restored by placing and compacting suitable clean fill in the road and carport areas. A new roadbase and asphalt surface will be installed in accordance with city of San Francisco construction requirements. Carports will not be replaced. Porches, patios, and fencing at occupied residences will be restored. Backfill and restoration methods are described in Section 4.7.

4.6.3 SWDA 1231/1233 Excavation

Figure 6 depicts the excavation limits within SWDA 1231/1233. Backyards and common areas behind and between Buildings 1231, 1233, 1235, and Building 1237 Unit A will be excavated. Lead impacted soil west of Building 1231 will be excavated, as will soil in front of Building 1233 Units E and F and Building 1235 Units A and B. Carports in front of Buildings 1233 and 1235 will not be removed, if possible.

4.6.3.1 SWDA 1231/1233 Waste Transport

Soil excavated within SWDA 1231/1233 will be either loaded directly onto end dump trucks stationed temporarily on Perimeter Road, or will be placed in temporary stockpiles by the excavation equipment and loaded onto end dumps by loaders or back hoes. Once they are full, end dumps will proceed offsite.

4.6.3.2 SWDA 1231/1233 Restoration

Excavation areas within SWDA 1231/1233 will be restored to pre-excavation conditions. Porches, patios, and fencing at occupied residences will be restored. Backfill and restoration methods are described in Section 4.7.

4.6.4 Excavation Procedures

4.6.4.1 Excavation Sloping

The 4 foot deep excavations may be sloped at up to 1 to 1 adjacent to buildings or other permanent structures and at 1 to 0.5 adjacent to pavement or landscaped areas.

4.6.4.2 Excavation Around Large Tree Roots

All trees and other vegetation within the excavation areas will be removed prior to the start of excavation. In the event that the excavation areas are expanded laterally to address visual or

analytical indications of additional soil impacts, care will be taken to protect trees near the edge of the expanded excavations. Soil will be excavated to a depth of 4 feet bgs around the roots of the trees. Care will be taken to protect trees while excavating and to prevent toppling from undermining shallow root systems.

4.6.4.3 Confirmation Sampling and Analysis

Confirmation soil sampling and analysis will be performed by Shaw as described in its Sampling and Analysis Plan (Appendix F). The sampling plan for excavation bottoms and excavation sidewalls, as well as excavation step-out sampling, is further discussed in the following subsections.

Samples will be collected using either hand auger methods or from an excavator bucket. Each sample will be analyzed for total lead by EPA method 6010B with the sidewall samples (not including Perimeter Road sidewall samples) analyzed for lead at a 48 hour turn-around. Each final sidewall confirmation sample and approximately 25 percent of the final bottom confirmation samples will be selectively analyzed for PAHs by EPA Method 8270 and PCBs by EPA Method 8082. Approximately 25 percent of both the final bottom and final sidewall confirmation samples will be analyzed for dioxin by EPA Method 8290. Select sidewall samples collected within SWDA A&B will be analyzed for volatile organic compounds (VOCs) by EPA Method 8260B. Samples scheduled for organics analysis will be analyzed on a standard turn-around.

Methane samples will not be collected during this work scope; however, air monitoring using an LEL meter will be performed following excavation east of Buildings 1319 and 1321 within SWDA A&B (Figure 4) to identify any methane concentrations that may remain in the area following excavation. Methane monitoring is further discussed in Section 4.6.1

Soil samples will also be collected and analyzed for radiological contamination during this project. 16 radiological samples will be collected from each vertical foot of excavated soil within each SWDA. Radiological screening and sampling is discussed in Section 4.1.

4.6.4.3.1 Bottom Sampling

In general, the bottoms of each excavation will be divided into 100 x 100-foot grid cells. Two discrete samples will be collected within each grid cell. All of the bottom confirmation samples will be analyzed for total lead. Twenty-five percent of the final bottom confirmation samples will be analyzed for PAHs, PCBs, and dioxin. Sample locations selected for dioxin analysis will be biased towards those samples collected in the vicinity of observed-ash layers.

Excavation bottom samples will also be analyzed for radiological contamination to document remaining concentrations, if any.

4.6.4.3.2 Sidewall Sampling

4.6.4.3.2.1 Perimeter Road

A discrete sample of the excavation perimeter sidewalls along Perimeter Road will be collected every 100 linear feet. The sidewalls will not be extended laterally due along the roadway and all of the samples will be analyzed for lead, PCBs, and PAHs. Twenty-five percent of the samples will be analyzed for dioxin. Sample locations selected for dioxin analysis will be biased towards those samples collected in the vicinity of observed-ash layers. Samples will be analyzed on a normal turn-around schedule.

4.6.4.3.2.2 General Excavation Sidewalls

A discrete sample of the excavation perimeter sidewalls will be collected at least every 50 linear feet except from excavation sidewalls at Perimeter Road where samples will be collected every 100 linear feet, as discussed above. Each sidewall will be sampled, regardless of length. Each of the sidewall confirmation samples will be analyzed for total lead using EPA method 6010B. Except for those collected along Perimeter Road, sidewall samples to be analyzed for lead will be analyzed on a 48 hour turn-around so that excavation limits may be rapidly expanded in the event that lead, a primary driver of this NTCRA, is detected above action levels of 400 mg/kg (milligrams per kilogram) (SulTech, 2006). If lead results in the "primary" sidewall sample are greater than 400 mg/kg the excavations will be extended laterally five feet and a total of three "secondary" confirmation samples will be collected from the over-excavation end wall and sidewalls. Excavation step-out sidewalls and endwalls may be further expanded if lead concentrations are found to exceed 400 mg/kg, as discussed in Section 4.6.4.4.

Final sidewall confirmation samples will be those which contain less than 400 mg/kg lead or those which are collected from a sidewall which cannot be extended laterally (*i.e.* along Perimeter Road). Each of the final sidewall confirmation samples will be analyzed for PAHs and PCBs; approximately 25 percent of the final sidewall confirmation samples will also be analyzed for dioxin. Sample locations selected for dioxin analysis will be biased towards those samples collected in the vicinity of observed-ash layers. If ash layers are observed, the Navy may request limited sidewall over-excavation of the ash-containing sidewall prior to sampling. Lateral expansion of excavation sidewalls is discussed further in Section 4.6.4.4.

Sidewall samples collected in the vicinity of Buildings 1319, 1321, and 1323 will be analyzed for VOCs to assess remaining concentrations of 1,1,2,2-TCA and chloromethane which have been detected in the area.

4.6.4.4 Step-Out Excavations

Upon completion of the initial excavation within SWDAs, excavation sidewalls found to contain obviously hazardous debris, or ash layers suggesting dioxin impacts, may be further excavated based on consultation with the Navy.

Excavations will be extended laterally if sidewall samples are found to contain lead at greater than 400 mg/kg. Sidewall samples will be collected by Shaw at 50 foot intervals. If analysis of a confirmation sample suggests that lead clean-up goals have not been achieved, Shaw will over-excavate a five foot by five foot (2.5 feet on either side of the sample location and five foot laterally) area of soil. The step-out excavation depth will be maintained at 4 feet bgs.

If PCB, PAH, or dioxin concentrations in sidewall confirmation samples exceed action levels, the Navy may recommend lateral expansion of the excavation. If additional excavation is performed, step-out endwalls and sidewalls will be analyzed for lead, PCBs, and PAHs. As discussed in the EE/CA (SulTec, 2006), action levels for site contaminants of concern are:

- Lead: 400 mg/kg
- PCB: 1 mg/kg
- PAHs: 0.62 mg/kg benzo(a)pyrene toxicity equivalent
- Dioxin: 12 nanograms per kilogram dioxin toxicity equivalent

Excavations will not be extended laterally based on VOC results. Excavations may be extended based on LEL readings collected in methane-impacted areas within SWDA A&B based on Navy recommendations.

4.6.4.5 Soil Handling

During excavation activities, waste soil will be either directly loaded on to local haul trucks for transportation to a waste soil/debris staging area or directly loaded into end-dumps for offsite transportation and disposal. Prior to leaving the exclusion zone, local haul trucks and/or end-dumps will be decontaminated and tarped as described in Section 5, (Waste Management).

Site conditions may require temporary storage of waste soil at the excavation sites. If excavation site storage is required, the soil may be either contained in U.S Department of Transportation-approved, lined, 20-yd^3 roll-off bins or stockpiled and covered. Stockpiling procedures are discussed in Section 5.1.1. The bins or stockpiles will be kept secured in the excavation site exclusion zone and will not be left at the excavation site beyond completion of site restoration activities. Upon removal, roll-off bins or stockpiled soil may be relocated to a waste soil/debris staging area for offsite transportation and disposal, or directly loaded from the excavation site for offsite transportation and disposal.

4.6.4.6 Excavation De-watering

Although excavations are not expected to reach groundwater, excavations may fill with water during rainstorms. Water may also infiltrate open excavations in areas under influence of tides. If necessary, Shaw may use perforated buckets to expand excavations that contain rainwater.

In the event that Shaw or Navy supervisors determine excavations require dewatering, a vacuum truck will be mobilized to the area. The water will be transported by the vacuum truck to a holding tank stationed within Site 6. The water will be characterized and disposed of in accordance with guidelines discussed in Section 5.2.

4.6.4.7 Equipment and Personnel Decontamination

Equipment and personnel exiting an exclusion zone will follow decontamination procedures presented in Shaw SOP 6.2, *Revision 1, Drilling, Development, and Heavy Equipment Decontamination* (IT, 1998) and the SHSP (Appendix E). Decontamination areas will be located near exclusion zone exits. The level of decontamination of equipment will be determined by the Site Health and Safety Officer. The need for and degree of decontamination will be based on the characteristics of the material within the exclusion zone and the potential for transporting COCs outside of the exclusion zone.

In general, equipment decontamination areas will consist of an impermeable surface (*e.g.* plastic sheeting) to catch material removed from equipment for collection and disposal. At a minimum, equipment will be decontaminated by dry brushing. A pressure washer will be used where a greater effort of decontamination is required. The equipment decontamination station for wet decontamination may include a bermed area with an impermeable surface and low point for the collection of liquids. When necessary, a protective layer (*e.g.*, geo-synthetic material, sand layer, soil layer) will be installed to protect the liner from puncture. A decontamination water source and rinsate water collection tank will be located adjacent to the area, as needed. In addition, decontamination areas may be developed for end-dumps leaving the project area.

4.7 Site Restoration

This section describes restoration methods to be used following excavation. Restoration activities include backfilling, resurfacing, and restoring fences. Backfill and other site restoration activities will be performed in accordance with City of San Francisco requirements and standard specifications. Within SWDA A&B, the Westside Drive excavation will be backfilled and a gravel surface placed on top; the asphalt road, concrete sidewalks and concrete gutters will not be replaced. Within SWDA 1207/1209, a new roadbase and asphalt surface will be placed within the Bayside Drive excavation.

4.7.1 Backfilling

Excavations will be backfilled following the completion of the initial excavation and confirmation sampling using the following guidelines.

4.7.1.1 Bottom Marker

Prior to backfilling, the bottom of the excavation will be lined with a visible barrier marker. The marker will serve to differentiate overlying remediated soil from the underlying, and

non-remediated, soil. The marker will consist of material that is permeable and will resist deterioration, such as snow fencing, geotextile, or a comparable material.

4.7.1.2 Backfill Materials

Backfill materials will consist of imported material including, topsoil, select fill, Class II aggregate base (Class II AB), pea gravel, or ¾-inch drain rock. Imported backfill material will be free of deleterious substances and chemical contaminants, having been pre-screened in general accordance with DTSC procedures identified in their October 2001 Informational Advisory fact sheet (DTSC, 2001). The Navy will review the suppliers' testing programs to ensure that they conform with DTSC's requirements. Backfill acceptance criteria are discussed below.

Select fill to be used for backfill will be sampled at a rate of at least one sample per 500 cubic yards. Samples will be selectively analyzed for VOCs, total petroleum hydrocarbons as gasoline, as diesel, and as motor oil, semi-volatile organic compounds, PCB, chlorinated pesticides, and metals. Select fill analytical results will be compared to EPA preliminary remedial goals (PRGs) (USEPA, 2004) for residential soil and TI metals background concentrations; no select fill containing an analyte exceeding the PRGs will be accepted without an evaluation of risk.

In addition, all imported backfill will be visually inspected prior to use on site. Prior to acceptance, topsoil, gravel and other materials will require supplier certifications as described below.

Select Fill - select fill will be visually inspected to ensure it is free of debris/organic matter and of sufficient clay content to be readily compatible. Material proposed for use as select fill will be chemically analyzed.

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

Class II AB - Class II AB will be visually inspected to ensure it is clean, free of organic matter and of sufficient clay and gravel content to be readily compatible. The supplier of the Class II AB will be required to certify that the material does not contain recycled materials (asphalt and/or concrete), is clean, and conforms to CalTrans specifications.

Drain Rock/Pea Gravel - Drain rock and pea gravel will be visually inspected to ensure it is clean and free of organic matter. The supplier will certify that the pea gravel and ¾-inch drain rock conforms to CalTrans specifications.

4.7.1.3 Backfill Placement and Compaction

Fill placed in the first two feet (*i.e.* 2 to 4 feet bgs) does not require compaction. The upper two feet of fill will be placed in 1-foot lifts and compacted. Non-woven geotextile fabric will be installed between drain rock and overlying fill at all locations. Select fill and Class II AB will be placed and compacted according to the following schedule:

Surface Completion[1]	Lift Thickness[2] (loose)	Number of Compacted Lifts to Backfill 2-feet[2]	Compaction Equipment[3]	Compaction Criteria[4]
Vegetation (sod)	10 to 12 inches	3	Sheepsfoot	85%
Vegetation (sod), limited access	12 to 14 inches	2	Hand-guided	85%
Porches, patios, sidewalks, and walkways	12 to 14 inches	2	Sheepsfoot or Hand-Guided	90%
Roads, driveways, and parking lots	12 to 14 inches	2	Sheepsfoot	95%

Notes:

[1] – Surface completions will in part determine compaction requirements. Vegetation areas (areas to be re-soded) include common areas, backyards and fence lines. Limited access areas include small planter box areas and areas with obstructions that may limit the size of available compaction equipment. Porches, patios, sidewalks, and walkways are non-load bearing surface completions. Roads, driveways, and parking lots are load bearing surface completions.

[2] – Lifts of backfill will first be placed loosely in lift thickness as described above. Each lift will then be compacted. The number of compacted loose-lifts to fill a depth of 2 feet is estimated.

[3] - Hand-guided mechanical compaction equipment such as a "Jumping Jack" or vibratory plate may be used in limited access areas. A sheepsfoot compactor will be used in most areas with good access. A smooth roller compactor may be used in accessible areas that require a smooth finish such as beneath roadways.

[4] - Compaction criteria is the percent of compacted density as determined by the American Society of Testing and Materials (ASTM) Method D-1557.

Compaction will be closely monitored during initial backfilling. At first, backfill will be tested using a nuclear gauge at a rate of approximately two tests per lift per 5,000 square feet. After a systematic backfill routine has been shown to be effective (*i.e.* consistent passing compaction test results) compaction testing will be relaxed to spot checking with a frequency of about one or two nuclear gauge tests per 5,000 square feet.

In excavations where standing water is present, if not dewatered prior to backfilling the flooded portion of the excavation may be filled with ¾-inch drain rock to just above the water level. Compacted fill may then be placed over the drain rock as described above. In areas where the surface completion is to be a roadway, curb and gutter, driveway, or parking lot, a layer of

non-woven geotextile (Mirafi 140N or equivalent) will be installed between the rock and overlying fill.

4.7.1.4 Subgrades

Excavation in areas scoped for a vegetative (sod) re-surfacing will be backfilled with select fill to within approximately 4 to 6 inches of final grade. The top approximately 4 to 6 inches will be filled with topsoil. Subgrades for non-load bearing concrete structures (patio, porch, sidewalk, or walkway) will include backfill with select fill to within 4 inches of final grade. The top 4 inches will be completed with concrete as described below. Subgrades for areas planned for roadways, driveways, or parking lots (load bearing) will be backfilled with select fill to within 10 inches of final grade, followed by no less than 6 inches of Class II AB. Pavement bases will be restored in accordance with City of San Francisco Standard Specifications Section 11.

4.7.1.5 Sod/Seed

Backyards and front yards at occupied building units will be restored with sod. All other unpaved areas will be restored with grass seed. Prior to placing the sod or seed, approximately 2 inches of topsoil will be placed on the subgrade and raked smooth. Sod will be brought onsite and carefully placed over the topsoil and thoroughly watered. At occupied buildings, the City of San Francisco will be expected to assume watering and maintenance responsibilities of the sod. At unoccupied buildings and common areas the Navy will assume watering responsibilities for one week following placement. Watering may be accomplished by; 1) spraying areas with a watering truck, or 2) constructing a series of aboveground piping and sprinkler head systems that may be temporarily connected to nearby fire hydrants. After one week the Navy will advise the City of San Francisco to assume watering responsibilities and the Navy's temporary water systems will be removed.

4.7.2 Miscellaneous Surface Features

Surface features such as asphalt roadways and parking lots; concrete curbs and gutters, driveways, porches, patios, walkways, and sidewalks; tot-lots, and curbside mail boxes are found throughout Site 12. In general, if these features are removed or damaged during construction activities and they are associated with occupied residences, they will be restored with like design. Miscellaneous surface features associated with un-occupied residences will not be restored.

Portions of Bayside Drive will be removed during the excavation of SWDA 1207/1209; pavement base, pavement, and sidewalks along the affected stretch of roadway will be restored in accordance with City of San Francisco Standard Specifications Sections 11 and 12. The Westside Drive roadway as well as gutters and sidewalks will not be resurfaced.

4.7.3 Fencing

Perimeter fencing removed or damaged during construction activities will be restored. Pre-demolition survey coordinates will be used to establish fence reconstruction alignment. At this time only backyard privacy fencing and SWDA cyclone fencing is scheduled for removal. Backyard fencing at occupied residences will be replaced with 6-foot-high wood fence panels. A common design of solid panels will be used through out Site 12. Gates will be replaced in the same approximate location as found prior to demolition. Cyclone fencing along Perimeter Road, if damaged during work efforts, will be restored to pre-excavation conditions.

5.0 Waste Management

Wastes generated during the Site 12 removal actions will be handled as described below.

5.1 Excavated Soil Handling, Transportation, and Disposal

Shaw will selectively excavate soil based on the findings of pre-excavation waste characterization samples and field observations. Previous Site 12 removal actions indicate that waste soil within SWDAs that contains visible debris will often contain lead and is likely to be profiled as Class I hazardous waste. Therefore, if areas of significant debris are encountered during excavation activities anticipated to contain Class II non-hazardous waste, the soil may be segregated from other excavated material, off hauled, or sampled to confirm profile characteristics. Class I hazardous waste will be managed to meet the time limits for accumulation as described in Title 40 Code of Federal Regulations (CFR) 262.34.

Transportation of waste soil will be provided by properly licensed/certified transporters. Prior to leaving TI, each loaded truck will be tarped, decontaminated (if required), and weighed. Class I hazardous waste will be manifested with a hazardous waste manifest. Non-hazardous waste will be manifested with non-hazardous waste manifests. Waste soil disposal facilities will be compliant with the EPA CERCLA "Off-site Policy" rule, (Title 40 CFR 300.440).

5.1.1 Stockpiling

Waste soil may be direct loaded at the excavation site into end-dumps, temporarily stockpiled, or placed in 20-cubic yard bins for offsite transportation and disposal. Materials may also be loaded into local-haul dump trucks and stockpiled at the waste soil/debris staging area in accordance with Shaw SOP 12.1 *Revision 1, Soil Stockpiling Standard Operating Procedure* (IT, 1995) and the SWPPP (Appendix A)

Waste soil and debris excavated from SWDA 1207/1209 will be stockpiled within Site 6 within lined and bermed cells constructed atop concrete. Figure 10 depicts clean soil and rock stockpiles, to be managed in the northern part of Site 6, and contaminated soil stockpiles, which will be managed in the western part of Site 6. All stockpiled soil will be protected from rainfall with plastic sheeting secured against wind. Cells will be constructed atop concrete with thick-milled plastic liners to prevent mixing of stockpiled soil with base material. Rail ties or hay bales will be placed around the perimeter of the stockpiles as berms to prevent transport of materials by stormwater. Waste soil stockpiles will be covered with 10-mil plastic to protect against airborn particulate generation.

If excavation activities occur during rainstorms and large amounts of waste soil become saturated, Shaw may build a drying rack atop concrete at the waste soil staging area. Once the

soils are sufficiently dewatered for shipment, they will be direct-loaded from the rack for offsite transportation and disposal. Water from the drying racks will be collected and stored in a holding tank pending characterization, as discussed below.

5.2 Liquid Waste, Handling, Transportation, and Disposal

Waste liquids may be generated from equipment decontamination or by dewatering excavations. Dewatering of excavations is not anticipated. Liquid waste will be stored in holding tanks. When the tanks are full, the water will be sampled for waste profiling. In general, liquid waste storage tanks will be held at the waste soil/debris staging area; however, if excavation dewatering is required it may be necessary to maintain a storage tank in the vicinity of the dewatering activity. In that case the holding tank will be maintained in a secured (fenced) area near the excavation site, and will be profiled, emptied, and demobilized within one month of completion of site restoration activities in the area.

Waste liquids are not expected to contain high concentrations of contaminants and should meet the profile requirements of acceptability of the TI POTW. If accepted by the POTW, wastewater will be discharged into an approved drain inlet or transported to POTW by a vacuum truck. If not acceptable by the POTW, the liquid waste will be profiled for an offsite disposal facility. Upon acceptance by an offsite disposal facility, the liquid waste will be loaded and transported by a properly certified/licensed liquid waste transporter. Depending on classification the water will be manifested as Class I hazardous waste or Class II non-hazardous waste. Offsite liquid waste facilities will be compliant with the EPA CERCLA "Off-site Policy" rule, (40 CFR 300.440).

5.3 Concrete, Asphalt, and Miscellaneous Debris Handling, Transportation, and Disposal

Construction debris generated during removal activities may include concrete pavement, rebar, asphalt pavement, wood fencing, and other miscellaneous construction debris. This debris is not anticipated to be contaminated. Concrete rubble and asphalt may be stockpiled at a waste soil/debris staging area and recycled or disposed of as construction debris in a Class III landfill. General construction debris will also be recycled or disposed of at a Class III landfill.

6.0 Demobilization

Following completion of construction activities construction equipment will be decontaminated and demobilized. Other demobilization activities include: removing tarps and excavation-related dust from occupied buildings, repairing any damage to paint or surfaces on occupied buildings resulting from field activities, cleaning and demobilizing temporary liquid-waste storage tanks, clearing and cleaning the waste disposal and construction material staging areas, and removal of all temporary fencing and sod watering systems.

7.0 Schedule

The Site 12 final remedy/removal action is scheduled to begin in late February/early March 2007. Work in the three SWDAs will be conducted simultaneously in order to limit potential impacts on TI residents. Construction is scheduled for completion in August 2007. A proposed construction schedule is included as Table 2. This schedule identifies time frames for construction within each SWDA and will be updated throughout the project. The detailed schedule will be made available to the Site 12 housing area residents through the community relations program.

8.0 Post Construction Summary Report

Following demobilization a post construction summary report with as-built drawings will be completed. The as-built drawings will include surveyed excavation extents and sample locations, post-construction ground surface elevations (to illustrate drainage patterns), and any other features pertinent to the removal action. As-built text and tables will supplement the drawings and will include analytical test results (waste profile samples), geotechnical test results, survey data as necessary, waste manifests, and excavated soil quantities. Materials, equipment and procedures used, field work variances submitted, and problems encountered will also be provided in the summary report.

9.0 References

Bay Area Air Quality Management District, Regulation 8, Rule 40

Code of Federal Regulations, Title 40, Part 262.34

Code of Federal Regulations, Title 40, Part 300

Code of Federal Regulations, Title 40, Part 300.440

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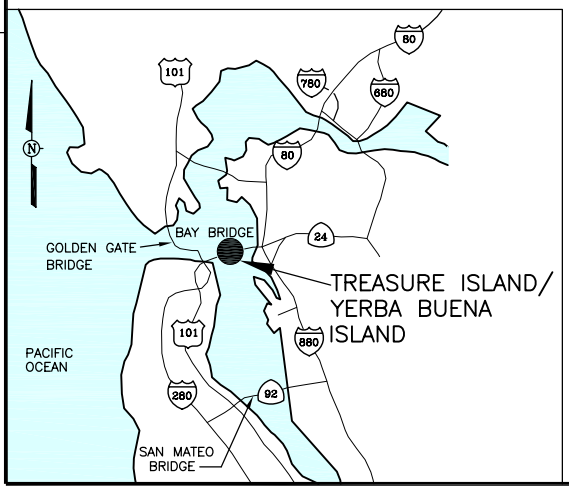
Figures

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	---	TI	SJZ	12/7/06	AMN	2/23//07	BM	2/23//07	112412-A4

SITE VICINITY MAP

NOT TO SCALE



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BRAC PMO WEST
SAN DIEGO, CALIFORNIA

FIGURE 1

TREASURE ISLAND LOCATION MAP

NAVAL STATION TREASURE ISLAND

LEGEND:

- SITE 12 SOLID WASTE DISPOSAL AREAS
- PREVIOUSLY EXCAVATED AREAS
- SITE 12 BOUNDARY

NOTE:
MAP BASED ON ENGINEERING EVALUATION/COST ANALYSIS FOR SITE 12, SulTech, 2006.

N

SCALE
0 400 800 FEET

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SAN DIEGO, CALIFORNIA

FIGURE 2

SITE FEATURES MAP

NAVAL STATION TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	CONC	SJZ 12/13/06	AMN 2/23/07	BM 2/23/07	122412-B16

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
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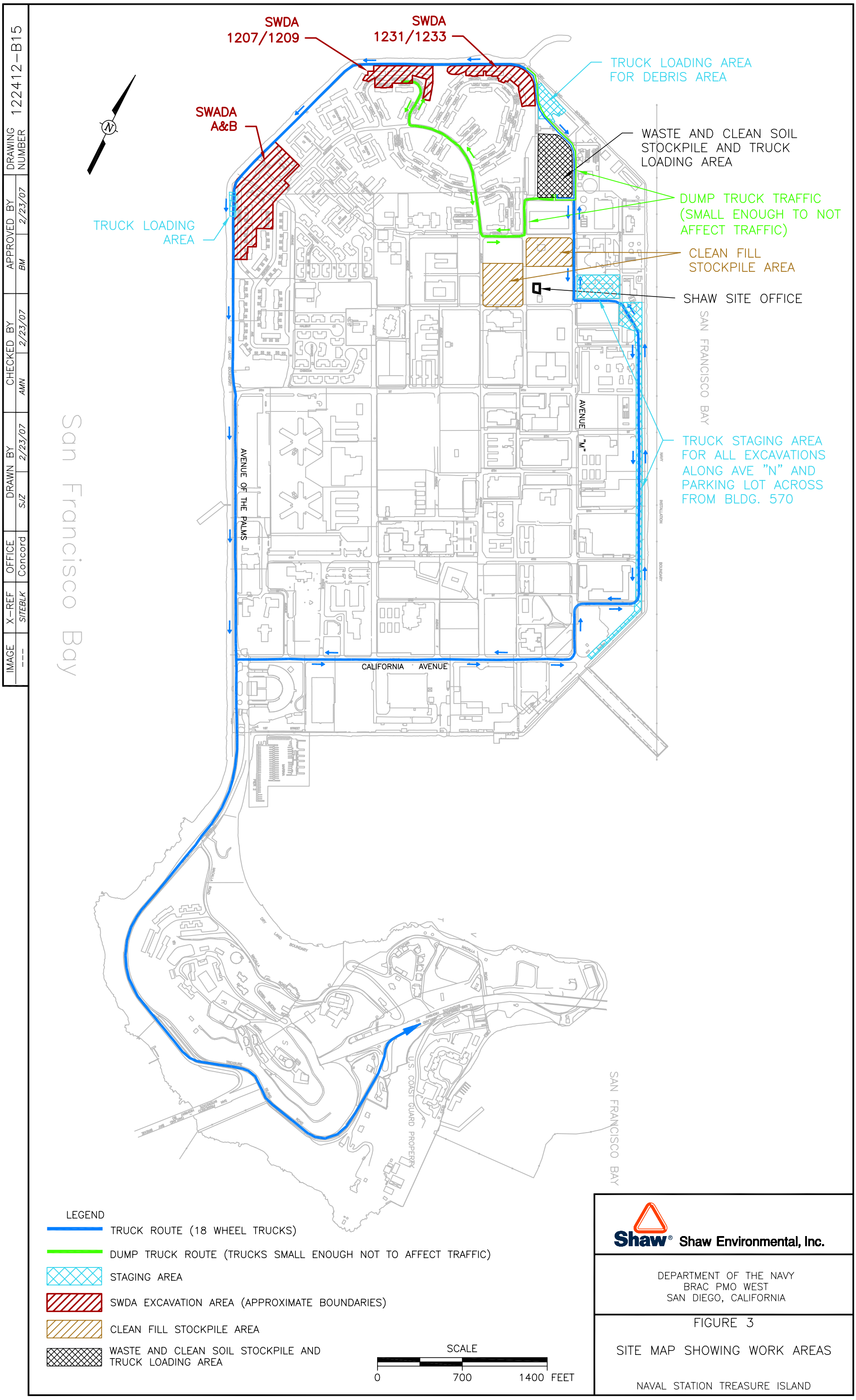

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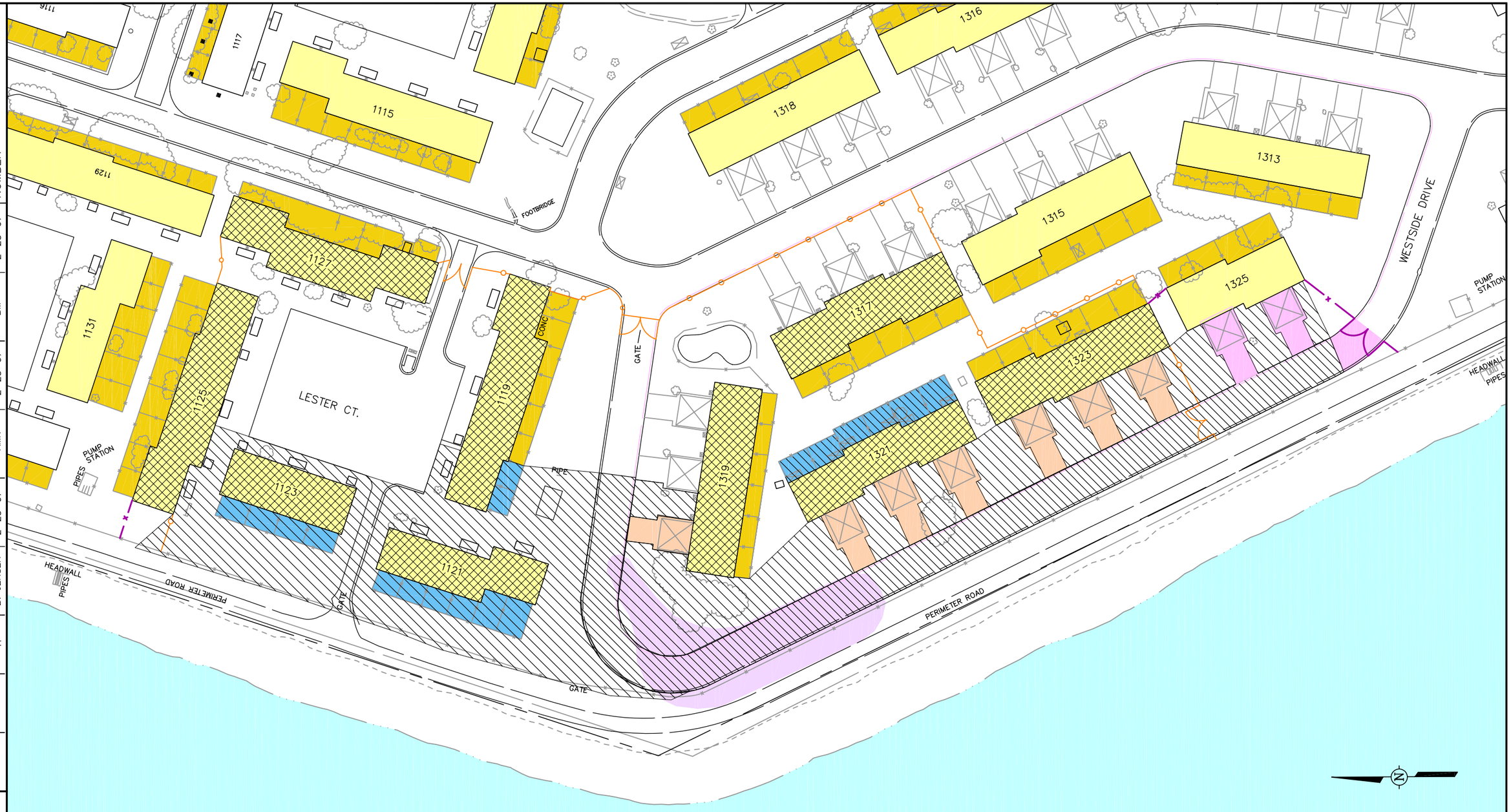
SAN DIEGO, CALIFORNIA

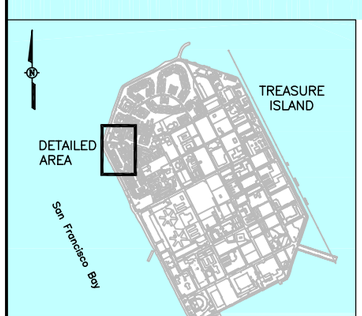
FIGURE 3

SITE MAP SHOWING WORK AREAS

NAVAL STATION TREASURE ISLAND

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
122412-B7	2-23-07 BM	2-23-07 AMN	2-23-07 B. JENSEN	TI	---	---





LEGEND:

- BACKYARDS TO BE EXCAVATED
- COMMON AREAS TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- NO PARKING IN SHADED AREAS FROM MAY 2007 THROUGH JUNE 2007.
- BACKYARDS
- CURRENT SWDA FENCE CONFIGURATION
- TEMPORARY FENCE LINE
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK
- CARPORT
- TREES, SHRUBS
- NON-EXCAVATED HARDSCAPE
- METHANE BOUNDARY

SCALE

0 80 160 FEET

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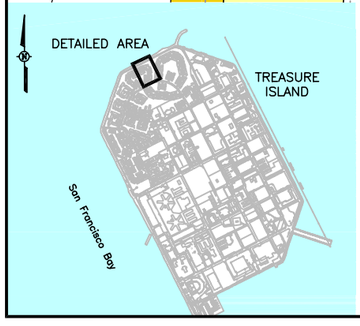
FIGURE 4
SWDA A & B EXCAVATION AREAS
TEMPORARY FENCING LINE TO BE INSTALLED
WITH ENFORCED PARKING RESTRICTIONS
NAVAL STATION TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	TI	BJ 2-26-07	AMN 2-26-07	BM 2-26-07	122412-B8



LEGEND:

- BACKYARDS TO BE EXCAVATED
- COMMON AREAS TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- PREVIOUSLY EXCAVATED
- NO PARKING ALONG BAYSIDE DRIVE OR WITHIN THE SHADED PARKING SPACES FROM FEB 27, 2007 THROUGH AUG 2007.
- BACKYARDS
- CURRENT SWDA FENCE CONFIGURATION
- TEMPORARY FENCE LINE
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK
- CARPORT
- TREES, SHRUBS
- NON-EXCAVATED HARDSCAPE

SCALE

0 50 100 FEET

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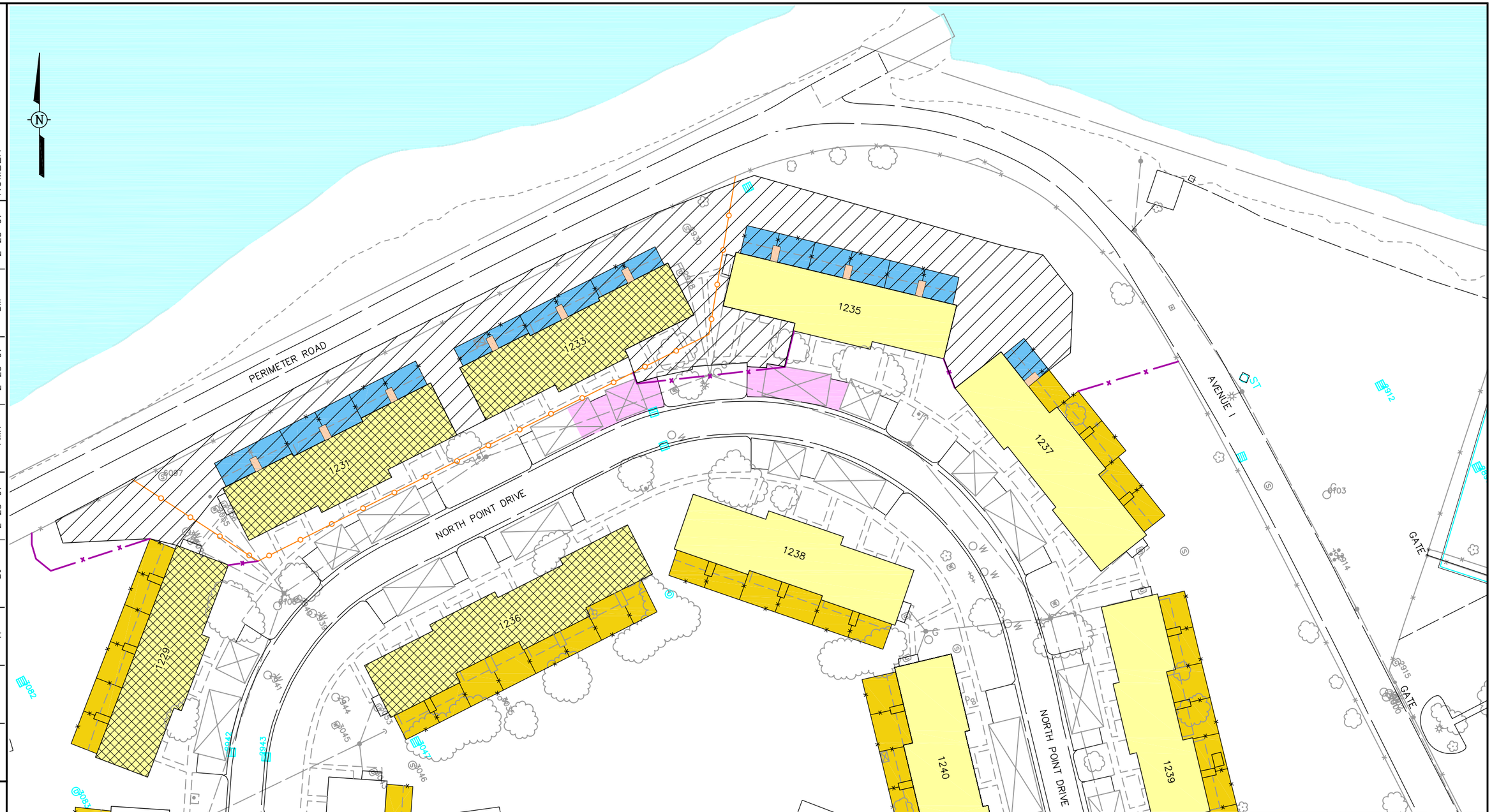
FIGURE 5
SWDA 1207/1209 EXCAVATION AREAS
TEMPORARY FENCING LINE TO BE INSTALLED
WITH ENFORCED PARKING RESTRICTIONS
NAVAL STATION TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	TI	BJ 2-23-07	AMN 2-23-07	BM 2-23-07	122412-B9



LEGEND:

- BACKYARDS TO BE EXCAVATED
- COMMON AREAS TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- NO PARKING IN SHADED AREAS FROM MARCH 2007 THROUGH JUNE 2007.
- BACKYARDS
- CURRENT SWDA FENCE CONFIGURATION
- TEMPORARY FENCE LINE
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK
- CARPORT
- TREES, SHRUBS
- NON-EXCAVATED HARDSCAPE

SCALE

0 60 120 FEET

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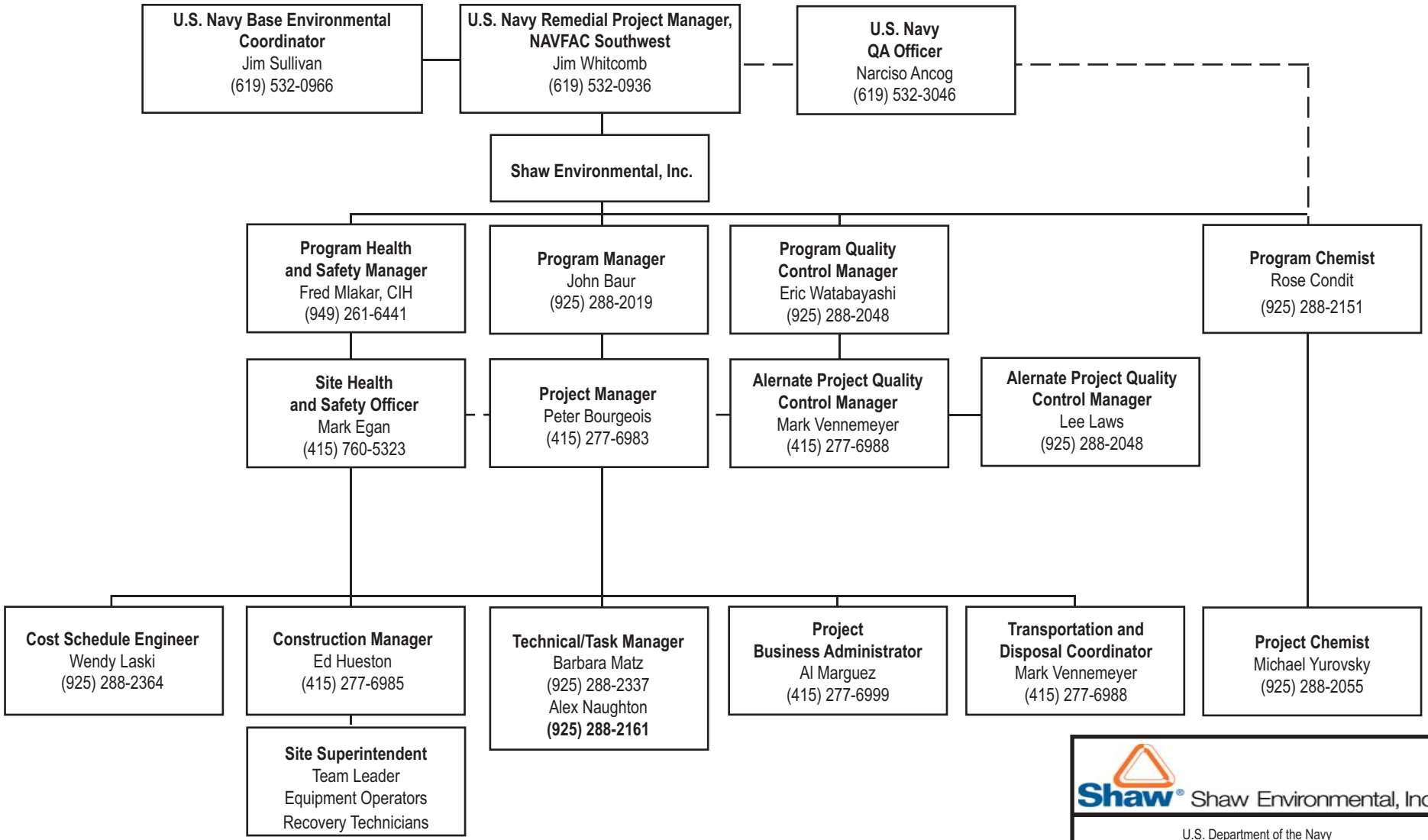
FIGURE 6
SWDA 1231/1233 EXCAVATION AREAS
TEMPORARY FENCING LINE TO BE INSTALLED
WITH ENFORCED PARKING RESTRICTIONS
NAVAL STATION TREASURE ISLAND



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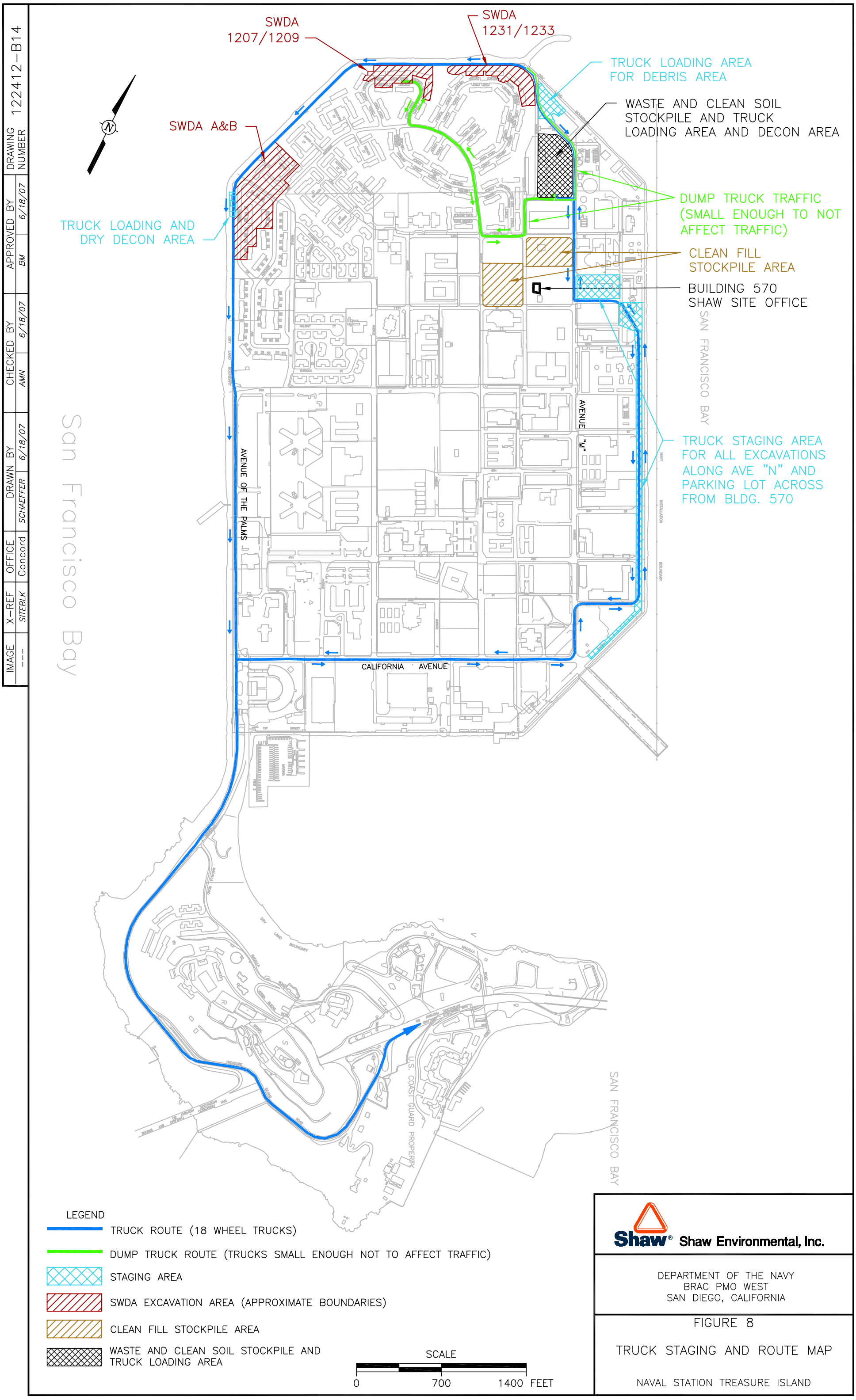
U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West
San Diego, California

FIGURE 7
CTO 0010 ORGANIZATION CHART
ENVIRONMENTAL REMEDIAL ACTION
CONTRACT NUMBER N62474-01-D-6011



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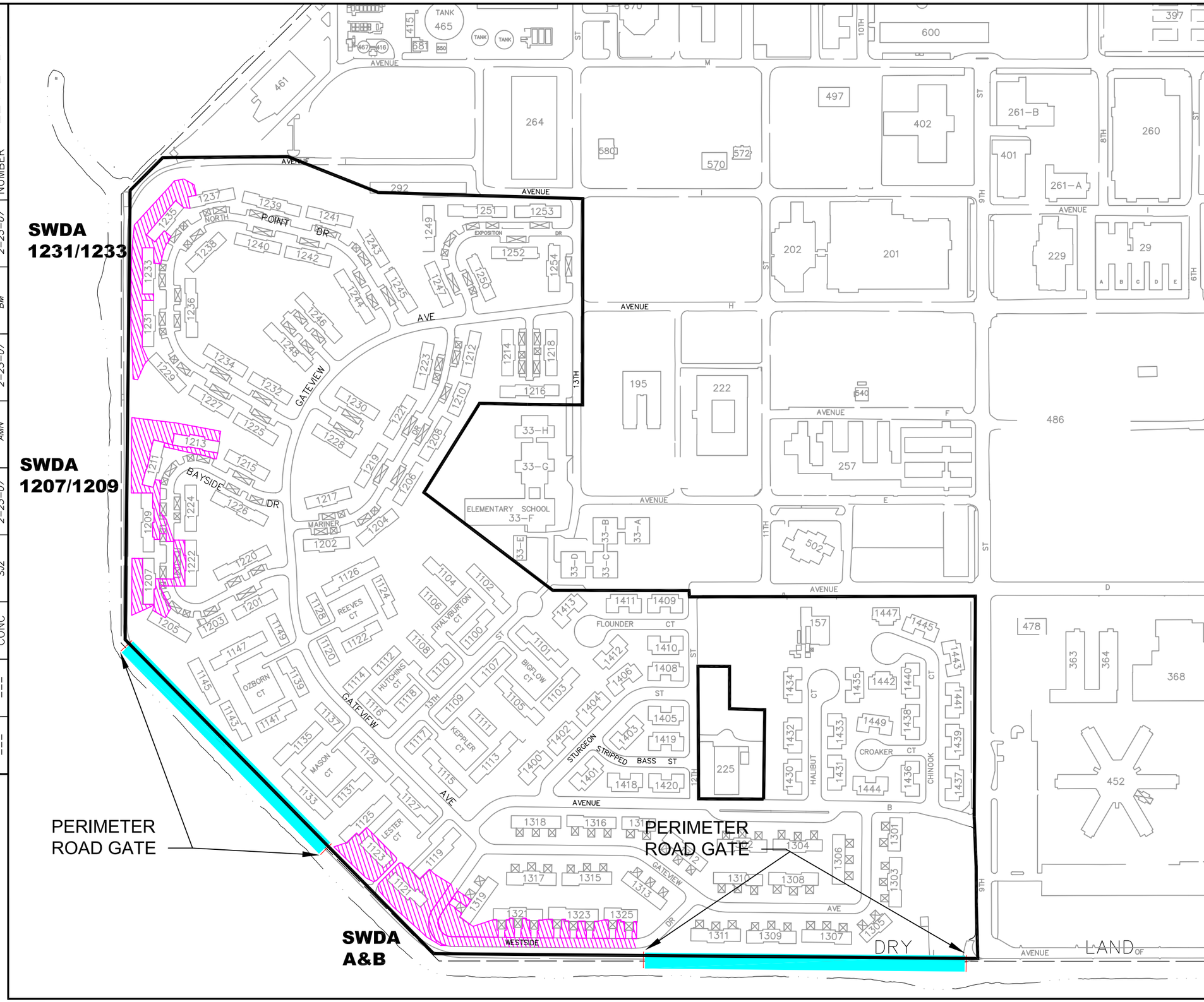
SAN DIEGO, CALIFORNIA

FIGURE 8

TRUCK STAGING AND ROUTE MAP

NAVAL STATION TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	SITEBLK	Concord	SCHAEFFER 6/18/07	AMN 6/18/07	BM 6/18/07	122412-B14



LEGEND

EXCAVATION AREAS
EXCLUSION ZONES

SITE 12 BOUNDARY

SECTION OF PERIMETER ROAD ACCESSIBLE TO PUBLIC, FRIDAY THRU SUNDAY

SCALE

0 300 600 FEET

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BRAC PMO WEST
SAN DIEGO, CALIFORNIA

FIGURE 9
SITE 12 PERIMETER ROAD
PUBLIC ACCESS MNAP

NAVAL STATION TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	CONC	SJZ 2-23-07	AMN 2-23-07	BM 2-23-07	122412-B17

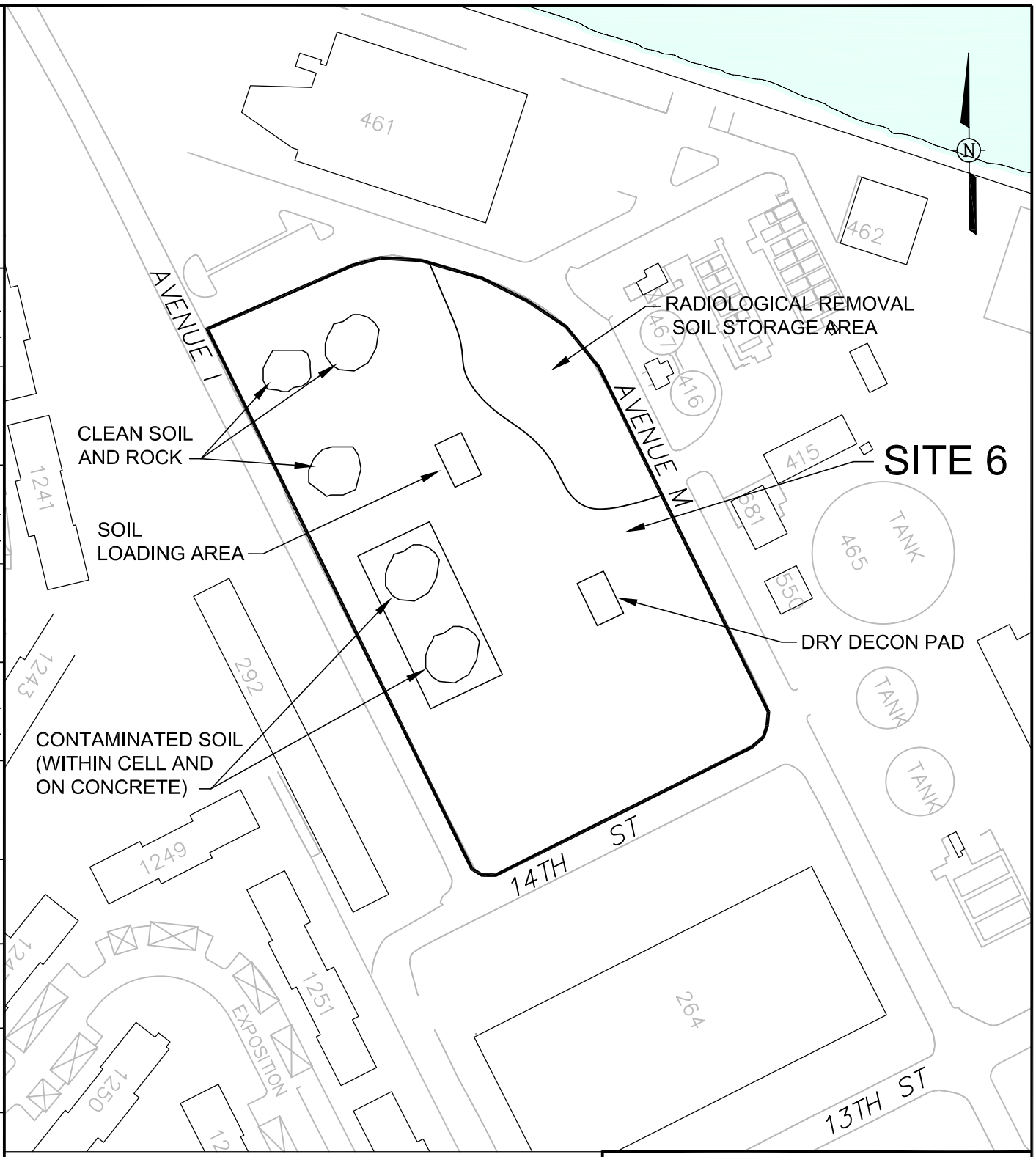

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	TI	SJZ 6/18/07	AMN 6/18/07	BM 6/18/07	122412-A5

SCALE

0 120 240 FEET

LEGEND:

BUILDING

SITE 6 BOUNDARY

NOTE:
MAP BASED ON ENGINEERING EVALUATION/COST ANALYSIS FOR SITE 12, SulTech, 2006.

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SAN DIEGO, CALIFORNIA

FIGURE 10

SITE 6
STOCKPILE LOCATIONS

NAVAL STATION TREASURE ISLAND

Tables

Table 1
NAVSTA TREASURE ISLAND
INSTALLATION RESTORATION SITE 12, OLD BUNKER AREA
(Currently the Treasure Island Housing Area)

Buildings and Units that will be affected during the SWDA Removal Action efforts within Site 12

Building Number/Street Association	Unit Numbers	Start Date	Duration	Comments
Building 1325 / Westside Drive	Units A through D	Roughly early May 2007	1 month for Excavation/ Backfill and 1 more month for Site Restoration	The impact to all the units of Building 1325 will be the tarping of Doors and Windows for roughly 1 month and residents will only have access to their units through the backyards. Westside drive will be blocked off near the building and access to their driveways will be unavailable for roughly 2 months to allow for the field efforts and restoration efforts to occur. Westside Drive, within the excavation footprint, will remain a gravel road after restoration efforts. Replacement of asphalt is not planned.
North Point Drive				
Building 1237 / North Point Drive	Units A and B	Roughly early March 2007	2.5 months for Excavation/ Backfill and 1 more month for Site Restoration	The impact to units A and B of Building 1237 will be the tarping of Doors and Windows of the entire back of the building, and excavation work in the backyards for roughly 2.5 months and residents will only have access to their units through the front. Site restoration will take another month beyond the 2.5 months of excavation and backfill. No parking restrictions for this building.
Building 1235 / North Point Drive	Units A through F	Roughly early March 2007	2.5 months for Excavation/ Backfill and 1 more month for Site Restoration	The impact to all the units of Building 1235 will be the tarping of Doors and Windows of the entire back of the building, as well as the tarping of units A, B, and C in the front of the building and excavation work in the backyards for roughly 2.5 months. Excavation in front of Units A and B will take 3 weeks during the 2.5 months. Residents of Units D and E will only have access to their units through the front. Site restoration will take another month beyond the 2.5 months of excavation and backfill. The Navy is requesting Units A, B, C, and F remain vacant for ~4 months.
	Units A, B, and C	Roughly early March 2007	4 months	Parking will not be allowed in these spaces for 4 months to facilitate the excavation efforts.
Building 1233 /North Point Drive	Bldg. 1233 Units D, E, and F	Roughly early March 2007	4 months	Parking will not be allowed in these spaces for 4 months to facilitate the excavation efforts.
Bayside Drive				
Building 1211 Bayside Drive	Units A through F	Roughly late February 2007	5.5 months	Residents in this Building will need to be temporarily displaced for 5.5 months during the excavation/backfill and site restoration work around the buildings. All the front and back Doors and Windows will be tarped.

NAVSTA TREASURE ISLAND
INSTALLATION RESTORATION SITE 12, OLD BUNKER AREA
(Currently the Treasure Island Housing Area)

Buildings and Units that will be affected during the SWDA Removal Action efforts within Site 12

Building Number/Street Association	Unit Numbers	Start Date	Duration	Comments
Bayside Drive Continued				
Building 1213 Bayside Drive	Units A through F	Roughly early March 2007	5.5 months	Residents in this Building will need to be temporarily displaced for 5.5 months during the excavation/backfill and site restoration work around the buildings. All the front and back Doors and Windows will be tarped.
Building 1205 Bayside Drive	Units D, E, and F	Roughly late February 2007	3 weeks for Excavation/ Backfill and ~5 more months for Total Restoration	The fronts of these Units will have Doors and Windows tarped for 3 weeks through the excavation/backfill work. Completion of the remaining area excavation/backfill and site restoration will take approx. 5 months beyond the 3 weeks of excavation/backfill in front of the units. Parking spaces for these units will not be available for 5 months.
Building 1224	Units A through F	Roughly late February 2007	1.5 months for Excavation/ Backfill and 4 more months for Site Restoration	Due to the excavation of soils beneath Bayside Drive road, the front of all of the units Doors and Windows will be tarped for 1.5 months. Site restoration will take approx. 4 months beyond the 1.5 months of excavation/backfill in front of the units. The parking spaces for the building will not be available for 5.5 months.
Bayside Drive	Entire Street	Roughly late February 2007	5.5 months	The entire Bayside Drive will be off limits to street side parking. With the exceptions stated above, the residents will be able to use their parking spaces, but no parking on the sides of the street. From Building 1205 to the corner of Building 1213, Bayside Drive will be closed to traffic. Residents will have one-way access to the street from the two street entrances only.

Table 2
Project Schedule
Site 12 Final Remedy Removal Action
Treasure Island, San Francisco, California

Environmental Remediation Action Contract No. N68711-01-D-6011
Contract Task Order 0010

Project Task	Duration (work days)		
	SWDA A&B	SWDA 1207/1209	SWDA 1231/1233
Mobilization	4	4	4
Survey & Permits	8	8	8
Environmental Protection	2	3	3
Clearing Site / Demolition	8	8	7
Excavation	47	18	15
Backfill	25	13	11
Site Restoration	30	30	12
Total Time (work days)	124	84	60
Total Weeks (four 10 hr days)	31	21	15
Total Months (16 work days per month)	7.75	5.25	3.75
Anticpated start date	27-Feb-07	27-Feb-07	27-Feb-07
Anticpated completion date / site open	2-Oct-07	24-Jul-07	12-Jun-07

Notes:

Assumes no delays due to weather

Assumes work days are Monday through Thursday 06:30 to 17:30 hours (equipment is operational between 07:30 and 17:00 hrs)

Work hours may change due to daylight variations and other conditions.

Delivery trucks may be passing the Bay Bridge on- and off-ramps between 07:30 and 16:30

Appendix A
Site 12 Stormwater Pollution Prevention Plan

FINAL

STORMWATER POLLUTION PREVENTION PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number N68711-01-D-6011
Contract Task Order 0010

Document Control Number NAV010-002-H
Revision 0

February 26, 2007

Prepared for:

U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, California 92108-4310

Prepared by:

Shaw Environmental, Inc.
4005 Port Chicago Highway
Concord, California 94520-1120

FINAL

STORMWATER POLLUTION PREVENTION PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number N68711-01-D-6011
Contract Task Order 0010

Document Control Number NAV010-002-H
Revision 0

February 26, 2007

Prepared by: Mary B. Worth Date: February 26, 2007
Mary Worth
Regulatory Compliance

Approved by: _____ Date: February 26, 2007
Peter Bourgeois
Project Manager

Stormwater Pollution Prevention Plan Certifications and Approval

Project Name: Site 12 Final Remedy Removal Action
Treasure Island, San Francisco, California

"I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Contractor's Signature _____ Date _____

Contractor's Name _____

Contractor's Title _____

Telephone Number _____

Client Approval and Certification of the Stormwater Pollution Prevention Plan

Project Name: Site 12 Final Remedy Removal Action
Treasure Island, San Francisco, California

"I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature _____ Date _____

Name _____

Telephone Number _____

Stormwater Pollution Prevention Plan Amendment Certification and Approval

This Stormwater Pollution Prevention Plan (SWPPP) shall be amended:

- Whenever there is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system
- If any condition of the General Permit is violated or the general objective of reducing or eliminating pollutants in stormwater discharges has not been achieved
- When deemed necessary by the Navy

The amendments for this SWPPP, along with the Contractor's Certification and the Navy's approval, can be found within this Plan. Amendments are listed in the Amendment Log that follows.

Amendment Log

Project Name: Site 12 Final Remedy Removal Action
Treasure Island, San Francisco, California

Amendment No.	Date	Brief Description of Amendment	Prepared By

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Figure 4 Site 6 Stockpile Locations and Storm Drain System

List of Attachments

Attachment 1 Applicable Best Management Practice Procedures
Attachment 2 Inspection Checklist and Log

Acronyms and Abbreviations

bgs	below ground surface
BMP	best management practice
Class II AB	Class II aggregate base
NAVSTA	Naval Station
Navy	Department of the Navy
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RWQCB	Regional Water Quality Control Board, San Francisco Bay Region
SWPPP	Stormwater Pollution Prevention Plan
SWDA	solid-waste disposal area
TI	Treasure Island
TtEMI	Tetra Tech EM, Inc.
EPA	U.S. Environmental Protection Agency

1.0 Introduction

1.1 Introduction and Project Description

This Stormwater Pollution Prevention Plan (SWPPP) was prepared to support the activities conducted as part of a removal action at the Site 12 residential housing area at the former Naval Station (NAVSTA) Treasure Island (TI), San Francisco, California. This proposed non-time-critical removal action will be undertaken under the National Oil and Hazardous Substance Pollution Contingency Plan (Title 40 of the Code of Federal Regulations, Part 300), Comprehensive Emergency Response, Compensation, and Liability Act, and California Health and Safety Code Section 25323. The scope of work includes the excavation of soil to a depth of four feet below ground surface (bgs) in three solid-waste disposal areas (SWDAs) within Site 12, including common areas and backyards. Following excavation, the sites will be backfilled and restored.

This SWPPP was developed to fulfill the substantive requirements set forth in the State Water Resources Control Board, Order No. 99-08-DWQ, National Pollutant Discharge Elimination System General Permit No. CAS000002. Adherence to the General Permit is required where clearing, grading, and excavation results in a land disturbance of one or more acres, or if smaller areas are part of a common plan of development that encompasses one or more acres. The work to be conducted at the Site 12 residential area will involve these types of activities across three SWDAs and nearby staging and stockpile areas totaling approximately 19.5 acres.

The General Construction Permit requires that a SWPPP be retained and implemented on the construction site. In accordance with the substantive requirements of the General Permit, this SWPPP will be retained and implemented on the construction site and made available to the Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) for review upon request.

1.2 Objectives

The objectives of the SWPPP are to:

- Identify pollutant sources that may affect the quality of discharged stormwater associated with construction activity from the site
- Identify, construct, and implement stormwater pollution prevention measures to reduce pollutants in stormwater discharges from the construction site both during construction and after construction is completed

This SWPPP and the accompanying Removal Action Work Plan/Remedial Design include best management practices (BMPs) to address source reduction and treatment of stormwater

discharges. BMPs for construction activities and pollutant source control will be implemented as described in detail in the following documents:

- *California Stormwater Best Management Practice Handbooks*, *Construction Activity Best Management Practice Handbook*, published by the Stormwater Quality Task Force, 1993
- *National Menu of Best Management Practices for Stormwater Phase II* available on the Internet at http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm.
- *Erosion and Sediment Control Field Manual*, Fourth Edition, published by the California RWQCB, 2002.
- *Guidelines for Construction Projects*, published by the California RWQCB, distributed in 2002.
- *Caltrans Statewide Stormwater Quality Practice Guidelines CTSW-RT-02-009*, prepared by the California Department of Transportation, May, 2003.

Specific BMPs referenced in this document are included in Attachment 1.

Elements of the SWPPP include:

- Site description (Sections 2.0 and 3.0)
- BMPs to be implemented for construction activities (Section 4.0)
- Erosion and sediment control (Section 5.0)
- Non- stormwater management (Section 6.0)
- Waste management and disposal (Section 4.5)
- Implementation of other approved plans (Section 11.0)
- Proposed post-construction controls (Section 9.0)
- Site inspection and monitoring (Section 7.0 and 12.0)

1.3 Project Overview

This project comprises the proposed final remedy/removal action construction activities for the Site 12 residential housing area at NAVSTA TI. The purpose of the action is the reduction of the potential for housing area residents to contact chemical- or solid-waste contaminated soil within Site 12. The U. S. Department of the Navy (Navy) has retained the services of Shaw Environmental, Inc., (herein referred to as Shaw) to conduct the removal action at this site.

The removal action includes excavation of chemical- and solid-waste contaminated soil within known SWDAs as well as the preemptive excavation of soil within residential backyards which may be impacted by historical grading and mixing of material from the SWDAs. Chemicals of concern within the Site 12 SWDAs include lead, polychlorinated biphenyls (PCB), and polycyclic aromatic hydrocarbons (PAH).

Site 12 is located on the northwest portion of TI on a flat-lying 93-acre area. The site consists of multiplex housing units with private backyards and common area front yards, side yards and surrounding greenbelts.

Depending on accessibility of construction equipment and digging conditions, excavations will be performed by a combination of mechanical equipment (excavators, mini-excavators, and backhoes) and hand digging. All areas, shown on Figures 4, 5, and 6 of the Work Plan, will be excavated to four feet bgs. Residential buildings and carports will not be removed. These features will in part define excavation boundaries, as shown in the excavation design drawings. During excavation activities, waste soil may be transported by local haul trucks to a waste soil/debris staging area or loaded directly into end-dumps for offsite transportation and disposal. Prior to leaving exclusion zones, the exterior of each truck will be decontaminated, if necessary and the load will be covered with a tarpaulin, as described in the Waste Management Section of the Work Plan.

It is intended that no stockpiling of waste soil will occur at the excavation site. However, unforeseen site conditions may require temporary storage of waste soil at the excavation site. If excavation site storage is required, the soil may be either contained in U.S. Department of Transportation-approved, lined, 20-cubic yard roll-off bins or stockpiled and covered.

2.0 Source Identification

This section identifies maps showing the following:

- Potential sources that are likely to add significant quantities of pollutants to stormwater discharges
- Potential sources that may result in non- stormwater discharges from the site.

The primary source of pollutants will be soil and sediment from active excavations that might be carried to the paved areas by the construction equipment and subsequently washed into the storm sewers. Other sources include 1) stormwater that overflows excavations during storm events and carries soil into the storm sewer, 2) wind erosion of soil from excavations that is deposited on paved areas and washed into the storm sewers, 3) leaking fuel and lubricants from construction equipment, 4) both clean and waste soil stockpiles areas, and 5) staging/loading areas. More complete descriptions of potential pollutants are provided in Section 3.4.1

2.1 Site Map

Figure 1 in this SWPPP, "Site Map with Truck Routes and Staging Areas," shows the location of the Site 12 excavations and their proximity to San Francisco Bay. The Bay is the only surface water potentially affected by the removal action. The map also shows the staging areas and location of decontamination pads where the equipment, including the trucks transporting soil off site, will be cleaned before leaving the controlled area

2.2 Storm Drain System Maps

Figure 2 ("Excavation Boundaries and Storm Drainage System, SWDA A&B") and Figure 3 ("Excavation Boundaries and Storm Drainage System, SWDAs 1207/1209 and 1231/1233") show the boundaries of the three SWDA excavations and the storm drain system that serves each SWDA. The sites are flat-lying with no natural channels; therefore, storm runoff primarily flows into the storm drains shown on Figures 2 and 3.

3.0 Project Background and Site Description

This section includes a brief background of the site, descriptions of the site condition prior to beginning construction, and the planned final site conditions following the completion of the project.

3.1 Site Background

Site 12 is located on the northwest portion of TI on a relatively flat 93-acre area. The site consists of multiplex housing units with private backyards and common area front yards, side yards and surrounding greenbelts. The area was originally used as a parking lot during the 1939-1940 Golden Gate International Exposition. After Navy occupation of the island in 1940, the area was developed for bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields and disposal and burning of solid-waste. Beginning in the 1960s, areas of Site 12 were incrementally developed into housing for Navy personnel and their dependents.

Collectively there are 149 residential buildings in Site 12. Each building has between four and eight residential units. Only a few of these are affected by the planned remedial action, as listed below and shown on Figures 4, 5, and 6 of the Work Plan:

SWDA	Number of Affected Residential Buildings	Number of Affected Buildings That Are Unoccupied	Number of Occupied Units in Affected Building
A & B	8	7	4
1207 / 1209	6	3	14
1231 / 1233	4	2	7

3.2 Site Description

3.2.1 Site Location

NAVSTA TI lies in San Francisco Bay, midway between San Francisco and Oakland, California. The facility consists of two contiguous islands, TI and Yerba Buena Island. TI is a manmade island constructed of sediment dredged from the San Francisco Bay, with a total area of approximately 403 acres (Tetra Tech EM, Inc. [TtEMI], 1999, *Draft Remedial Investigation Report Site 12 Operable Unit*, San Francisco, June 1).

3.2.2 Climate

The climate in the project area is Mediterranean (National Oceanic Atmospheric Administration division CA-04 Central Coast) with moderate year-round temperatures and a winter rainy season. The average annual temperature is 56 to 58 degrees Fahrenheit, with an annual frost-free period ranging from 300 to 330 days. The average annual precipitation is about 25 to 30 inches, according to the Navy. Approximately 90 percent of the annual precipitation occurs from November to April. Localized showers are infrequent, and storms are moderate in duration and intensity.

Two long-term precipitation gauges are located near TI, one at Oakland Museum (National Climatic Data Center ID 046336), and one at San Francisco Mission Dolores (ID 047772). The California Department of Water Resources has compiled precipitation frequency data for these two stations and summaries are available on the internet at http://www.wrcc.dri.edu and http://cdec.water.ca.gov/snow_rain.html. Monthly rainfall averages listed for these stations over a continuous 30-year period from 1970 through 2000 provide mean yearly precipitation values of 23 inches at Oakland and 22 inches at San Francisco. The data from these two stations agree with that provided by the Navy.

3.3 Site Soil

Soils encountered in borings advanced to depths of up to 15 feet bgs consist primarily of tan to grayish-brown, fine to coarse-grained, loose sands, with some shell fragments and gravel. According to monitoring well and Hydropunch® boring logs, the estimated depth to groundwater during drilling at Site 12 ranged from about 2.5 to 7.5 feet. The water table is unconfined and subject to tidal influence in areas close to the shoreline (TtEMI, 1999a).

3.3.1 Pre-Existing Conditions

The Site 12 area is flat-lying with no natural drainage channels. The primary drainage pattern for Site 12 consists of flow from the housing units and common areas to the storm sewer system that drains into San Francisco Bay, which is contiguous with the western boundary of the site (Figures 2 and 3). The San Francisco Bay is the only surface water body that will receive stormwater runoff from Site 12. The storm drainage system flows into pump stations located along the perimeter of the island, which then pump stormwater into San Francisco Bay.

The stormwater drainage system will not be modified by the removal action. However, if a stormwater line is encountered in an excavation, it will be cut and capped at the excavation boundary, and the drain line will be replaced during backfill and restoration.

3.3.2 Planned Restoration Conditions

In general, surface restoration will approximate pre-construction conditions. Excavations will be backfilled following the receipt of analytical data for confirmation samples. Prior to backfilling, the base of the excavation will be marked to define the limits of excavation. Backfill materials will consist of clean imported material that could include topsoil, clean fill, sand, Class II aggregate base (Class II AB), pea gravel, or ¾-inch drain rock. Backfill will be compacted to the specifications in the Work Plan. Backyards and common areas that are not scheduled for other surface completions (patios, sidewalks, etc.) will be restored with sod. Fencing removed for excavation activities will be replaced in kind. In general, asphalt-paved roadways and parking areas, concrete curbs and gutters, sidewalks and driveways will be restored to pre-construction design.

3.4 Sources of Stormwater Pollution

This SWPPP includes the following descriptions regarding source identification:

- A description of potential sources that are likely to add significant quantities of pollutants to stormwater discharges
- A description of potential sources that may result in non- stormwater discharges from the site

Potential sources for adding contaminants to stormwater are discussed in this section.

3.4.1 Site Pollutants

From the time that the Navy occupied TI in late 1940 until the 1960s, the area was used for bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields, and disposal and burning of waste. During construction of residential housing units beginning in 1967, construction specifications for the residential units instructed the contractor to prepare the site by mixing the solid-waste with fill material. The mixing, spreading, and grading of the solid-waste/fill mixture occurred both within and outside the known SWDAs and resulted in a random distribution of solid-waste, lead, PAH, PCB, and dioxin contamination in soil. Additionally, localized areas within SWDA A&B, west of Buildings 1319 and 1321, contain methane and 1,1,2,2-tertrachloroethane contamination. Based on information to date, the primary areas of concern are the known SWDAs. The excavated soil from these areas and unfilled excavations are a potential source of chemical pollutants and sediment.

3.4.2 Toxic Materials

Toxic materials used during the remedial activity will include gasoline, diesel fuel, motor oil, hydraulic fluid, and various lubricants. Acutely hazardous materials will not be used or stored

on site during the project. There are not any feasible alternatives to motor fuels and oils for operating construction equipment.

At the end of each day heavy equipment will remain within the excavation exclusion zones. A petroleum vendor will periodically deliver fuel to the equipment. No petroleum fuel will be stored on site.

Cement is an alkaline material that will raise the pH of stormwater significantly if a release or spill should occur. Cement will not be stored on site. Restoration of paved surfaces will be conducted following completion of excavation backfilling. When cement restoration is required, the mix will be delivered by a supplier on the day of the work. Excess cement will be removed from the site by the supplier. Wash-outs of cement equipment will be performed and contained in the waste/debris staging area.

3.4.3 Sanitary Waste

Portable toilets will be used at the site. These are a potential source of chemical and biological pollution. The location of portable toilets will vary at the site, depending on the current area being excavated. Any portable toilets that appear to be leaking will immediately be replaced with intact units.

3.5 Construction Site Estimates

The construction covers three SWDAs within Site 12 with a combined area of approximately 10 acres (the work area, including staging and stockpile areas, comprise a total of approximately 19.5 acres). The removal action activities are not anticipated to change the current percent impervious area and, should plans change, any change would be expected to decrease impervious areas. Stormwater flow onto the construction sites will be minimal because Site 12 is relatively level.

4.0 General Site and Materials Management

The removal action is complex and not every excavation will follow the typical scenario. Typical BMPs for site control and materials management have been identified, and certain BMPs have been included in the lists below and in Section 5.0 that are contingency BMPs. The project engineer will implement one or more of the contingency BMPs if the standard BMPs will be, in his opinion, inappropriate, insufficient, or ineffective.

BMPs in this document are either site-specific or are general BMPs prepared by the U.S. Environmental Protection Agency (EPA) or the RWQCB. The EPA BMPs are available on the internet site referenced in Section 1.2 and are referred to as EPA BMPs in this SWPPP. The Water Board's BMPs are contained in the Erosion and Sediment Control Field Manual, Fourth Edition (RWQCB, 2002).

4.1 Preconstruction Control Practices

Prior to beginning construction, key field project team members will review and discuss the BMP planning and training methods to be implemented during the removal action. Field personnel will receive the required training. Materials for standard BMPs will be provided. Decontamination pad(s) will be set up and BMPs will be installed before excavation begins

4.2 General Practices

Equipment and construction materials will be stored and used in a controlled manner throughout the removal action so that stormwater does not come into contact with potential pollutants. General practices include routine inspections by management to ensure that controls remain in place. The management will also ensure that field staff and subcontractors are following this plan. Awareness training (Section 10.0) will be periodically included in the daily safety briefings. Management will plan BMP implementation based on work activities and daily weather forecasts obtained for planning removal action activities.

The following general practice BMPs are described in the Field Manual and provided in Attachment 1:

- Scheduling
- Water conservation practices

4.3 Practices to Minimize Contact with Stormwater

Construction equipment is the second most likely source of stormwater pollutants, after sediment from removal action activities. Incoming equipment that will remain on site will be inspected for

leaking oil and fluids initially and daily while on site. Leaking vehicles will not be allowed on site and any that develop leaks will be repaired immediately or contained in a manner such that the leaking fuel or lubricant is not released to the soil or storm drain. This might include placing a catch basin or bermed impermeable sheeting under the leak.

Vehicle washing (decontamination) will be done using the following guidelines:

- As little water as possible will be used to avoid causing erosion and sediment transport in the decontamination area
- Designated bermed wash areas will be used to prevent waste water discharge into storm drains

Vehicle maintenance will be performed off site whenever possible and controls described in the BMP (Attachment 1) will be implemented whenever it occurs on site. Equipment fueling will be performed away from areas that slope to storm drain inlets and secondary containment will be employed to ensure any spilled fuel will not be released.

Portable toilets will be located so that accidental release of the contents would not be released to the storm drains. The toilets will be maintained by the supplier and waste will be disposed of off-site.

The following BMPs are described in the EPA BMPs and/or the Field Manual and provided in Attachment 1:

- Vehicle and Equipment Service
- Spill prevention and control

Conex boxes will be used as temporary storage facilities to keep tools and equipment dry. Stockpiled waste soil and clean import fill soil will be covered during rain storms. If roll-off bins are used for waste soil, they will be lined before use, and the covers closed during rain events. Wastewater will be stored in rented tanks near the soil stockpile area prior to offsite transportation and disposal.

4.4 Material Loading, Unloading, and Access Areas

Materials that will be delivered to the site include clean fill (soil, sand, gravel, Class II AB), sod, fencing materials (lumber), and piping for utility repairs. All of these materials will be stored in stockpile and truck loading areas (Figure 1). Fuel for heavy equipment will be transported to and from the site in fuel trucks when needed, and will not be stored on site.

The following BMPs are described in the Field Manual and provided in Attachment 1:

- Material Delivery, Handling and Storage

4.5 Waste Management and Disposal

Waste management will be a major concern during this removal action and practices are described in detail in the Work Plan. The Work Plan addresses the site soil that might be hazardous waste, any demolition debris, and any miscellaneous waste generated. The waste management practices are designed to prevent spread of waste to the environment, including stormwater.

The following BMPs are described in the EPA BMPs and/or the Field Manual and provided in Attachment 1:

- Solid and demolition waste management
- Handling and Disposal of Concrete and Cement (includes concrete washout).
- Hazardous waste management
- Contaminated soil and water management
- Sanitary/septic waste management
- General construction site waste management

5.0 Erosion and Sedimentation Control Practices

This section discusses the determination and implementation of the BMPs to control erosion and sedimentation during construction and post construction. Site-specific BMPs are described in further detail while general practice BMPs are itemized.

Construction is planned for the wet season; therefore, the appropriate BMPs will need to be implemented. The primary BMPs used for erosion and sediment control during construction will be tracking control practices combined with storm drain inlet protection. No work will be conducted on days that heavy rains are eminent during this period. BMPs listed in this section will be installed as needed during construction and maintained until they are no longer necessary.

5.1 General Practices

The practices in this section are designed to prevent a net increase of sediment load into stormwater discharge. These general practices and controls will be implemented at each excavation until the sites are restored.

The removal action is designed to prevent the spread of soil contamination during excavation, accumulation and transportation of waste soil off site. Soil will be directly loaded into trucks whenever possible to minimize stockpiles. The excavations themselves prevent stormwater runoff because the sandy soil is highly permeable and it is not expected that the excavations will overflow. Excavations will be restored as soon as possible after backfilling so that the fill material will not be eroded from the excavation by wind or rain. BMPs will be implemented if heavy rain is predicted before sod is placed on backfilled excavations and include BMPs such as fiber rolls or gravel bags to slow any stormwater flowing towards storm drain inlets. In our experience at TI, the highly permeable soils allow for rapid infiltration of rain water. To limit off-site transport of pollutants, storm drains in excavation areas will be blocked with filter fabric and/or plastic sheeting. Ponded water will be excluded from excavations and allowed to infiltrate into soil. During heavy rains, water may pond more rapidly than it infiltrates. If observations suggest that ponded water may result in an off-site discharge, ponded waters will be allowed to flow into open excavations to limit potential for discharges.

The following BMPs are described in the EPA BMPs and/or the Field Manual and provided in Attachment 1:

- Fiber rolls
- Sand/gravel bag barrier
- Storm drain inlet protection
- Catch basin inlet filters and covers

- Construction Sequencing

5.2 Soil Stabilization Practices

The site is generally level and filled excavations will generally be restored very soon after backfilling. Some slight slopes may be created during backfilling of excavations, especially in the common areas. These areas may require protection from erosion if there is precipitation before the soil is stabilized. Many techniques are available and the project engineer will evaluate the area and choose BMPs.

The most common soil stabilization practices are the following BMPs that are described in the EPA BMPs and Field Manual and provided in Attachment 1:

- Preservation of Existing Vegetation
- Dust control
- Fiber rolls
- Sand/gravel bag barrier
- Brush or rock filter
- Filter Berms
- Sodding

5.3 Reduction of Tracking of Sediment onto Roadways

Site-specific BMPs to reduce the amount of sediment and pollutant transport in stormwater discharge from the soil excavation areas include the following:

- Clean tires of trucks
- Tarp trucks to prevent wind and water erosion during transport
- Regular street sweeping; if too much soil is in street to sweep by hand, a vacuum-type sweeper will be used
- Stockpiling

The following BMPs are described in the Field Manual and provided in Attachment 1:

- Stabilized construction entrance
- Entrance and exit tire wash

5.4 Wind Erosion

The dust control and stockpiling BMPs are described in the EPA BMPs and the Field Manual and provided in Attachment 1.

6.0 Non-Stormwater Management

No non-stormwater discharges to the storm drain system or surface are proposed for the removal action. The project engineer is responsible for overseeing any unplanned discharges to ensure that no materials are discharged in quantities which will have an adverse effect on receiving waters or the storm drain system.

Non- stormwater wastewater generated on site may include water from decontamination of equipment and personnel and from dewatering of excavations or saturated excavated soil. Wastewater may be stored on site as described in the Work Plan to prevent releases to the surface and storm drains and will be disposed of as described in the Work Plan. It will be sampled and may be disposed of into the sanitary sewer if it meets publicly-owned treatment works acceptance limits. Water not meeting those requirements will be transported off site to the appropriate disposal facility.

Other water used at the site includes water for dust control and drinking water. These will not be discharged to the storm sewer unless the project engineer in consultation with the Navy and the water board determine that it will not adversely impact the quality of the water discharged from the storm sewer system.

7.0 Inspections, Maintenance, and Repair of Structural Controls

Structural controls are subject to degradation from weathering, mechanical abuse, and similar forces and can become ineffective. Inspections are a means of determining which controls are in need of repair or replacement. Maintenance and repair of controls are necessary to meet the pollution prevention goal this plan documents.

7.1 Inspections and Reporting

Inspections of the structures for prevention of erosion, sediment control, and to prevent other types of stormwater pollution will be conducted before and after each storm event by the project engineer or his designee for the duration of the removal action. Inspections will cover the items presented in this SWPPP and the applicable BMPs in Attachment 1. Records of the inspections will be kept in field notebooks and placed on file for at least 3 years. A record of each inspection will include the date of the inspection, the individual(s) who performed the inspection, and the observations. The inspection results will be used to evaluate the performance of the BMPs and determine if any corrective action is required. Dependent upon the level of action required, a modification to the SWPPP may be generated. This modification will be included as an attachment to the SWPPP and be provided to holders of controlled copies of the plan. A copy of the inspection checklist and inspection log to be used during this project is included in Attachment 2.

Incidents of noncompliance will be reported to the Navy who in turn will report to the RWQCB within 30 days of identification of noncompliance. An annual inspection will not be conducted due to the scheduled project duration of less than one year, as shown in Work Plan Table 2. An annual certification of compliance will not be required.

7.2 Responsible Personnel

This section lists the names and contact numbers for the responsible persons.

Name (Title)	Contact Number	Responsibility
Peter Bourgeois, Project Manager	415-760-5321	Project oversight, provide training as needed, authorize funding for BMPs
Barbara Matz, Mark Vennemeyer, Alex Naughton, Technical Managers	925-288-9898	Management of BMPs: inspections, implementation of contingency BMPs
Ed Hueston, Site Supervisor	415-277-6985	Implementation and maintenance of BMPs; personnel oversight.

8.0 Spill Prevention and Control

Soil and wastewater will be handled on site during the removal action and spills of these materials could adversely impact the receiving waters. The Work Plan and the health and safety plan contain other details pertaining to spill prevention and control and emergency planning. Equipment described in those plans to control spills will be on site during the removal action activities.

Procedures for loading and transporting soil, as described in the Work Plan, are designed to reduce the probability of a release of soil. Stockpiled soil will be protected from rain and wind erosion as described above. Wastewater will be stored using methods such as double-walled tanks and bermed, lined storage areas.

The most likely incidents involving hazardous materials other than soil would be associated with spills or drips of motor fuels and lubricants described above. Impacts from such incidents will be mitigated by thoroughly cleaning up minor spills as they occur. An incident involving a service vehicle or refueling truck release would present the worst-case scenario for release of hazardous materials. In the case of a large spill of hazardous material, the area would be immediately bermed/contained followed by blocking of the nearest storm drain inlets (if not already blocked), to prevent off-site release. The spill would be reviewed by the Project Manager and Project Engineer to determine if the Navy and any regulatory agencies need to be notified. A large spill or release would most likely involve excavation and storage of the impacted soil and/or materials in drums or roll-off bins for off-site disposal or recycling. The method for off-site disposal or recycling will depend on the waste classification.

Emergency response/notification protocols are provided in the Site Health and Safety Plan (Appendix F of the Work Plan).

9.0 Post-Construction Stormwater Management

The excavated areas will be returned to pre-construction condition as closely as possible. Areas of vegetation will be replaced, primarily with hydroseed or sod. Sod will be brought on site, carefully placed over the topsoil, and thoroughly watered. At occupied buildings, the City of San Francisco will be expected to assume watering and maintenance responsibilities of the sod. At unoccupied buildings and common areas, the Navy will assume watering responsibilities for one week following placement. Watering may be accomplished by; 1) spraying areas with a watering truck, or 2) constructing a series of aboveground piping and sprinkler head systems that may will be temporarily connected to nearby fire hydrants. After one week the Navy will advise the City of San Francisco to assume watering responsibilities and the Navy's temporary water systems will be removed. This plan will be amended to assure post-construction erosion control if seeding is substituted for sod placement. Surface features such as asphalt roadways and parking lots; concrete curb and gutter, driveways, porches, patios, walkways, and sidewalks; tot-lots, and curbside mail boxes are found throughout Site 12. If these features are removed or damaged during construction activities, they will generally be restored with like design, which will control erosion.

10.0 Personnel Training

Informal training will include tailgate site briefings to be conducted bi-weekly and will address the following topics:

- Erosion control BMPs
- Sediment control BMPs
- Non-stormwater BMPs
- Waste management and materials pollution control BMPs
- Emergency procedures specific to the construction site stormwater management

Informal training for the site supervisory staff will include periodic review of this plan and review of the RWQCB and EPA guidance documents.

The site supervisory staff will be formally trained in erosion and sediment control as necessary.

11.0 Other Plans

Several site-specific management plans as well as programmatic plans to be approved by Shaw and/or the Navy will be implemented for this project. These plans describe the methods that will be used to execute, integrate, and coordinate emergency response, quality control, health and safety, and generally perform work in a controlled manner.

12.0 Monitoring and Reporting

Inspection of BMPs will be carried out after each rain event as described above to determine if they were effective for that event. Incidents of noncompliance will be reported to the Navy who will notify the RWQCB within 30 days of identification of noncompliance. An annual inspection will not be conducted due to the scheduled project duration. Similarly, an annual certification of compliance will not be required.

13.0 References

California Department of Transportation, 2003, *Caltrans Statewide Stormwater Quality Practice Guidelines, CTSW-RT-02-009*, May.

Code of Federal Regulations, Title 40, Part 300

State Water Resources Control Board, Order No. 99-08-DWQ, National Pollutant Discharge Elimination System General Permit No. CAS000002

Stormwater Quality Task Force, 1993, *California Stormwater Best Management Practice Handbooks, Construction Activity Best Management*. March.

National Menu of Best Management Practices for Stormwater Phase II available on the Internet at http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm.

Regional Water Quality Control Board, San Francisco Bay Region, 2002, *Erosion and Sediment Control Field Manual*, Fourth Edition.

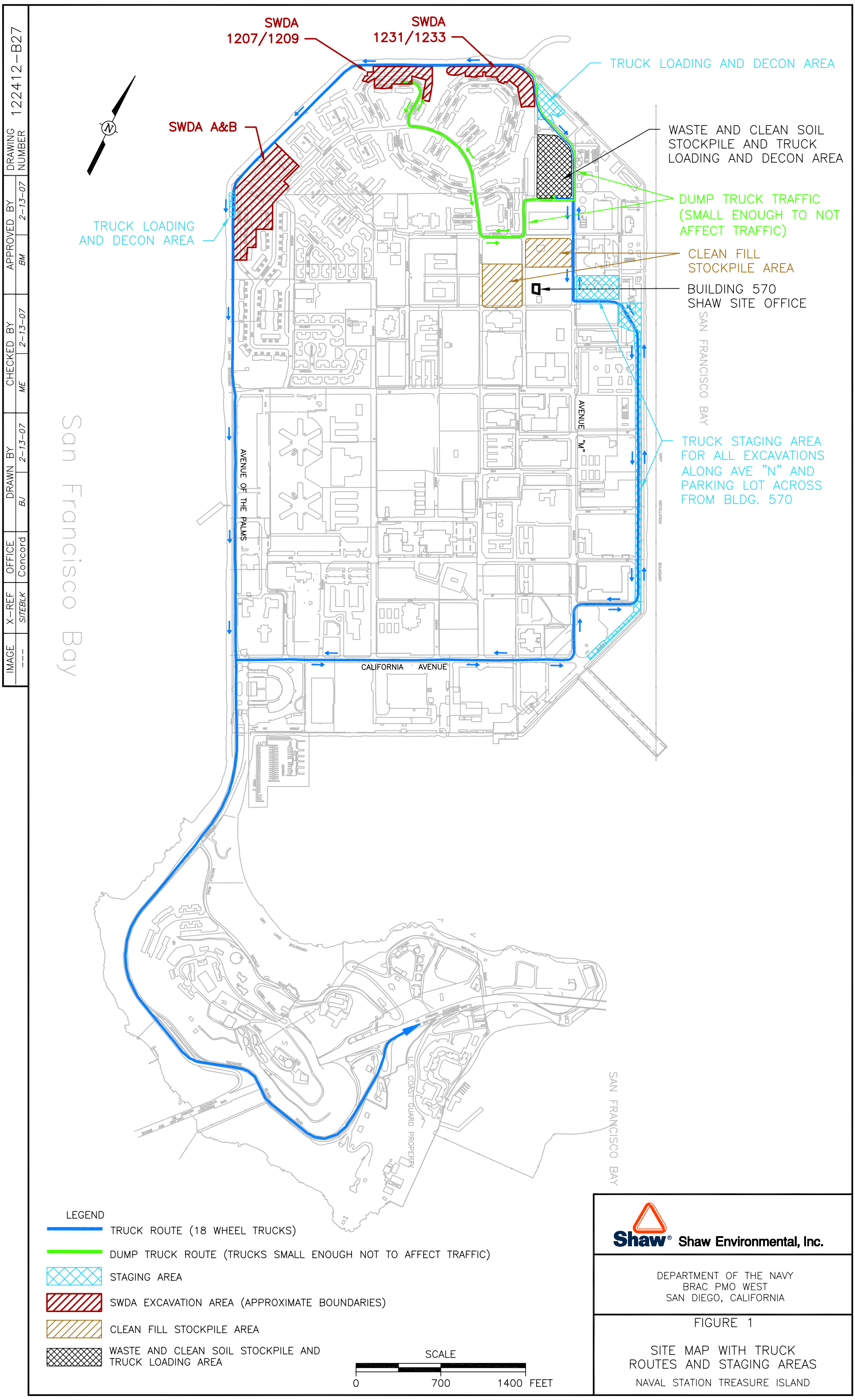
Regional Water Quality Control Board, San Francisco Bay Region, 2002, *Guidelines for Construction Projects*.

Tetra Tech EM, Inc., 1999, *Draft Remedial Investigation Report Site 12 Operable Unit*, San Francisco. June.

Western Regional Climate Center at http://www.wrcc.dri.edu queried on 12/04/02.

Figures

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
---	SITEBLK	Concord	BJ	2-13-07	ME	2-13-07	BM	2-13-07	122412-B27



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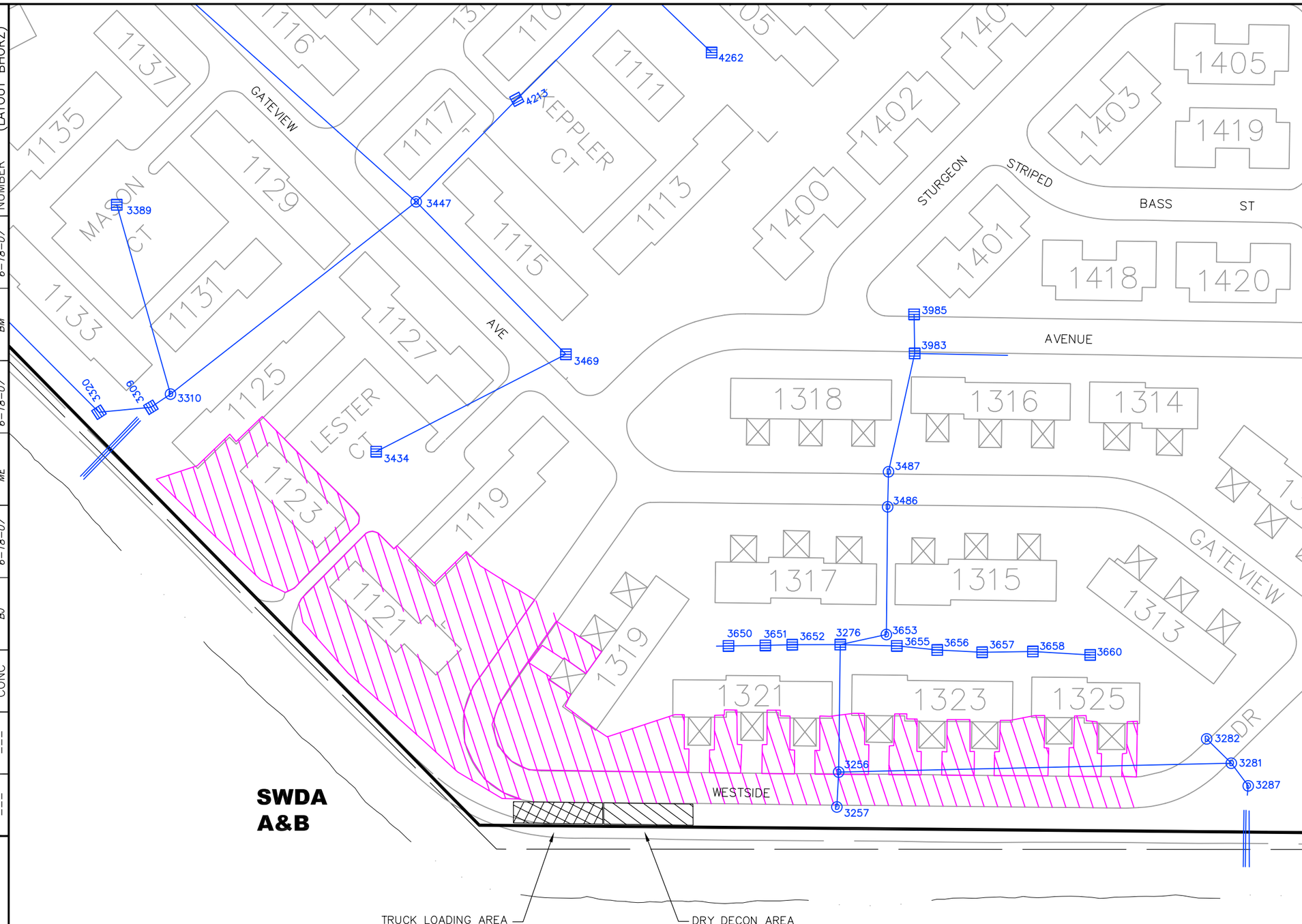
BRAC PMO WEST
SAN DIEGO, CALIFORNIA

FIGURE 1

SITE MAP WITH TRUCK ROUTES AND STAGING AREAS

NAVAL STATION TREASURE ISLAND



LEGEND

- EXCAVATION AREAS
- SITE 12 BOUNDARY
- STORM DRAIN LINE
- TRUCK LOADING AREA
- DRY DECON AREA

SCALE

0 100 200 FEET

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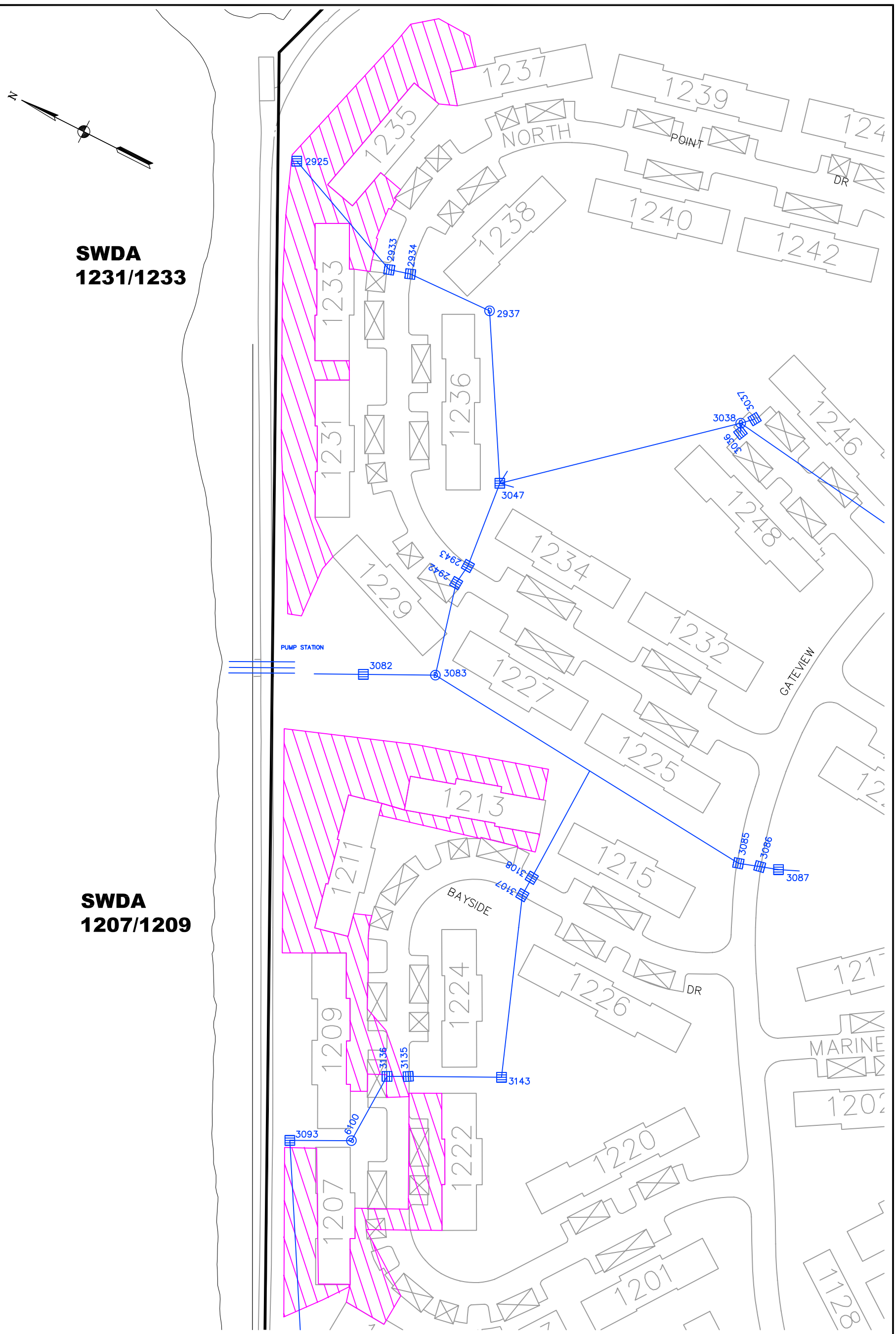
FIGURE 2
EXCAVATION BOUNDARIES AND
STORM DRAINAGE SYSTEM
SWDA A AND B

NAVAL STATION TREASURE ISLAND

DRAWING NUMBER	122412-B26 (LAYOUT BHORZ)	APPROVED BY	BM	6-18-07	
CHECKED BY	ME	6-18-07			
DRAWN BY	BJ	6-18-07			
OFFICE	CONC				
X-REF	---				
IMAGE	---				

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	Concord	BJ 2-13-07	ME 2-13-07	BM 2-13-07	122412-B26 (LAYOUT BVERT)



LEGEND

EXCAVATION AREAS

SITE 12 BOUNDARY

STORM DRAIN LINE

SCALE

0 100 200 FEET

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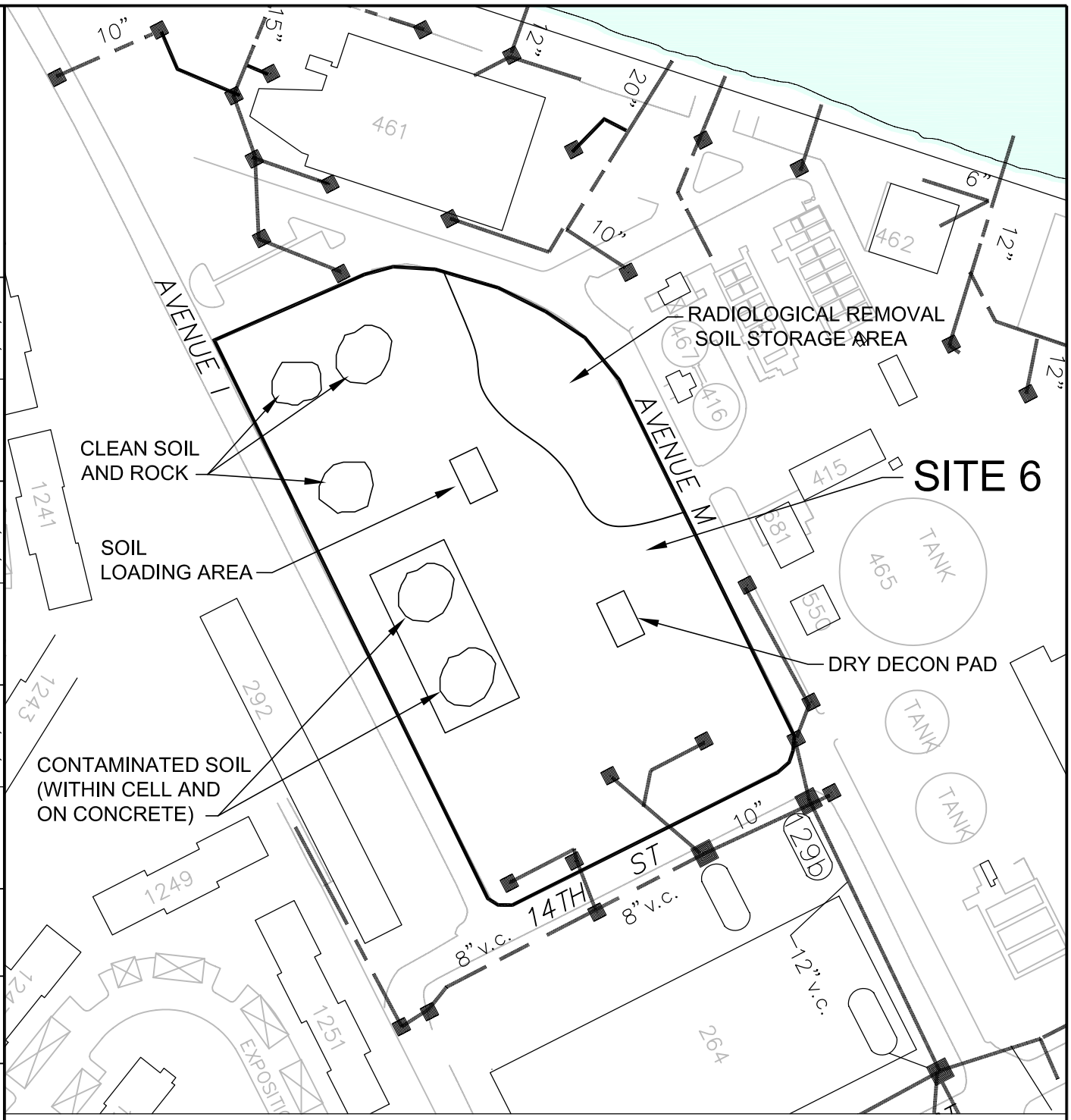
SAN DIEGO, CALIFORNIA

FIGURE 3
EXCAVATION BOUNDARIES AND
STORM DRAINAGE SYSTEM
SWDA'S 1207/1209 AND 1231/1233
NAVAL STATION TREASURE ISLAND



LEGEND:

- BUILDING
- SITE 6 BOUNDARY
- STORM DRAIN LINE
- CATCH BASIN
- MANHOLE

SCALE

0 120 240 FEET

NOTE:
MAP BASED ON ENGINEERING EVALUATION/COST ANALYSIS FOR SITE 12, SulTech, 2006.

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FIGURE 4
SITE 6
STOCKPILE LOCATIONS AND
STORM DRAIN SYSTEM
NAVAL STATION TREASURE ISLAND

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
122412-A8	BM 6/18/07	AMN 6/18/07	BJ 6/18/07	TI	---	---

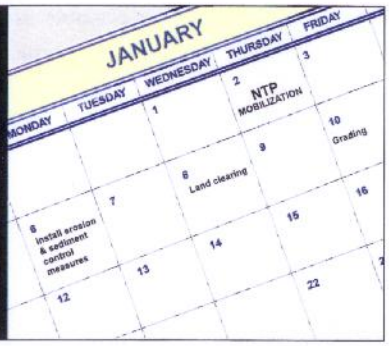
SWPPP

Attachment 1
Applicable Best Management Practice Procedures

S C H E D U L I N G

➡ Erosion Control

➡ Sediment Control



Purpose: The project schedule should sequence construction activities with the installation of erosion and sediment control measures. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking and to perform the construction activities and control practices in accordance with the planned schedule.

Application: All projects involving land-disturbing activities.

Limitations: None identified.

Inspection and Maintenance:

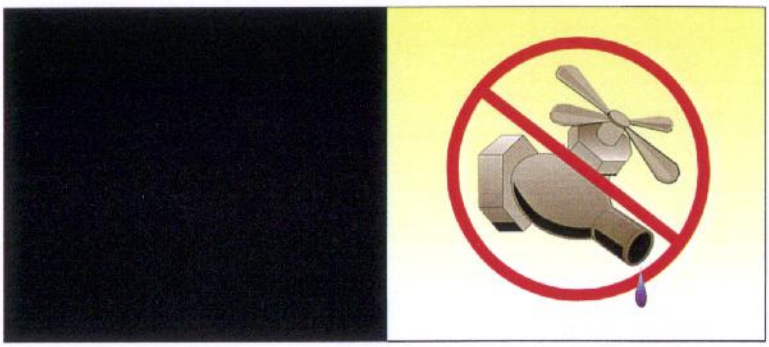
- Incorporate the use of a schedule or flow chart to layout the construction plan.
- Work out the sequencing and timetable for the starting and completion of each item such as site clearing, grading, excavation, pouring foundations, installing utilities, etc.
- Incorporate erosion and sediment control items in construction schedule.
- Avoid or minimize land disturbing activities scheduled between October and April 1st. Extra precautions (BMP's) should be implemented to protect the site from erosion.
- Schedule major grading operations in dry-weather months (April thru October).
- Allow enough time before rainfall begins to stabilize soil with vegetation or physical means or to install temporary sediment trapping devices.

- Erosion may be caused during dry seasons by unseasonal rainfall, wind, and vehicle tracking. Maintain site stabilization year-round, and keep wet-season sediment trapping devices in operational condition.
- Whenever possible, schedule work to minimize the extent of site disturbance at any one time.
- Incorporate staged revegetation of graded slopes and installation of geotextile blankets as work progresses.
- Sequence trenching activities by closing open portions before new trenching begins.

Inspection and Maintenance:

- Routinely verify that work is progressing in accordance with the project schedule. If progress deviates, take corrective actions.
- When changes to the project schedule are unavoidable, amend the sequence schedule well in advance to anticipate potential problems and maintain control.

WATER CONSERVATION PRACTICES



Purpose: Appropriate uses and restrictions on the use of water on construction sites reduce the potential for erosion and the transport of pollutants off site.

Application: All construction sites where water is used.

Limitations: None identified.

Installation Guidelines:

- Reset irrigation controllers according to seasonal needs.
- Keep water equipment in good working condition.
- Repair water leaks promptly.
- Discourage washing of equipment on the construction site.
- Avoid using water to clean construction areas. Sweep paved areas where practical.
- Direct construction water runoff to areas where it can soak into the ground.
- Apply dust control water sparingly to avoid washing sediments into drainage system. Use recycled water when possible.
- When washing vehicles and equipment:
  (1) minimize water use and retain all runoff on-site
  (2) do not use soaps or chemicals
  (3) use a commercial washrack facility whenever possible

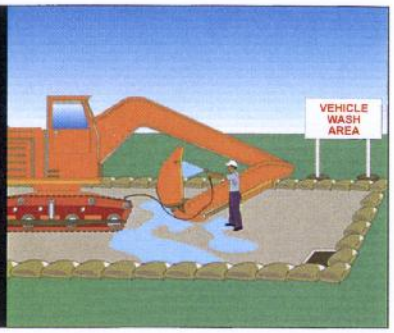
Inspection and Maintenance:

➟ Inspect water equipment at least twice weekly.

Vehicle and Equipment Service

➡ Pollution Prevention

➡ Pollution Control



Purpose: Prevention and control of leaks from equipment and vehicles and proper management of wash water eliminates or minimizes discharge of toxic pollutants to the storm drain system or watercourses.

Application:

- Fueling areas
- Maintenance and storage/parking areas
- Cleaning/wash areas

Practices:

- Conduct fueling, major maintenance/repair, and washing off-site whenever feasible.
- Regularly maintain and frequently inspect vehicles and equipment for damaged hoses, leaky gaskets, or other service problems.
- Clearly designate vehicle/equipment service areas away from waterways, storm drains, curbs and gutters.
- Properly contain areas with berms, sandbags, or other barriers.
- Only use water for any on-site cleaning. Do not use soap, solvents, degreasers, steam cleaning, or similar methods.
- Use drip pans/drip cloths if necessary to drain and replace fluids on-site.
- Collect all spent fluids, store in separate labeled containers, recycle when possible, and properly dispose (generally as hazardous waste).

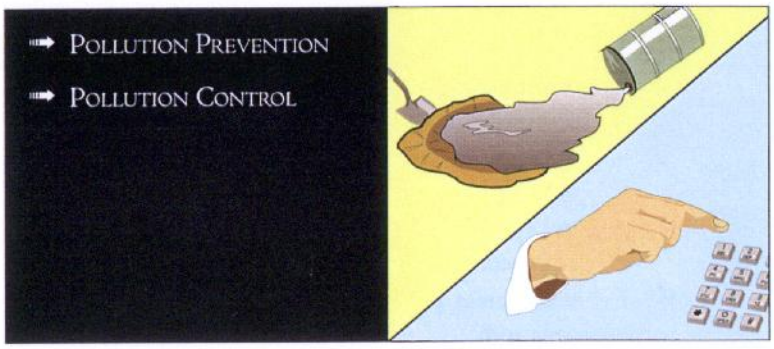
Limitations:

- Some municipalities may require pretreatment and monitoring of wash water discharges to sanitary sewer.

Inspection and Maintenance:

- Inspect containment structures (such as berms) to ensure they are intact.
- Maintain waste fluid containers in leak proof condition.
- Regularly service sumps associated with wash areas.

Spill Prevention and Control



Purpose: Prevention and control of spills minimizes or eliminates the discharge of hazardous and nonhazardous materials to the storm drain system and to watercourses.

Application:

- Solid and liquid materials, including, but not limited to:
  - Fuels
  - Lubricants
  - Other petroleum distillates
  - Deicing/anti-icing chemicals
  - Paints, solvents
  - Cement, mortar
  - Soil stabilizers
  - Herbicides
  - Fertilizers
  - Growth inhibitors
- Storage areas for chemicals and/or hazardous substances
- Fuel areas
- Vehicles/equipment transporting and handling chemicals and other hazardous substances

Practices:

- Notify the State Office of Emergency Service (OES) at 800-852-7550 when a hazardous spill occurs. Construction sites located near natural watercourses, canals, and reservoirs are at highest risk of an uncontained spill contaminating surface waters.

- Locate chemical and/or hazardous materials storage and handling areas away from natural watercourses, canals, reservoirs and storm drains.
- Store chemicals and/or hazardous materials in areas not susceptible to rain and provide secondary containment in case of leaks or spills.
- Immediately clean up spills and properly dispose of contaminated soils and clean up materials:
  - dry spills should be swept, not washed/hosed.
  - wet spills on impermeable surfaces should be absorbed, and absorbent materials properly disposed.
  - wet spills on soil should be dug up and all exposed soils properly disposed.
- For fueling areas, provide secondary containment with enough capacity to contain a spill.
- Use only a reputable, licensed company to clean up large spills and dispose contaminated materials.

Limitations:

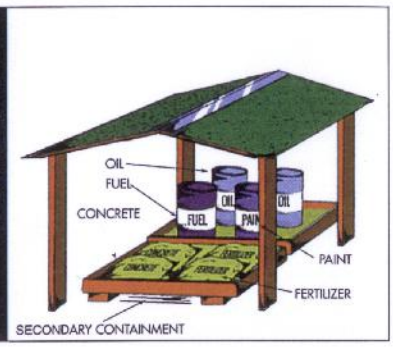
- Procedures and practices presented herein are general. Contractor should identify appropriate practices for the specific materials used or stored on site.

Inspection and Maintenance:

- Verify weekly that sufficient spill control clean up materials are located near material storage, unloading and use areas, as well as fueling areas.
- Inspect containment structures for storage and fueling areas.
- Fueling areas and storage tanks should be inspected on a regular basis.
- Update spill prevention and control plans and stock appropriate clean up materials whenever changes occur in the types of chemical on site.

Material Delivery, Handling and Storage

➡ Pollution Prevention



Purpose: Wet and dry building materials with the potential to pollute runoff should be handled and delivered with care and stored under cover and/or surrounded by berms when rain is forecast or during wet weather.

Application: Construction sites with delivery, handling/preparation, and storage of the following materials:

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

Practices:

- Train employees and subcontractors in proper material delivery, handling, and storage practices.
- Purchase, transport to site, and use only the amount needed for the work on site.
- Purchase and use nonhazardous and environmentally-friendly materials when possible.
- Label and store all hazardous materials according to local, state, and federal regulations.

- Keep inventory of hazardous material for use in emergency.
- Store granular materials at least 10 feet from waterways, storm drains, curbs and gutters.
- Install barriers around storage areas to prevent contact with runoff.
- Provide indoor coverage, a temporary roof, or a secure impermeable tarp for plaster or other powders. These can create large quantities of suspended solids in runoff, which may be toxic to aquatic life and cause serious environmental harm. Water quality and air quality can be protected with secure cover.
- Provide a temporary roof, or secured plastic sheeting or tarp for stockpiled materials and wastes.
- Provide storage in accordance with secondary containment regulations and provide secondary cover for containers of paint, chemicals, solvents, and other hazardous materials during rainy periods.
- Use mats during delivery and storage.
- Control dust daily with reclaimed water.
- Do not apply hazardous chemicals outdoors during wet weather.
- Have proper storage instructions posted at all times in an open and conspicuous location.
- Keep ample supply of appropriate spill clean up materials near storage areas.

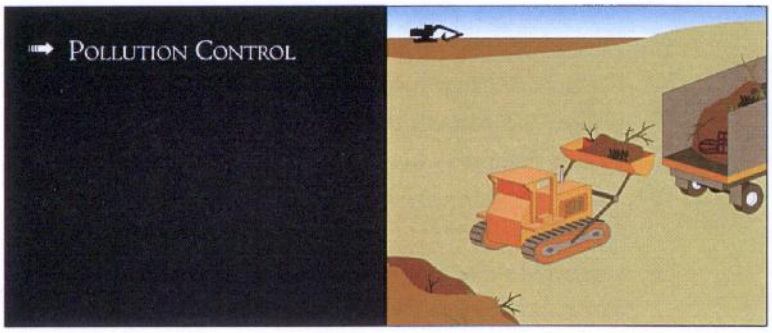
Limitations:

- Space limitations may preclude indoor storage
- Storage sheds must meet building and code requirements.
- Alternative materials which are less hazardous or polluting may be more difficult to obtain or may require different preparation and use.
- Materials must be stored according to fire code requirements.

Inspection and Maintenance:

- Inspect storage areas before and after rainfall events, and at least weekly throughout the job.
- Inspect to ensure that designated storage areas are kept clean and well organized.
- Repair and/or replace perimeter controls, containment structures, and covers as necessary to ensure their proper functioning.
- Spot check employees and subcontractors monthly throughout the job to ensure appropriate practices are being employed.

Solid and Demolition Waste Management



Purpose: Proper management of demolition materials and solid waste created and stockpiled on site eliminates and minimizes the discharge of pollutants to the storm drain system and watercourses.

Application: Applicable to all nonhazardous materials.

Reusable materials:
- doors
- banisters
- floorboards
- windows
- 1x4s
- old, dense lumber

Recyclable materials:
- metal framing
- wood (framing, etc.)
- concrete, brick and cement mortar
- asphalt
- plate glass
- cleared vegetation, tree trimmings, plant material

Non-recyclable:
- dry paint; nonhazardous paint chips and dust from dry stripping and sand blasting
- absorbent materials (cat litter, sand, rags, mats) used to absorb nonhazardous spills. Materials used to absorb oil-based spills must be disposed of as hazardous waste.;
- steel and metal scraps
- pipe and electrical cuttings
- ground and/or broken paving materials
- domestic wastes (containers, cans, cups, bags etc.)
- other demolition waste

Practices:

- Reuse and recycle construction materials and waste when possible (see *Resources* for a list of recycling and disposal services).
- Designate waste collection areas away from streets, gutters, storm drains, and waterways, and close to construction entrances.
- Cover dumpsters securely at night and during rainy weather.
- Replace/exchange leaky dumpsters.
- Collect and properly dispose of leaking material from dumpsters.
- Return dumpsters to company for cleaning when necessary.
- Arrange for adequate debris disposal schedule to ensure dumpsters do not overflow.
- Clean and sweep roadways and paved areas where work is being conducted at the end of every working day.

Limitations:

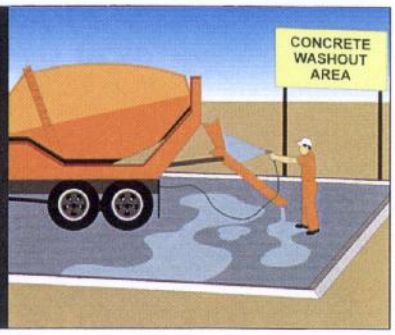
- Temporary stockpiling of certain construction wastes may necessitate stringent drainage-related controls during the wet season.

Inspection and Maintenance:

- Foreman and/or construction supervisor should monitor on-site solid waste storage and disposal procedures.
- Site should be routinely policed for litter and debris.
- Dumpsters should be inspected for leaks and secure covers.

Handling & Disposal of Concrete and Cement

➡ Pollution Prevention



Purpose: Concrete and cement-related mortars are toxic to fish and the aquatic environment and require proper handling and disposal to minimize or eliminate discharges to gutters, storm drains, and watercourses.

Application:

- stored wet and dry concrete and cement mortar materials
- on-site preparation and use of concrete and cement mortar
- equipment wash-out
- concrete dust and debris from demolition activities

Practices:

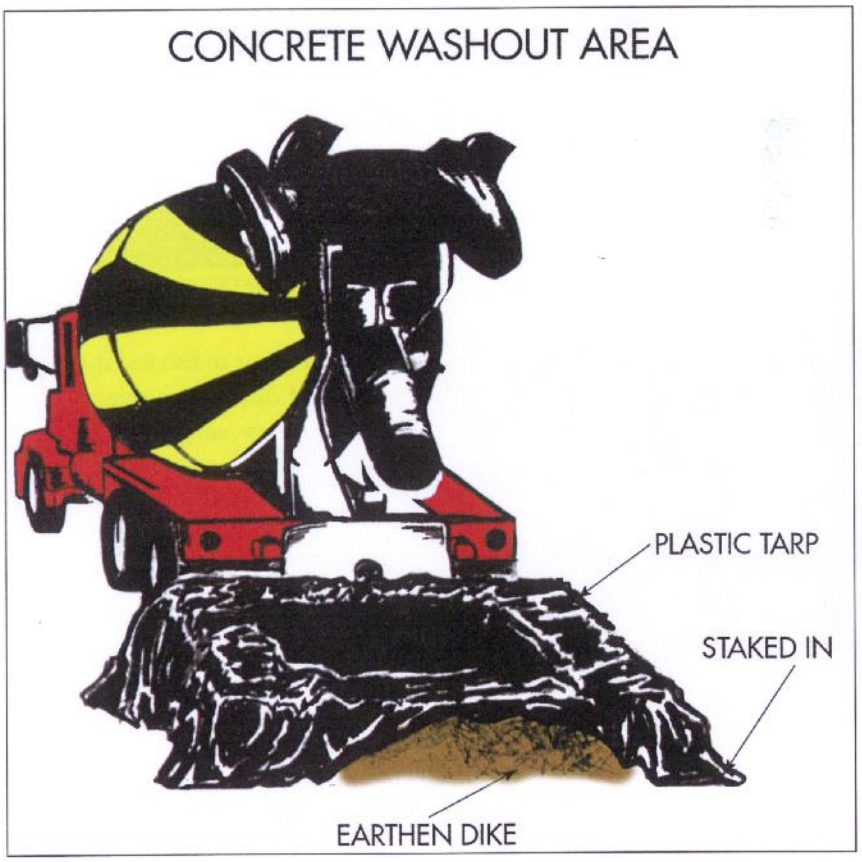
- Avoid mixing excess amounts of fresh concrete or cement mortar on-site.
- Store dry and wet materials away from waterways and storm drains; cover and contain to protect from rainfall and prevent runoff.
- Never dispose of wash-out into the street, storm drains, drainage ditches, or watercourses. Wash out concrete transit mixers only in designated wash-out areas where the water will flow into temporary pit in dirt area or onto stockpiles of aggregate base or sand.
- Identify location for waste water pit away from watercourses and storm drains. Dig a pit large enough to hold waste. Pump water from pit to the sanitary sewer, where allowed. When possible, recycle wash-out by pumping back into mixers for reuse. If neither practice is feasible, let water percolate through soil and dispose of settled, hardened concrete with trash.

Limitations:

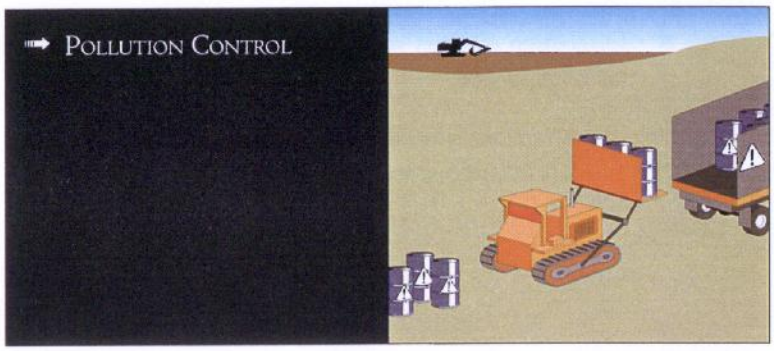
- An appropriate wash out area must be identified.

Inspection and Maintenance:

- Foreman and/or construction supervisor should monitor on-site concrete wash-out, waste storage and disposal procedures at least weekly.


CONCRETE WASHOUT AREA
PLASTIC TARP
STAKED IN
EARTHEN DIKE

Hazardous Waste Management



Purpose: Proper handling and disposal of hazardous waste eliminates or minimizes the discharge of such pollutants to stormdrains and waterways.

Application:

- petroleum products such as oil, fuel, and grease
- asphalt products, including roofing tar
- concrete curing compounds
- herbicides and pesticides
- chemical additives used for soil stabilization
- acids for cleaning masonry
- septic wastes
- paints and solvents
- stains and wood preservatives
- materials which have been used to absorb hazardous spills
- hazardous demolition waste (such as lead paint, asbestos)
- any material considered a hazardous waste by the State of California

Practices:

- Properly label and store all hazardous wastes.
- Dispose of hazardous waste only at authorized treatment, storage and disposal facilities. Illegal dumping of hazardous waste is a violation subject to fine and/or time in jail. Contact your local agency for disposal site information.
- Use licensed hazardous waste haulers for threshold quantities as required by state and federal regulations.
- Be sure that trailers carrying hazardous materials are covered during transit. Illegal transit of hazardous waste is a violation subject to fine and/or jail time.

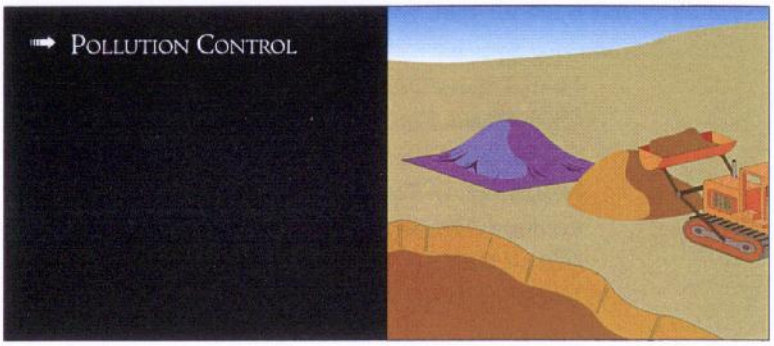
Limitations:

- This practice is not intended to address site-assessments and pre-existing contamination.
- Major contamination, large spills, and other serious hazardous waste incidents require immediate response from specialists.
- Demolition activities and potential pre-existing materials, such as asbestos, are not addressed by this manual.

Inspection and Maintenance:

- Check to make sure all wastes are properly labeled and stored.
- Monitor hazardous waste disposal procedures.

Contaminated Soil and Water Management



Purpose: Soil, ponded stormwater, and groundwater may become contaminated if exposed to hazardous materials and should be properly managed to prevent health hazards and minimize or eliminate discharge of pollutants to the storm drain system and watercourses.

Application:

- Areas of previous commercial or industrial activity.
- Sites with history of illegal dumping on site or adjacent properties.
- Sites subject to Superfund, state, or local cleanup order.
- Ponded stormwater, groundwater, or dewatering areas which exhibit an oily sheen or smell of petroleum.
- Soils which appear discolored, smell of petroleum, or exhibit other unusual properties.
- Site where abandoned underground storage tanks, drums, or other buried debris are encountered during construction activities.
- On site or adjacent site spills of pesticides and herbicides; fertilizers; detergents; plaster and other products; petroleum products such as fuel, oil, and grease; or other hazardous chemicals such as acids, lime, glues, paints, solvents, and curing compounds.
- Highway construction projects, especially those in highly urbanized or industrial areas, where soil contamination may have occurred due to spills, illicit discharges, and underground storage tanks.
- Highway widening projects in older areas where median and shoulder soils may have been contaminated by transportation-related lead deposits.

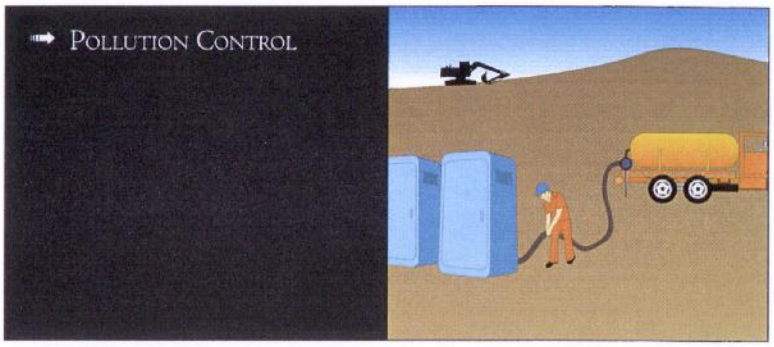
Limitations:

- The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered on site.
- Excavation, transport, and disposal of contaminated material and hazardous waste must be in accordance with the rules and regulations of the following agencies:
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)
  - Department of Toxic Substances Control (DTSC)
  - California Division of Occupational Safety and Health Administration (CAL-OSHA)
  - Local Regulatory Agencies

Practices:

- Inspect sites for contamination, particularly when preexisting site conditions make contamination likely, when spills are reported, or when leaks are detected.
- If project is in an area of known contamination or contamination is suspected, the water should be contained and held for testing. Call the appropriate local agency and/or the regional water quality control board for further guidance.
- Never discharge contaminated soil and water to street, gutter, or storm drain.

Sanitary/Septic Waste Management



Purpose: Leaking and portable toilets are a potential health and environmental hazard. Proper management will minimize or eliminate human and natural resource exposure to hazards.

Application:
- portable toilets
- other portable or temporary septic systems

Limitations:
- The leasing company must have a permit to dispose of waste to the sanitary sewer.

Practices:
- Inspect facilities for leaks.

Inspection and Maintenance:
- Monitor on-site sanitary/septic waste storage and disposal procedures at least weekly.
- Be sure the leasing company adequately maintains, promptly repairs, and replaces units as needed.

General Construction Site Waste Management

Minimum Measure: Construction Site Stormwater Runoff Control

Subcategory: Good Houskeeping/Materials Management

Description

Building materials and other construction site wastes must be properly managed and disposed of to reduce the risk of pollution from materials such as surplus or refuse building materials or hazardous wastes. Practices such as trash disposal, recycling, proper material handling, and spill prevention and cleanup measures can reduce the potential for stormwater runoff to mobilize construction site wastes and contaminate surface or ground water.

Applicability

The proper management and disposal of wastes should be practiced at every construction site to reduce stormwater runoff. Use waste management practices to properly locate refuse piles, to cover materials that might be displaced by rainfall or stormwater runoff, and to prevent spills and leaks from hazardous materials that were improperly stored.

Siting and Design Considerations

Solid Wastes:

- Designate a waste collection area on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody.
- Ensure that containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible.
- Schedule waste collection to prevent the containers from overfilling.
- Clean up spills immediately. For hazardous materials, follow cleanup instructions on the package. Use an absorbent material such as sawdust or kitty litter to contain the spill.
- During the demolition phase of construction, provide extra containers and schedule more frequent pickups.
- Collect, remove, and dispose of all construction site wastes at authorized disposal areas. Contact a local environmental agency to identify these disposal sites.

Hazardous Materials and Wastes:

- Consult with local waste management authorities about the requirements for disposing of hazardous materials.
- To prevent leaks, empty and clean hazardous waste containers before disposing of them.
- Never remove the original product label from the container because it contains important safety information. Follow the manufacturer's recommended method of disposal, which should be printed on the label.
- Never mix excess products when disposing of them, unless specifically recommended by the manufacturer.

To ensure the proper disposal of contaminated soils that have been exposed to and still contain hazardous substances, consult with state or local solid waste regulatory agencies or private firms. Some landfills might accept contaminated soils, but they require laboratory tests first.

Paint and dirt are often removed from surfaces by sandblasting. Sandblasting grits are the byproducts of this procedure and consist of the sand used and the paint and dirt particles that are removed from the surface. These materials are considered hazardous if they are removed from older structures because they are more likely to contain lead-, cadmium-, or chrome-based paints. To ensure proper disposal of sandblasting grits, contract with a licensed waste management or transport and disposal firm.

Pesticides and fertilizers:

- Follow all federal, state, and local regulations that apply to the use, handling, or disposal of pesticides and fertilizers.
- Do not handle the materials any more than necessary.
- Store pesticides and fertilizers in a dry, covered area.
- Construct berms or dikes to contain stored pesticides and fertilizers in case of spillage.
- Follow the recommended application rates and methods.
- Have equipment and absorbent materials available in storage and application areas to contain and clean up any spills that occur.

Petroleum Products:

- Store new and used petroleum products for vehicles in covered areas with berms or dikes in place to contain any spills.
- Immediately contain and clean up any spills with absorbent materials.
- Have equipment available in fuel storage areas and in vehicles to contain and clean up any spills that occur.

Detergents:

Phosphorous- and nitrogen-containing detergents are used in wash water for cleaning vehicles. Excesses of these nutrients can be a major source of water pollution. Use detergents only as recommended, and limit their use on the site. Do not dump wash water containing detergents into the storm drain system; direct it to a sanitary sewer or contain it so that it can be treated at a wastewater treatment plant.

Limitations

An effective waste management system requires training and signage to promote awareness of the hazards of improper storage, handling, and disposal of wastes. The only way to be sure that waste management practices are being followed is to be aware of worker habits and to inspect storage areas regularly. Extra management time may be required to ensure that all workers are following the proper procedures.

Maintenance Considerations

Inspect storage and use areas and identify containers or equipment that could malfunction and cause leaks or spills. Check equipment and containers for leaks, corrosion, support or foundation failure, or other signs of deterioration, and test them for soundness. Immediately repair or replace any that are found to be defective.

Effectiveness

Waste management practices are effective only when they are regularly practiced at a construction site. In storage and use areas, post the guidelines for proper handling, storage, and disposal of construction site wastes; train workers in these practices to ensure that everyone is knowledgeable enough to participate.

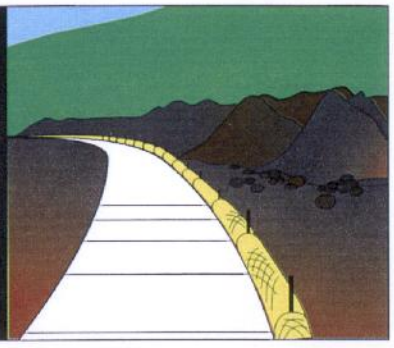
Cost Considerations

The costs associated with construction site waste management are mainly attributed to purchasing and posting signs, increased management time for oversight, additional labor required for special handling of wastes, transportation costs for waste hauling, and fees charged by disposal facilities to take the wastes.

FIBER ROLLS

➡ EROSION CONTROL

➡ SEDIMENT CONTROL



Purpose:

Fiber rolls (sediment logs or wattles), composed of bio-degradable fibers stuffed in a photo-degradable open weave netting, are designed to reduce sediment runoff from disturbed soils into the storm drain system or watercourses. Fiber rolls are porous and allow water to filter through fibers and trap sediment, increase filtration rates, slow runoff and reduce sheet and rill erosion. Wattles also create a favorable environment for plant establishment.

Application:

- Along the face of exposed and erodible slopes to shorten slope length
- At grade breaks where slopes transition to a steeper slope
- In drainage swales to slow flows
- Along streambanks to assist stabilization and revegetation

Inspection and Maintenance:

Follow manufacturer's recommendations for installation. In general, these will be as follows:

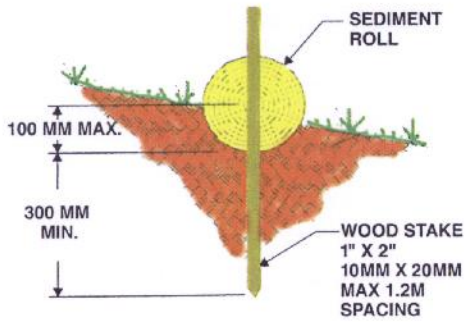
- Fine grade the subgrade by hand dressing where necessary to remove local deviations and to remove larger stones or debris that will inhibit intimate contact of the fiber roll with the subgrade.
- Prior to roll installation, contour a concave key trench 50 to 100 mm (2 to 4 inches) deep along the proposed installation route.
- Soil excavated in trenching should be placed on the uphill or flow side of the roll to prevent water from undercutting the roll.
- Place fiber rolls into the key trench and stake on both sides of the roll within 6 feet of each end and then 3–5 feet with 1" x 2" stakes or as suggested by manufacturer.
- Stakes are typically driven in on alternating sides of the roll. When more than one fiber roll is placed in a row, the rolls should be abutted securely to one another to provide a tight joint, not overlapped.

Limitations:

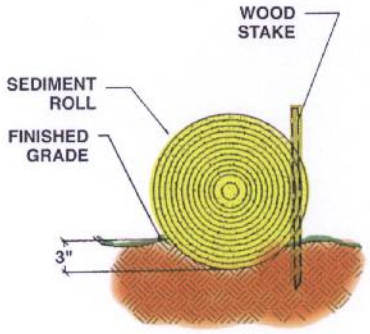
- Designed for low surface flows not to exceed 1 cfs for small areas.
- Designed for short slopes or slopes flatter than 3:1.
- Primary purpose is not sediment control, although do provide some sediment removal.

Inspection and Maintenance:

- Repair or replace split, torn, unraveling or slumping fiber rolls.
- Inspect fiber rolls when rain is forecast, following rain events and at least daily during prolonged rainfall. Perform required maintenance.
- In most cases, fiber rolls do not require removal and can be abandoned in place. If not excessively soiled, rolls may be removed, replaced and reused.



ENTRENCHMENT DETAIL IN SLOPE AREA



ENTRENCHMENT DETAIL IN FLAT AREA

Fiber Rolls

Minimum Measure: Construction Site Stormwater Runoff Control

Subcategory: Sediment Control

Description

Photo from Earth Saver Erosion Control Products, 2005.

Fiber rolls (also called fiber logs or straw wattles) are tube-shaped erosion-control devices filled with straw, flax, rice, coconut fiber material, or composted material. Each roll is wrapped with UV-degradable polypropylene netting for longevity or with 100 percent biodegradable materials like burlap, jute, or coir. Fiber rolls complement permanent best management practices used for source control and revegetation. When installed in combination with straw mulch, erosion control blankets, hydraulic mulches, or bounded fiber matrices for slope stabilization, these devices reduce the effects of long or steep slopes (Earth Saver Erosion Control Products, 2005). Fiber rolls also help to slow, filter, and spread overland flows. This helps to prevent erosion and minimizes rill and gully development. Fiber rolls also help reduce sediment loads to receiving waters by filtering runoff and capturing sediments.

Applicability

Fiber rolls can be used in areas of low shear stress. Avoid using them in channels that are actively incising or in reaches with large debris loads or potential for significant ice buildup (Maryland Department of the Environment, 2000). Fiber rolls have been used to control erosion in a variety of areas--along highways and at construction sites, golf courses, ski areas, vineyards, and reclaimed mines. According to the California Stormwater Quality Association (CASQA, 2003), fiber rolls can be suitable in the following settings:

- Along the toe, top, face, and at-grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- At the end of a downward slope where it transitions to a steeper slope
- Along the perimeter of a project
- As check dams in unlined ditches
- Downslope of exposed soil areas
- Around temporary stockpiles

Siting and Design Considerations

Fiber rolls should be prefabricated rolls or rolled tubes of geotextiles fabric. When rolling the tubes, make sure each tube is at least 8 inches in diameter. Bind the rolls at each end and every 4 feet along the length of the roll with jute-type twine (California Stormwater Quality Association, 2003).

Slope ground projects

On slopes, install fiber rolls along the contour with a slight downward angle at the end of each row to prevent ponding at the midsection (California Straw Works, 2005). Turn the ends of each fiber roll upslope to prevent runoff from flowing around the roll. Install fiber rolls in shallow trenches dug 3 to 5 inches deep for soft, loamy soils and 2 to 3 inches deep for hard, rocky soils. Determine the vertical spacing for slope installations on the basis of the slope gradient and soil type. According to California Straw Works (2005), a good rule of thumb is:

1:1 slopes = 10 feet apart

2:1 slopes = 20 feet apart

3:1 slopes = 30 feet apart

4:1 slopes = 40 feet apart

For soft, loamy soils, place the rows closer together. For hard, rocky soils, place the rows farther apart. Stake fiber rolls securely into the ground and orient them perpendicular to the slope. Biodegradable wood stakes or willow cuttings are recommended. Drive the stakes through the middle of the fiber roll and deep enough into the ground to anchor the roll in place. About 3 to 5 inches of the stake should stick out above the roll, and the stakes should be spaced 3 to 4 feet apart. A 24-inch stake is recommended for use on soft, loamy soils. An 18-inch stake is recommended for use on hard, rocky soils.

Projects without slopes

Fiber rolls can also be used at projects with minimal slopes. Typically, the rolls are installed along sidewalks, on the bare lot side, to keep sediment from washing onto sidewalks and streets and into gutters and storm drains. For installations along sidewalks and behind street curbs, it might not be necessary to stake the fiber rolls, but trenches must still be dug. Fiber rolls placed around storm drains and inlets must be staked into the ground. These rolls should direct the flow of runoff toward a designated drainage area. Place them 1 to 1½ feet back from the storm drain or inlet.

Photo from IECA, 2005.

Limitations

The installation and overall performance of fiber rolls have several limitations, including the following (California Stormwater Quality Association, 2003):

Fiber rolls are not effective unless trenched.

Fiber rolls can be difficult to move once saturated.

To be effective, fiber rolls at the toe of slopes greater than 5:1 must be at least 20 inches in diameter. An equivalent installation, such as stacked smaller-diameter fiber rolls, can be used to achieve a similar level of protection.

If not properly staked and entrenched, fiber rolls can be transported by high flows.

Fiber rolls have a very limited sediment capture zone.

Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.

Maintenance Considerations

The maintenance requirements of fiber rolls are minimal, but short-term inspection is recommended to ensure that the rolls remain firmly anchored in place and are not crushed or damaged by equipment traffic (Murphy and Dreher, 1996). Monitor fiber rolls daily during prolonged rain events. Repair or replace split, torn, unraveled, or slumping fiber rolls. Fiber rolls are typically left in place on slopes. If they are removed, collect and dispose of the accumulated sediment. Fill and compact holes, trenches, depressions, or any other ground disturbance to blend with the surrounding landscape.

Effectiveness

Unlike other BMPs that could cause water to back up and flow around the edges, fiber rolls allow water to flow through while capturing runoff sediments. Fiber rolls placed along the shorelines of lakes and ponds provide immediate protection by dissipating the erosive force of small waves. As an alternative to silt fences, fiber rolls have some distinct advantages, including the following (Earth Saver, 2005):

They install more easily, particularly in shallow soils and rocky material.
They are more adaptable to slope applications and contour installations than other erosion and sediment control practices.
They are readily molded to fit the bank line.
They blend in with the landscape and are less obtrusive than other erosion and sediment controls such as silt fence.
They do not obstruct hydraulic mulch and seed applications.
They can be removed or left in place after vegetation is established.

Fiber rolls can provide slope protection for 3 to 5 years (California Straw Works, 2005). They slowly decompose into mulch, and the netting breaks down into small pieces. The San Diego State University Soil Erosion Research Laboratory reported that the use of fiber roll products reduced offsite sediment delivery by 58 percent (International Erosion Control Association, 2005).

The Flint Creek watershed, which covers approximately 28 square miles of Lake and Cook counties in northeastern Illinois, was listed in the Illinois Water Quality Report (1994-1995) as being impaired due to nonpoint source pollution from land development, channelization, and urban runoff. Along with other bioengineering techniques, fiber rolls were installed along the shorelines of the creek to reduce the effects of wave action. Native plants were installed in the fiber rolls. As a result, the growth of vegetative cover increased and helped to stabilize the slopes along the banks of the creek. Ultimately, the water quality of Flint Creek was improved (USEPA, 2002).

Cost Considerations

Material costs for fiber rolls range from $20 to $30 per 25-foot roll (CASQA, 2003). Labor hours should also be allocated for installation, monitoring, and maintenance. Because fiber rolls are usually left along slopes and are biodegradable, labor costs for removing them are avoided. However, sediment removal and disposal are still necessary in areas where sediment accumulates to at least one-half the distance between the top of the fiber roll and the ground surface.

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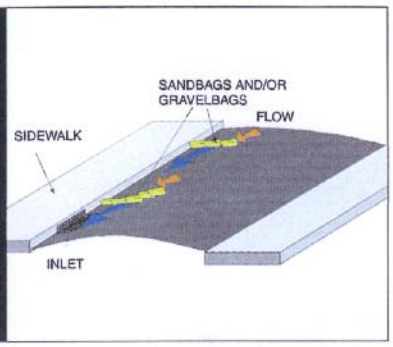
SAND / GRAVEL BAG BARRIER

➡ SEDIMENT CONTROL



Purpose:

A temporary berm of stacked sand or gravel bags, installed along a level contour to detain sediment-laden runoff from disturbed areas, retains the sediment, and releases the water as sheet flow. Sand bags can also be used as check dams in small ditches, but only if the ditch has been lined to prevent erosion.

Application:

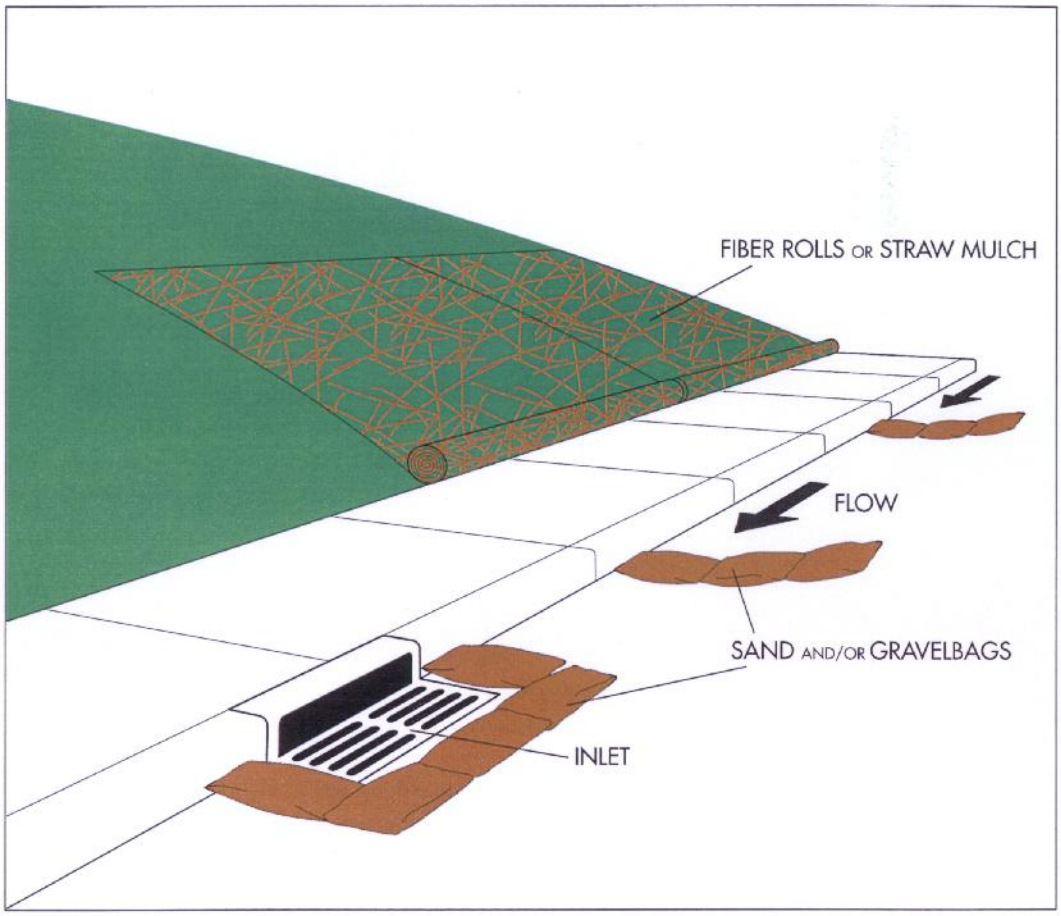
- Along the perimeter of the site.
- Across channels to serve as a barrier for utility trenches or to provide a temporary channel crossing for construction equipment.
- Parallel to roadways to keep sediment off paved areas.
- To divert or direct flow or to create a temporary sediment basin.
- When extended construction period limits the use of either silt fence or straw bale barriers.
- When site conditions or construction sequencing require adjustments or relocation of the barrier to meet changing field conditions and needs during construction.

Limitations:

- Limit the drainage area upstream of the barriers to 2 ha (5 ac).
- Installation can be labor intensive.
- Should not be used to detain concentrated flows.
- Gravel bags preferable to sand bags near storm drain inlets.

Inspection and Maintenance:

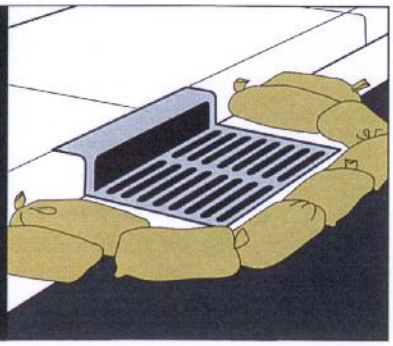
- Inspect before and after significant storm events
- Remove accumulated sediment when one-third barrier height.
- Repair washouts and other damage as needed.
- Remove barrier when no longer needed.



SAND OR GRAVEL BAGS (PREFERRED) USED IN ROADWAYS SERVE TO DIVERT FLOW, SLOW FLOW VELOCITY, AND POND AND FILTER RUNOFF.

Storm Drain Inlet Protection

➡ Sediment Control



Purpose: Temporary devices constructed around storm drains improve the quality of water being discharged to inlets or catch basins by ponding sediment-laden runoff and increasing settling time. Appropriate for small drainage areas only.

Application:

- Where sediment laden surface runoff may enter an inlet.
- Where drainage areas have not been permanently stabilized.
- Where the drainage area is 0.4 ha (1 ac) or less.
- Appropriate during wet seasons.
- Appropriate in open areas subject to sheet flow and for flows not exceeding 0.014 m^3/s (0.5 cfs).
- Block and gravel bag barriers are applicable when sheet flows or concentrated flows exceed 0.014 m^3/s (0.5 cfs), and it is necessary to allow for overtopping to prevent flooding.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected and overflow capability is needed.

Limitations:

- Use only when ponding will not encroach into highway traffic or onto erodible surfaces and slopes.
- Sediment removal becomes more difficult in high flow conditions. If high flow conditions are expected, other on-site sediment trapping techniques should be used in conjunction with inlet protection.
- Frequent maintenance is required to minimize short-circuiting and to remove sediment deposits and buildup.

- For drainage areas larger than 0.4 ha (1 ac), runoff should be routed to a sediment trapping device designed for larger flows.
- Filter fabric should not be used to cover the inlet grate.

Inspection and Maintenance:

- Bring the disturbed area to the grade of the drop inlet and smooth and compact it. Appropriately stabilize all bare areas around the inlet.
- Properly dispose of accumulated sediment.
- Inspect all inlet protection devices before and after rainfall events, and weekly throughout the rainy season. During extended rainfall events, inspect inlet protection devices at least once every 24 hours.
- Remove all inlet protection devices within thirty days after the site is stabilized, or when inlet protection is no longer required.

Storm Drain Inlet Protection

Minimum Measure: Construction Site Stormwater Runoff Control

Subcategory: Sediment Control

Description

There are many different ways to prevent sediment from entering storm drains.

Storm drain inlet protection measures prevent soil and debris from entering storm drain drop inlets. These measures are usually temporary and are implemented before a site is disturbed.

There are several types of inlet protection:

Excavation around the perimeter of the drop inlet: Excavating a small area around an inlet creates a settling pool that removes sediments as water is released slowly into the inlet through small holes protected by gravel and filter fabric.

Fabric barriers around inlet entrances: Erecting a barrier made of porous fabric around an inlet creates a shield against sediment while allowing water to flow into the drain. This barrier slows runoff while catching soil and other debris at the drain inlet.

Block and gravel protection: Standard concrete blocks and gravel can be used to form a barrier to sediments that permits water runoff to flow through select blocks laid sideways.

Sandbags can also be used to create temporary sediment barriers at inlets. For permanent inlet protection after the surrounding area has been stabilized, sod can be installed. This permanent measure is an aesthetically pleasing way to slow stormwater near drop inlet entrances and to remove sediments and other pollutants from runoff.

Applicability

All temporary inlet protection should have a drainage area no greater than 1 acre per inlet. Temporary controls should be constructed before the surrounding landscape is disturbed. Excavated drop inlet protection and block and gravel inlet protection are applicable to areas of high flow, where drain overflow is expected. Fabric barriers are recommended for smaller, flatter drainage areas (slopes less than 5 percent leading to the drain). Temporary drop inlet control measures are often used in sequence or with other erosion control techniques.

Siting and Design Considerations

With the exception of sod drop inlet protection, install these controls before any soil disturbance in the drainage area. Excavate around drop inlets at least 1 foot deep (2 feet maximum), excavating a volume of at least 35 yd^3 per acre disturbed. Side slopes leading to the inlet should be no steeper than 2:1. Design the shape of the excavated area such that the dimensions fit the area from which stormwater is expected to drain. For example, the longest side of an excavated area should be along the side of the inlet expected to drain the largest area.

Stake fabric inlet protection close to the inlet to prevent overflow onto unprotected soils. Stakes should be at least 3 feet long and spaced no more than 3 feet apart. Construct a frame for fabric support during overflow periods, and bury it at least 1 foot below the soil surface. It should rise to a height no greater than 1.5 feet above the ground. The top of the frame and fabric should be below the downslope ground elevation to keep runoff from bypassing the inlet.

Block and gravel inlet barriers should be at least 1 foot high (2 feet maximum). Do not use mortar. Lay the bottom row of blocks at least 2 inches below the soil surface, flush against the drain for stability. Place one block in the bottom row on each side of the inlet on its side to allow drainage. Place 1/2-inch wire mesh over all block openings to prevent gravel from entering the inlet. Place gravel (3/4 to 1/2 inch in diameter) outside the block structure at a slope no greater than 2:1.

Do not consider sod inlet protection until the entire surrounding drainage area is stabilized. Lay the sod so that it extends at least 4 feet from the inlet in each direction to form a continuous mat around the inlet. Lay the sod strips perpendicular to the direction of flows. Stagger them so that the strip ends are not aligned. The slope of the sodded area should not be steeper than 4:1 approaching the drop inlet.

Limitations

To increase the effectiveness of these practices, use them with other measures, such as small impoundments or sediment traps (USEPA, 1992). In general, stormwater inlet protection measures are practical for areas receiving relatively clean runoff that is not heavily laden with sediment. They are designed to handle drainage from areas less than 1 acre (CASQA, 2003). To prevent clogging, storm drain control structures must be maintained frequently. If sediment and other debris clog the water intake, drop inlet control measures can actually cause erosion in unprotected areas.

Maintenance Considerations

Check all temporary control measures after each storm event. To maintain the capacity of the settling pools, remove accumulated sediment from the area around the drop inlet (excavated area, area around fabric barrier or block structure) when the capacity is reduced by half. Remove additional debris from the shallow pools periodically. The weep holes in excavated areas around inlets can become clogged, preventing water from draining out of the pools. If that happens, it might be difficult and costly to unclog the intake.

Effectiveness

Excavated drop inlet protection can be used to improve the effectiveness and reliability of other sediment traps and barriers, such as fabric or block and gravel inlet protection. The effectiveness of inlet protection alone is low for erosion and sediment control, long-term pollutant removal, and habitat and stream protection.

Cost Considerations

The cost of implementing storm drain inlet protection measures varies depending on the control measure used. Initial installation costs range from $50 to $150 per inlet depending on the materials used, with an average cost of $100 (USEPA, 1993). Maintenance costs can be high (up to 100 percent of the initial construction cost annually) because of the frequent inspection and repair needs. The Southeastern Wisconsin Regional Planning Commission has estimated the cost of installing inlet protection devices at $106 to $154 per inlet (SEWRPC, 1991).

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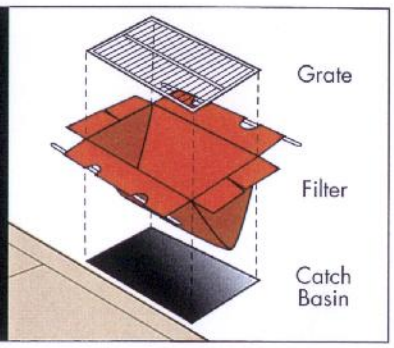
Catch Basin Inlet Filters

➡ Sediment Control



Purpose: Temporary inlet filter lowered into catch basins and held in place by the grate. Designed to improve the quality of the water being discharged to inlets or catchbasins by filtering silt and sediment from runoff.

Application:
- Construction sites with disturbed or unvegetated areas where sediment laden water can enter catchbasins or inlets
- Where pollution of watercourses or drainage system clogging from sediment laden storm water is a concern.

Limitations:
- Should be used only as a secondary sediment control in conjunction with primary erosion control measures such as hydroseeding/hydromulching, or erosion control blankets

Installation:
- Remove drain grate
- Insert catch basin filter into basin leaving 3" flap exposed
- Replace grate to basin thereby pinching fabric between grate and catch basin and holding filter in place

Inspection and Maintenance:
- Inspect catch basin filters weekly and after every rain event
- Empty catch basin filters when filters appear to be half full
- Dispose of trapped sediment in accordance with local requirements
- Clean and reuse inlet filters or discard and replace as necessary.

Construction Sequencing

Minimum Measure: Construction Site Stormwater Runoff Control

Subcategory: Construction Site Planning and Management

In sequenced construction, sites are completed in stages and completed portions are permanently stabilized before other areas are disturbed

Description

Construction sequencing is a specified work schedule that coordinates the timing of land-disturbing activities and the installation of erosion and sediment control measures. The goal of a construction sequence schedule is to reduce on-site erosion and off-site sedimentation by performing land-disturbing activities and installing erosion and sediment control practices in accordance with a planned schedule (Smolen et al., 1988).

Construction site phasing involves disturbing only part of a site at a time to prevent erosion from dormant parts. Grading activities and construction are completed and soils are effectively stabilized on one part of the site before grading and construction commence at another part. A key consideration of grading activities should be the coordination of cuts and fills to minimize the movement and storage of soils on, off, and around the site. This differs from the more traditional practice of construction site sequencing, in which site-disturbing activities are performed initially for all or a large section of the site, leaving portions of the disturbed site vulnerable to erosion. To be effective, construction site phasing needs to be incorporated into the overall site plan early on. Elements to consider when phasing construction activities include the following:

Managing runoff separately in each phase
Determining whether water and sewer connections and extensions can be accommodated
Determining the fate of already completed downhill phases
Providing separate construction and residential accesses to prevent conflicts between residents living in completed stages of the site and construction equipment working on later stages (USEPA, 2004).

Applicability

Construction sequencing can be used to plan earthwork and erosion and sediment control activities at sites where land disturbances might affect water quality in a receiving waterbody.

Siting and Design Considerations

Construction sequencing schedules should, at a minimum, include the following: Design and Installation Criteria

- The ESC practices that are to be installed
- Principal development activities
  - Which measures should be installed before other activities are started
  - Compatibility with the general contract construction schedule

Table 1 summarizes other important scheduling considerations in addition to those listed above.

Table 1. Scheduling considerations for construction activities.

Construction activity	Schedule consideration
Construction access, entrance to site, construction routes, areas designated for equipment parking	This is the first land-disturbing activity. As soon as construction begins, stabilize any bare areas with gravel and temporary vegetation.
Sediment traps and barriers, basin traps, sediment fences, outlet protection	After the construction site is accessed, install principal basins. Add more traps and barriers as needed during grading.
Runoff control diversions, perimeter dikes, water bars, outlet protection	Install key practices after installing principal sediment traps and before land grading. Install additional runoff control measures during grading.
Runoff conveyance system, stabilize stream banks, storm drains, channels, inlet and outlet protection, slope drains	If necessary, stabilize stream banks as soon as possible, and install a principal runoff conveyance system with runoff control measures. Install the remainder of the systems after grading.
Land clearing and grading, site preparation (cutting, filling, and grading, sediment traps, barriers, diversions, drains, surface roughening)	Implement major clearing and grading after installing principal sediment and key runoff-control measures, and install additional control measures as grading continues. Clear borrow and disposal areas as needed, and mark trees and buffer areas for preservation.
Surface stabilization, temporary and permanent seeding, mulching, sodding, riprap	Apply temporary or permanent stabilizing measures immediately to any disturbed areas where work has been either completed or delayed.
Building construction, buildings, utilities, paving	During construction, install any erosion and sedimentation control measures that are needed.
Landscaping and final stabilization, topsoiling, trees and shrubs, permanent seeding, mulching, sodding, riprap	This is the last construction phase. Stabilize all open areas, including borrow and spoil areas, and remove and stabilize all temporary control measures.

Limitations

Weather and other unpredictable variables might affect construction sequence schedules. However, the ESC plan should plainly state the proposed schedule and a protocol for making changes due to unforeseen problems.

Maintenance Considerations

Follow the construction sequence throughout the project and the modify the written plan before any changes in construction activities are executed. Update the plan if a site inspection indicates the need for additional erosion and sediment control.

Effectiveness

Construction sequencing can be an effective tool for erosion and sediment control because it ensures that management practices are installed where necessary and when appropriate. Follow the plan and, if needed, update it to maximize the effectiveness of ESC BMPs under changing conditions. A comparison of sediment loss from a typical development and from a comparable phased project showed a 42 percent reduction in sediment export in the phased project (Claytor, 1997).

Cost Considerations

Construction sequencing is a low-cost measure because it requires a limited amount of a contractor's time to provide a written plan for coordinating construction activities and management practices. It might take additional time to update the sequencing plan if the current plan is not providing sufficient erosion and sediment control.

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Last updated on May 22, 2006 8:28 AM

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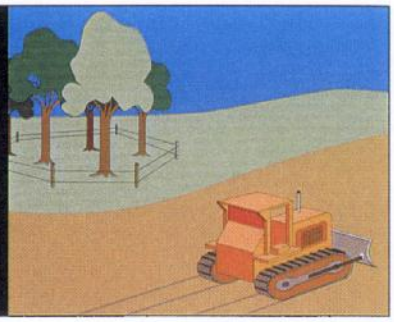
Preservation of Existing Vegetation

➡ Erosion Control

➡ Sediment Control



Purpose: Protection of plants and trees in any area subject to land-disturbing activities is beneficial and should be attempted wherever possible. Existing vegetation serves as an effective form of erosion and sediment control, and provides watershed protection, landscape beautification, dust control, pollution control, noise reduction, and shade cover.

Application:

- Appropriate to all types of construction sites
- Floodplains
- Wetlands
- Streambanks
- Steep slopes
- Areas where construction will occur at a later date
- Sensitive habitat areas where natural vegetation exists

Limitations:

- Protection of existing vegetation requires planning, and may constrict the area available for construction activities.

Timing: Efforts to preserve existing vegetation should be made before site disturbance begins.

Installation Guidelines:

- Areas not to be disturbed must be clearly marked with construction fencing at all times and communicated to contractors.
- Any damage to the area must be repaired immediately in accordance with the landscaping plan.

Preserving Natural Vegetation

Minimum Measure: Construction Site Stormwater Runoff Control

Subcategory: Construction Site Planning and Management

Natural vegetation is protected from heavy equipment with safety fencing

Description

The principal advantage of preserving natural vegetation is protecting desirable trees, vines, bushes, and grasses from damage during project development. Vegetation provides erosion control, stormwater detention, biofiltration, and aesthetic values to a site during and after construction activities. Other benefits of preserving natural areas are because natural vegetation

- Can process higher quantities of stormwater runoff than newly seeded areas
- Does not require time to establish
- Has a higher filtering capacity than newly planted vegetation because above ground and root structures are typically denser and using living root systems helps to hold soil in place
- Reduces stormwater runoff by intercepting rainfall, protecting soil surface from the impact of raindrops, holding soil particles in place, maintaining the soil's capacity to absorb water, promoting infiltration, and lowering the water table through transpiration
- Provides buffers and screens against noise and visual disturbance
- Provides a fully developed habitat for wildlife
- Usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation
- Enhances aesthetics

Applicability

Preserving natural vegetation is applicable to all construction sites where vegetation exists in the predevelopment condition. The practice can be especially beneficial for floodplains, wetlands, stream banks, steep slopes, and other areas where erosion controls would be difficult to establish, install, or maintain. Clear only the land needed for building activities and vehicle traffic.

Siting and Design Considerations

Designers should be aware of and respond to local the climate and other conditions, including project scheduling, that may influence the use of natural vegetative stabilization measures. Before clearing activities begin, clearly mark the vegetation that is to be preserved. Prepare a site map with the locations of trees and boundaries of environmentally sensitive areas and buffer zones to be preserved. Plan the location of roads, buildings, and other structures to avoid these areas. This requires careful site management to minimize the impact of construction activities on existing vegetation. Protect large trees near construction zones because damage during construction activities could result in reduced vigor or death after construction has ceased. Extend and mark the boundaries around contiguous natural areas and tree drip lines to protect the root zone from damage. Obviously, direct contact by equipment damages trees and other vegetation, but compaction, filling, or excavating land too closely to the vegetation also can cause severe damage.

When selecting trees for preservation, consider the following factors:

Tree vigor. Preserve healthy trees that will be less susceptible to damage, disease, and insects. Indicators of poor vigor include dead tips of branches, stunted leaf growth, sparse foliage, and pale foliage color. Hollow, rotten, split, cracked, or leaning trees also have a lesser chance of survival.

Tree age. Choose older trees because they are more aesthetically pleasing as long as they are healthy.

Tree species. Preserve species that are well-suited to present and future site conditions. Keeping a mixture of evergreens and hardwoods can help to conserve energy--specifically, keeping evergreens on the northern side of the site to protect against cold winter winds and keeping deciduous trees on the southern side to provide shade in the summer and sunshine in the winter.

Wildlife benefits. Choose trees that are preferred by wildlife for food, cover, and nesting.

Other considerations include following natural contours and maintaining preconstruction drainage patterns. Changing the hydrology might kill preserved vegetation because their environmental requirements are no longer met.

The following are basic considerations for preserving natural vegetation:

Do not nail boards to trees during building operations.

Do not cut tree roots inside the tree drip line.

Use barriers to prevent equipment from approaching protected areas.

Keep equipment, construction materials, topsoil, and fill dirt outside the limit of preserved areas.

If a tree or shrub that is marked for preservation is damaged, remove and replace it with a tree of the same or similar species with a 2-inch or larger caliper width from balled and burlaped nursery stock when construction activity is complete.

During final site cleanup, remove barriers from around preserved areas and trees.

Limitations

Preserving vegetation is limited by the extent of existing vegetation in preconstruction conditions. It requires planning to preserve and maintain the existing vegetation. It is also limited by the size of the site relative to the size of structures to be built. High land prices might prohibit preservation of natural areas. Additionally, equipment must have enough room to maneuver; in some cases, preserved vegetation might block equipment traffic and can constrict the area available for construction activities. Finally, if grading is not done properly, it could result in changes in environmental conditions that kill vegetation. Consider the hydrology of natural or preserved areas when planning the site.

Maintenance Considerations

Even if workers take precautions, some damage to protected areas might occur. If this happens, repair or replace damaged vegetation immediately to maintain the integrity of the natural system. When planning for new vegetation, choose kinds that enhance the existing vegetation. Ensure that new structures do not harm protected areas. If fertilization is needed, use the following practices to minimize adverse water quality affects:

Apply fertilizers at the minimum rate and to the minimum area needed.
Work the fertilizer deeply into the soil to reduce exposure of nutrients to stormwater runoff.
Apply fertilizer at lower application rates with a higher application frequency.
Limit hydroseeding, which is simultaneously applying lime and fertilizers.
Ensure that erosion and sediment controls are in place to prevent fertilizers and sediments from being transported offsite.

Effectiveness

Natural vegetation (existing trees, vines, brushes, and grasses) can provide water quality benefits by intercepting rainfall, filtering stormwater runoff, and preventing sediments and other pollutants from leaving the site.

Cost Considerations

Preserving natural vegetation could require additional labor to maneuver around trees or protected areas.

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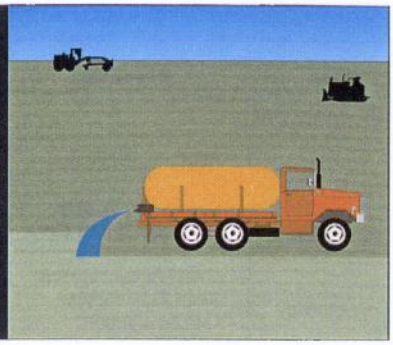
Dust Control

- Erosion Control
- Sediment Control
- Wind Erosion Control



Purpose:

Stabilizing materials are applied to the disturbed soil surface to prevent the transport of soil from exposed surfaces on construction sites either by wind or storm water runoff.

Dust control measures may consist of either chemical, structural or mechanical measures. Examples are shown in Table 1.

Application:

- Dust control should be practiced on all construction sites with exposed soils as needed.
- Dust control is particularly important in windy or wind-prone areas.
- Sites with silt and clay soils are particularly prone to dust.
- Dust control is considered a temporary measure and as an intermediate treatment between site disturbance and construction, paving, or revegetation.

Limitation:

- Dust control measures are temporary in nature and require reapplication.
- Chemical stabilization materials may have harmful effects on water quality if used incorrectly.
- Excessive sprinkling with water may result in non-storm water discharge from the site.

Inspection and Maintenance:

- Areas exposed to excessive wind, vehicle traffic, or rain should be inspected daily.
- Reapply soil stabilizers at appropriate intervals, and based on need.

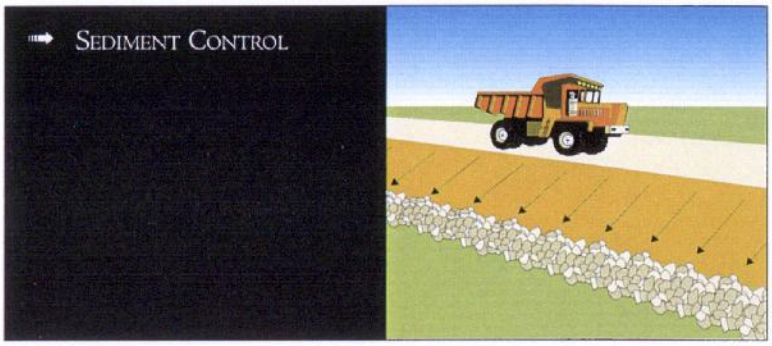
Table 1

Method	Selection	Site Preparation	Recommended Application Rate
Chemicals - Inorganic			
Water	– Most commonly used practice – Evaporates quickly – Lasts less than 1 day	For all liquid agents: – Blade a smooth surface. – Crown or slope surface to avoid ponding. – Compact soils if needed. – Uniformly pre-wet at 0.14-1.4 L/m^2 (0.03-0.3 gal/yd^2). – Apply solution under pressure. Overlap solution 100-300 mm (6-12 in). – Allow treated area to cure 0-4 hours. – Compact area after curing. – Apply second treatment before first treatment becomes ineffective, using 50% application rate. – In low humidities, reactivate chemicals by rewetting at 0.5-0.9 L/m^2 (0.1-0.2 gal/yd^2).	0.6 L/m^2 (0.125 gal/yd^2) every 20 to 30 minutes.
Salts – Calcium Chloride (CaCl)	– Restricts evaporation – Lasts 6-12 months – Can be corrosive – Less effective in low humidity – Can build up in soils and leach by rain		Apply 38% solution at 1.21 L/m^2 (0.27 gal/yd^2) or as loose, dry granules per manufacturer.
– Magnesium Chloride (MgCl)	– Restricts evaporation – Works at higher temperatures and lower humidity than CaCl – May be more costly than CaCl		Apply 26-32% solution at 2.3 L/m^2 (0.5 gal/yd^2).
– Sodium Chloride (NaCl)	– Effective over smaller range of conditions – Less expensive – Can be corrosive – Less effective in low humidity		Per manufacturer.
Silicates	– Generally expensive – Available in small quantities – Require second application		
Surfactants	– High evaporation rates – Effective for short time periods – Must apply frequently		

Table 1 (Continued)

Method	Selection	Site Preparation	Recommended Application Rate
Chemicals - Organic			
– Copolymers	– Form semipermeable transparent crust. – Resist ultraviolet radiation and moisture induced breakdown. – Last 1 to 2 years.	Same as above.	750-940 L/ha (80-100 gal/ac).
– Petroleum Products	– Bind soil particles – May hinder foliage growth – Environmental and aesthetic concerns – Higher cost		Use 57-63% resins as base. Apply at 750-940 L/ha (80-100 gal/ac).
– Lignin Sulfonate	– Paper industry waste product – Acts as dispersing agent – Best in dry climates – Can be slippery		Loosen surface 25-50 mm (1-2 in). Need 4-8% fines.
– Vegetable Oils	– Coat grains of soil, so limited binding ability – May become brittle – Limited availability		Per manufacturer.
– Spray-on Adhesives	– Available as organic or synthetic – Effective on dry, hard soils – Form a crust – Can last 3 to 4 years		Per manufacturer.

Brush or Rock Filter



Purpose:

Effective temporary barriers are brush, wrapped in filter cloth and secured in place, or rock anchored in place to intercept and filter sediment-laden stormwater runoff from disturbed areas, retaining sediment and releasing water as sheet flow.

Application:

- Where contributing drain areas are less than or equal to 2 ha (5 ac).
- Along the perimeter of disturbed areas.
- Near the toe of slopes subject to sheet flow and rill erosion.
- Along streams and channels.
- Across mildly sloped construction roads (rock filter berms only).

Limitations:

- Not appropriate for contributing drainage areas greater than 2 ha (5 ac).
- Require sufficient space for water to pond.
- Not effective for diverting runoff (filters allow runoff to seep through).
- Rock filter berms are difficult to remove.

Inspection and Maintenance:

- Inspect berms before and after each significant rainfall event, and weekly throughout the rainy season.
- Reshape berms as needed and replace lost or dislodged rock, brush and/or filter fabric.
- Inspect for sediment accumulation and remove sediment when depth reaches one-third the berm height or 300 mm (12 in), whichever occurs first.
- Remove filter barriers upon completion of construction activities.

Filter Berms

Minimum Measure: Construction Site Stormwater Runoff Control

Subcategory: Sediment Control

Description

A gravel or stone filter berm is a temporary ridge made up of loose gravel, stone, or crushed rock. It slows and filters flow and diverts it from an open traffic area. It acts as an efficient form of sediment control. One type of filter berm is the continuous berm, a geosynthetic fabric berm that captures sand, rock, and soil.

Applicability

Gravel or stone filter berms are most suitable in areas where traffic needs to be rerouted because roads are under construction, or in traffic areas within a construction site.

Siting and Design Considerations

Consider the following guidelines when building a berm:

Use well-graded gravel or crushed rock to build the berm, with rock size ranging from 3/4 inches to 3 inches in diameter containing less than 5 percent fines (Massachusetts DEP, 2003).

Space berms according to the steepness of the slope. Space them closer together as the slope increases.

Remove and dispose of sediment that builds up, and replace the filter material. Regular inspection should indicate how often sediment needs to be removed.

Limitations

Berms are intended to be used only in gently sloping areas (less than 10 percent). They do not last very long unless they are maintained regularly because they are prone to clogging with mud and soil from vehicle tires.

Maintenance Considerations

Inspect the berm after every rainfall to make sure sediment has not built up and that vehicles have not damaged it. It is important to make repairs at the first sign of deterioration to keep the berm functioning properly.

Effectiveness

The effectiveness of a rock filter berm depends on rock size, slope, soil and rainfall amount. The continuous berm is not staked into the ground, and no trenching is required. Effectiveness has been rated at up to 95 percent for sediment removal. Effectiveness depends on local conditions such as hydrologic, hydraulic, topographic, and sediment characteristics.

Cost Considerations

Construction materials for filter berms (mainly gravel) are relatively low in cost. Installing a berm and regularly cleaning and maintaining it can result in substantial labor costs. Costs are lower in areas of less traffic, gentler slopes, and low rainfall.

References

Fifield, S.J. 1997. *Field Manual for Effective Sediment and Erosion Control Methods*. Hydrodynamics, Inc., Parker, CO.

Massachusetts Department of Environmental Protection. 2003. *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas: A Guide for Planners, Designers and Municipal Officials.* http://www.mass.gov/dep/water/esfull.pdf EXIT Disclaimer. Accessed May 17, 2006.

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

Sodding

Minimum Measure: Construction Site Stormwater Runoff Control

Subcategory: Erosion Control

Grass sod is laid on exposed soil to stabilize the soil and to reduce the velocity of stormwater runoff (Source: Landscape USA, no date)

Description

Sodding is a permanent erosion control practice and involves laying a continuous cover of grass sod on exposed soils. Sodding can stabilize disturbed areas and reduce the velocity of stormwater runoff. Sodding can provide immediate vegetative cover for critical areas and stabilize areas that cannot be readily vegetated by seed. It also can stabilize channels or swales that convey concentrated flows and reduce flow velocities.

Applicability

Sodding is appropriate for any graded or cleared area that might erode, requiring immediate vegetative cover. Locations that are well-suited to sod stabilization include:

- Residential or commercial lawns and golf courses where prompt use and aesthetics are important
- Steeply sloped areas
- Waterways and channels carrying intermittent flow
- Areas around drop inlets that require stabilization

Siting and Design Considerations

Sodding eliminates the need for seeding and mulching. Sod can be laid during times of the year when seeded grasses are likely to fail. Water the sod frequently within the first few weeks of installation. Select a type of sod that is composed of plants adapted to the site conditions. Sod composition should reflect environmental conditions and the function of the area where it will be laid. Know the genetic origin of the sod, and make sure it is free of noxious weeds, diseases, and insects. Ensure that the sod is machine cut at a uniform soil thickness of 15 to 25 mm (not including top growth or thatch) at the time of establishment.

If a soil test determines the need, prepare the soil and add lime and fertilizer. Lay the sod in strips perpendicular to the direction of waterflow and stagger it in a brick-like pattern. Staple the corners and

middle of each strip firmly. Peg jute or plastic netting over the sod to protect against washout during establishment. In the area to be sodded, clear all trash, debris, roots, branches, stones and clods larger than 2 inches in diameter. Ensure that sod is harvested, delivered, and installed within a period of 36 hours. If it is not transplanted within this period, inspect and approve the sod before its installation.

Limitations

Compared to seed, sod is more expensive and more difficult to obtain, transport, and store. To ensure successful establishment, prepare the soil and provide adequate moisture before, during, and after installation. If sod is laid on poorly prepared soil or an unsuitable surface, the grass will die quickly because it is unable to root. After installation, inadequate irrigation can cause root dieback or cause the sod to dry out.

Maintenance Considerations

To maintain adequate moisture in the root zone and to prevent dormancy, water the sod, especially within the first few weeks of installation. When mowing, do not remove more than one-third of the shoot. Maintain grass height between 2 and 3 inches. After the first growing season, determine if additional fertilization or liming is needed. Permanent, fine turf areas require yearly maintenance fertilization. Fertilize warm-season grass in late spring to early summer; fertilize cool-season grass in late winter and again in early fall.

Effectiveness

Sod removes up to 99 percent of total suspended solids in runoff, but its sediment trapping efficiency is highly variable depending on hydrologic, hydraulic, vegetation, and sediment characteristics.

Cost Considerations

Average construction costs of sod average $0.20 per square foot and range from $0.10 to $1.10 per square foot; maintenance costs are approximately 5 percent of installation costs (USEPA, 1993).

References

FHWA (Federal Highway Administration). 1995. *Best Management Practices for Erosion and Sediment Control*. FHWA-SLP-94-005. Federal Highway Administration, Sterling, VA.

Landscape USA. No date. *Installing Sod for an Instant Lawn*. [www.landscapeusa.com/tips/turf.htm EXIT Disclaimer]. Accessed November 10, 2005.

Smolen, M.D., D.W. Miller, L.C. Wyall, J. Lichthardt, and A.L. Lanier. 1988. *Erosion and Sediment Control Planning and Design Manual*. North Carolina Sedimentation Control Commission; North Carolina Department of Environment, Health, and Natural Resources; and Division of Land Resources, Land Quality Section, Raleigh, NC.

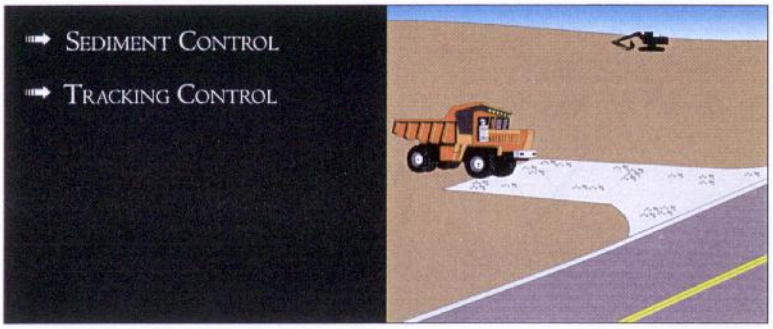
USEPA (U.S. Environmental Protection Agency). 1993. *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters*. EPA 840-B-92-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

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

Last updated on May 22, 2006 8:28 AM

URL:http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm

STABILIZED CONSTRUCTION ENTRANCE



Purpose: Stabilizing the point of ingress/egress is an effective means of minimizing the tracking of mud and dirt onto public roads by construction vehicles.

Application:

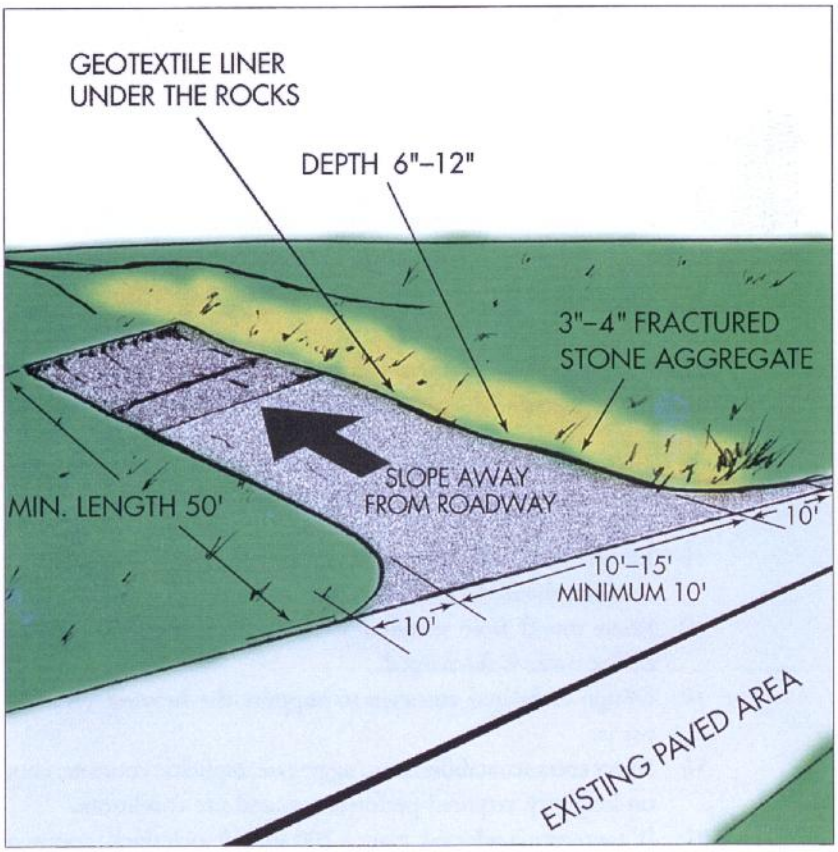
- On sites where tracking onto public roads is a potential problem.
- Site conditions will dictate design and need.

Installation Guidelines:

- Properly grade entrance to prevent runoff from construction site. Entrance elevation should be lower than street.
- Route runoff from stabilized entrance through a sediment trapping device before water is discharged.
- Design stabilized entrance to support the heaviest vehicles which will use it.
- Select entrance stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions.
- If aggregate is selected, place a 200 mm (8 inch thick) course of aggregate over the geotextile fabric or a thickness of aggregate recommended by a soils engineer.

Inspection and Maintenance:

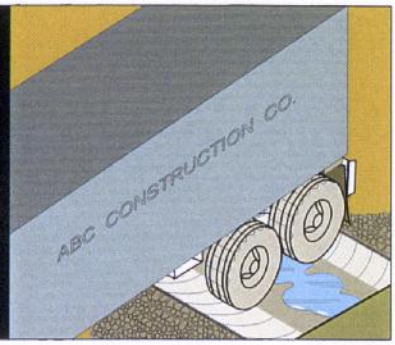
- Inspect routinely for damage and repair as needed.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction entrance.
- Service sediment trapping devices regularly.



length—minimum 50'
width—minimum 10'–15'
(should be flared at the existing road to provide turning radius)
depth—6" to 12"

Entrance / Exit Tire Wash

- Erosion Control
- Tracking Control



Application:

- On construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations:

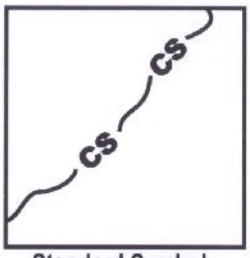
- A wash area requires a supply of wash water as well as a turnout or double wide exit to avoid entering vehicles from having to drive through the wash area.

Inspection and Maintenance:

- Inspect regularly to ensure the wash area is functioning efficiently.
- Maintain exits in a working and effective condition to prevent tracking of sediment onto public roads.
- Provide for exchange and treatment of polluted water as needed.

Stockpile Management

WM-3



Standard Symbol

BMP Objectives

- ● Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ● Materials and Waste Management

Definition and Purpose

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

Appropriate Applications

Implemented in all projects that stockpile soil and other materials.

Limitations

- None identified

Standards and Specifications

- Protection of stockpiles is a year-round requirement.
- Locate stockpiles a minimum of 15 m (50 ft)away from concentrated flows of storm water, drainage courses, and inlets.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information see BMP WE-1, "Wind Erosion Control."
- Stockpiles of contaminated soil shall be managed in accordance with BMP WM-7, "Contaminated Soil Management."
- Bagged materials should be placed on pallets and under cover.

Protection of Non-Active Stockpiles

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

- ***Soil stockpiles:***
  - During the rainy seasons, soil stockpiles shall be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
  - During the non-rainy season, soil stockpiles shall be covered and protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
- ***Stockpiles of portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate subbase:***
  - During the rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier at all times.
  - During the non-rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
- ***Stockpiles of "cold mix":***
  - During the rainy season, cold mix stockpiles shall be placed on and covered with plastic or comparable material at all times.
  - During the non-rainy season, cold mix stockpiles shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.
- ***Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate:***
  - During the rainy season, treated wood shall be covered with plastic or comparable material at all times.
  - During the non-rainy season, treated wood shall be covered with plastic or comparable material and shall be placed on pallets prior to the onset of precipitation.

Protection of Active Stockpiles

Active stockpiles of the identified materials shall be protected further as follows:

- All stockpiles shall be covered, stabilized, or protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Maintenance and Inspections

- Repair and/or replace perimeter controls and covers as needed, or as directed by the RE, to keep them functioning properly. Sediment shall be removed when sediment accumulation reaches one-third (1/3) of the barrier height.

Attachment 2
Inspection Checklist and Log

Inspection Checklist and Log

GENERAL INFORMATION

Project Name	Site 12 Find Remedy			
Contractor	Shaw Environmental & Infrastructure			
Inspector's Name	E. Hueston (or delegate)			
Inspector's Title	Construction Superintendent			
Signature				
Date of Inspection				
Inspection Type (Check Applicable)	☐ Prior to forecast rain ☐ After a rain event ☐ 24-hr invervals during extended rain ☐ Other ___			
Season (Check Applicable)	☐ Rainy ☐ Non-Rainy			
Storm Data	Storm Start Date & Time:		Storm Duration (hrs):	
	Time elapsed since last storm (Circle applicable units)	Min. Hr. Days	Approximate Rainfall Amount (in.)	

OTHER REQUIREMENTS

Requirement	Yes	No	N/A	Corrective Action
Vehicle & Equipment Service				
Are vehicle and equipment fueling, cleaning and maintenance areas reasonably clean and free of spills, leaks, or any other deleterious material?				
Are vehicle and equipment fueling, cleaning and maintenance activities performed on an impermeable surface in dedicated areas?				
If no, are drip pans used?				
On each day of use, are vehicles and equipment inspected for leaks and if necessary, repaired?				
Location:				
Location:				
Location:				
Location:				
Material Delivery				

GENERAL INFORMATION				
Are storage areas kept clean and well organized?				
Are any repairs required?				
Location:				
Location:				
Location:				
Location:				
Concrete Washout				
Are washout waters contained?				
Are washout areas near a discharge point?				
Location:				
Location:				
Location:				
Location:				
Hazardous Waste Management				
Are all material handling and storage areas clean; organized; free of spills, leaks, or any other deleterious material; and stocked with appropriate clean-up supplies?				
Are liquid materials, hazardous materials, and hazardous wastes stored in temporary containment facilities?				
Are hazardous materials and wastes stored in appropriate, labeled containers?				
Are proper storage, clean-up, and spill-reporting procedures for hazardous materials and wastes posted in open, conspicuous and accessible locations adjacent to storage areas?				
Location:				
Location:				
Location:				
Location:				
Entrance and Exit Tire Wash				
Are vehicles tracking sediment onto public roads?				

GENERAL INFORMATION				
If so, is it in amounts that require vacuum street sweeping?				
Does the tire wash water appear polluted and need to be disposed?				
Location:				
Location:				
Location:				
Location:				
Solid and Demolition Waste Management				
Does the waste collection area receive a substantial amount of runoff from upland areas?				
Does the waste collection area drain directly into a waterbody?				
Do waste containers/ trucks have lids or another form of covering?				
Are waste containers overfilled?				
Location:				
Location:				
Location:				
Location:				
Contaminated Soil and Water Management				
Is there preexisting contamination at the site?				
Are there any detectable leaks of contaminated soil or water?				
Location:				
Location:				
Location:				
Location:				
Fiber Rolls				

GENERAL INFORMATION				
Are fiber rolls trenched, anchored, properly spaced and functional?				
Location				
Location:				
Location:				
Location:				
Sand/Gravel Bag Barrier				
Has sediment accumulated to 1/3 the height of the barrier?				
Are the bags properly placed?				
Location:				
Location:				
Location:				
Location:				
Storm Drain Inlet Protection				
Are storm drain inlet protection devices in working order and being properly maintained?				
Is the drainage area for each protected inlet less than an acre?				
Location:				
Location:				
Location:				
Location:				
Catch Basin Inlet Filters				
Is the filter less than half full of sediment and debris?				
Is the filter damaged?				

GENERAL INFORMATION				
Location:				
Location:				
Location:				
Location				
Preservation of Existing Vegetation				
Is temporary fencing provided to preserve vegetation in areas where no construction activity is planned?				
Location:				
Location:				
Location:				
Location:				
Dust Control				
Are dust control methods consistent with specific site and weather conditions?				
Do the dust control methods cause non-storm water runoff or reduce water quality?				
Location:				
Location:				
Location:				
Location:				
Filter Berms / Brush or Rock Filter				
Has sediment built up enough to clog the filter berm?				
Is there damage from vehicle traffic?				
Location:				

GENERAL INFORMATION				
Location:				
Location:				
Location:				
Sodding				
Is the sod properly installed?				
Is the sod properly watered and maintained?				
Is the sod free of noxious weeds, diseases, and insects?				
Location:				
Location:				
Location:				
Location:				
SWPPP Update				
Does the SWPPP adequately reflect the current site conditions and contractor operations?				
Are selected BMPs appropriate and sufficient?				
Location:				
Location:				
Location:				
Location:				
General				
Are there any other potential water pollution control concerns at the site?				
Location:				
Location:				

GENERAL INFORMATION				
Location:				
Location:				

Appendix B
Site 12 Environmental Protection Plan

Environmental Protection Plan

1.0 Introduction

This Environmental Protection Plan (EPP) was specifically developed to meet the requirements of performing the work described in the Shaw Environmental, Inc. (herein referred to as Shaw) Removal Action Work Plan/Remedial Design in a manner that protects the environment during the construction period. Environmental protection, for the purpose of this project, is defined as maintaining the environment in its natural state and the enhancement and/or restoration of the appearance of disturbed sites after construction completion.

To accomplish environmental protection, consideration will be given to air, water, and land resources, including management of visual aesthetics; natural, historical, and archeological resources; noise; and other solid waste, as well as other pollutants. The Shaw Project Manager will implement the EPP so that all work is performed in a manner that minimizes the pollution of air, water, and land resources and complies with federal, state, and local regulations.

1.1 Conformance with Laws, Regulations, and Permits

The Shaw Project Manager will verify that all work is performed in accordance with applicable and relevant federal, state, or local environmental regulations. All hazardous wastes will be characterized and disposed of in accordance with the Resource Conservation and Recovery Act.

The Clean Water Act (CWA) Amendments (CWA Section 402 Phase II Rule) requires adoption of a Storm Water Management Plan (SWMP) for any construction project that affects more than 1 acre of ground. The scope of this project includes excavating about 11 acres of land, which exceeds this criterion. Thus, the construction activities will be performed in accordance with the SWMP which is an appendix to the Removal Action Work Plan/Remedial Design.

1.2 Protection of Air Resources

Dust emissions will be controlled using standard engineering controls so that no visible dust is generated for a sustained period of time. Air monitoring will be performed to ensure that all Bay Area Air Quality Management District regulations are met.

1.2.1 Air Monitoring

Air monitoring will be performed during construction (demolition/excavation/backfilling) to monitor for potential airborne contaminant emissions. Prior to starting Site 12 work, an initial baseline air monitoring event will be performed to establish ambient conditions. During construction, Shaw will operate air monitoring equipment at locations upwind and down wind of

the excavations. Additional air quality monitors will be placed at appropriate locations to monitor air quality in the vicinity of residential buildings potentially affected by air born dust. Air monitoring equipment will consist of personal data rams Minirams calibrated to record total dust concentrations.

1.2.2 Dust Control

Construction activities associated with this project may result in release of respirable dust particulates. The work procedures will be designed to control, prevent, and minimize these releases. Dust suppression will be implemented at the direction of the Project Superintendent to control observed dust emissions or as a preventative measure based on observation of site and work conditions, as well as ambient weather conditions. Fugitive dust emissions during the excavation or demolition activities will be controlled by spraying water from a water truck, water trailer, or nearby fire hydrant. Spraying will be conducted as needed on the excavation areas, access roads, and paved areas during the day. At the end of each workday, the work areas will be swept or washed as appropriate to minimize the potential for fugitive dust during the evening hours. Control measures will be implemented for dust particles from all construction activities during normal working hours. Care will be taken to control over-spraying and to minimize discharge of dust control water to the storm drain system.

Occupied and other selected residences will be further protected from dust by tarping the building façades or other measures. Emergency egress will be provided at covered exits by implementing a “double-flap layer” in the tarp.

1.2.3 Burning

No hot work permits are anticipated for this work; however, any work requiring an open flame or posing a potential fire hazard shall be coordinated with the Site Health and Safety Officer.

1.2.4 Noise

Noise receptors are not anticipated at this site. Shaw will comply with the U.S. Occupational Safety and Health Administration and applicable local noise standards. Equipment operators, contractors, and other personnel will be required to wear appropriate hearing protection when necessary as detailed in the Site Health and Safety Plan.

1.3 Protection of Surface and Groundwater Resources

Construction activities associated with this project will be conducted so as to prevent the discharge of pollutants and to minimize the impact to water resources within and outside the project boundaries. A SWMP for this site is included in the Work Plan as an appendix. This project will follow the best management practices presented in the SWMP.

Project activities will be conducted in compliance with all appropriate federal, state, and local laws regarding potential and actual contamination of surface and groundwater. In addition, activities will be performed in a manner so as to prevent the discharge of pollutants into any existing waterways.

No bulk liquids storage is anticipated as part of this project. As necessary, excavation and stockpile areas will be bermed and/or ditched as needed to prevent surface runoff. Runoff from the work area will be managed to minimize erosion and siltation damage though the use of flow control structures constructed of straw bales, sandbags, or other appropriate materials. Stockpiles of excavated materials will be covered when not in use, and especially during non-working hours, using 6-mil visqueen. Storm drain inlets may be covered to prevent excavated soil from inadvertently being introduced to the storm drain system.

1.4 Protection of Land Resources

Construction activities associated with this project will be conducted in a manner to minimize the impact to land resources within and outside the project boundaries. Project activities will be coordinated with the Construction Site Officer (CSO) and the Resident Officer in Charge of Construction (ROICC) in order to minimize impact to land resources. Photographs of existing conditions will be collected as part of a pre-construction survey. Facilities such as sidewalks, fences, and pavement will be restored to original alignments with the exception of the Westside Drive area. Grassy areas will be restored with sod or reseeded.

1.4.1 Landscape Protection

Landscaping within the excavation areas will be entirely removed. Shaw will coordinate with the CSO and the ROICC prior to remediation activities at the site to identify any land resources to be preserved outside the work area. Shaw personnel will mark the areas to be preserved and provide fencing, barriers, or other physical protection. Shaw will make a reasonable effort to minimize damage of land resources outside the project work area and will repair any damage inadvertently caused to land resources.

1.4.2 Historical and Archeological Finds

Shaw is not aware of any structure(s) and/or artifact(s) of historical importance within the work areas. Items discovered during construction activities that could be of archeological interest will be carefully preserved in an undisturbed state. The Site Superintendent will immediately report any findings to the CSO and the ROICC so that proper authorities may be notified.

1.5 Runoff, Soil Erosion, and Sediment Control

In accordance with the Work Plan, the majority of excavated soil will be loaded directly onto end-dump trucks for offsite disposal. Soil excavated from within solid-waste disposal area

1209/1211 will be transported by dump trucks to Site 6 where it will be temporarily stockpiled. In other areas, including expedited excavation areas in front of Buildings 1325, 1205 and 1207, soil may be excavated to depths of 4 feet below ground surface and stockpiled in large 1 foot thick piles so the materials may be screened for radiological contamination. Other excavated soil which is stockpiled will be placed in covered roll-off bins or on a semi-permeable surface (polyethylene plastic sheeting may be used) and covered. As necessary to protect work features from runoff, temporary diversion ditches or berms may be installed as required to control runoff and sediment migration. Backfill soil will be compacted and graded to minimize erosion. Erosion and sediment control measures, such as sediment traps or stabilized drainage ways, will be installed as needed, and maintained throughout the project.

1.6 Post-Construction Cleanup

Upon completion and subject to input from the CSO and ROICC, Shaw will perform the final site cleanup and will leave the work site in a suitably restored condition.

Appendix C
Site 12 Radiological Sampling and Analysis Plan

New World Environmental, Inc., d.b.a.

New World Technology *Bringing you the Technology of the New World*

FINAL
RADIOLOGICAL SAMPLING AND ANALYSIS PLAN

Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Revision 3
4 July, 2007

Prepared for:

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4005 Port Chicago Highway
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Contract Number N68711-01-D-6011
Contract Task Order 0010

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FINAL
RADIOLOGICAL SAMPLING AND ANALYSIS PLAN

Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Revision 3
4 July, 2007

APPROVAL PAGE

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January 23, 2008
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ABBREVIATIONS AND ACRONYMS

α	alpha
β	beta
γ	gamma
μCi/mL	microcurie per milliliter
μR/hr	microroentgen per hour
AEC	Atomic Energy Commission
AHA	Activity Hazard Analysis
ALARA	as low as reasonably achievable
bgs	below ground surface
CalEPA	California Environmental Protection Agency
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	centimeters
cm^2	square centimeters
cpm	counts per minute
CSO	Caretaker Site Office
CTO	Contract Task Order
DCGL	derived concentration guideline level
DHS	Department of Health Services
DOE	Department of Energy
DOD	Department of Defense
DOT	Department of Transportation
dpm	disintegrations per minute
DQO	data quality objective
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
FSS	Final Status Survey
ft	feet
ft^2	square feet
g	gram
GPS	Global Positioning System

ABBREVIATIONS AND ACRONYMS
(Continued)

HpGe	High Purity Germanium Detector
HRA	Historical Radiological Assessment
ISO	International Organization for Standardization
IWMB	[CalEPA] Integrated Waste Management Board
keV	kilo-electron volts
LBGR	lower boundary of the gray region
LLRW	Low-level Radioactive Waste
m	meter
m^2	square meters
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
MDC	minimum detectable concentration
MDCR	minimal detectable count rate
MDER	minimum detectable exposure rate
MeV	mega-electron volts
min	minute
mR/hr	milliroentgen per hour
N/A	not applicable
NAVSEA	Naval Sea Systems Command
NaI	sodium iodide
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
NWT	New World Technology
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
pCi	picocurie
pCi/g	picocurie per gram
pCi/L	picocurie per liter

ABBREVIATIONS AND ACRONYMS
(Continued)

PM	Project Manager
PPE	personal protective equipment
QA	Quality Assurance
QC	Quality Control
^{226}Ra	radium-226
RASO	Radiological Affairs Support Office
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RHP	Radiological Health Program
RI	Remedial Investigation
ROC	radionuclide of concern
RRO	radiological remedial objective
RSAP	Radiological Sampling and Analysis Plan
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
Shaw	Shaw Environmental, Inc.
SHSO	Site Health and Safety Officer
SHSP	Site Health and Safety Plan
SOP	Standard Operating Procedure
SWDA	Solid Waste Disposal Area
TtEMI	TetraTech EM, Inc
USC	United States Code
Weston	Weston Solutions, Inc.

EXECUTIVE SUMMARY

This Radiological Sampling and Analysis Plan describes the proposed Non-Time Critical Removal Action (NTCRA) activities for three solid waste disposal areas (SWDAs) located in the Site 12 residential housing area at the former Naval Station (NAVSTA) on Treasure Island (TI). The removal action includes excavation of chemical- and solid-waste contaminated soil within known SWDAs. Contaminants of potential concern within the Site 12 SWDAs include polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dioxins, and lead. The excavated soils will also be surveyed for radiological contamination for disposal purposes. Figure 1 illustrates the location of Site 12 within TI. This proposed NTCRA will be undertaken under the National Oil and Hazardous Substance Pollution Contingency Plan (Title 40 of the Code of Federal Regulations, Part 300), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and (Ca-HSC Section 25323).

The radiological surveys will be completed in accordance with guidelines specified in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) for Final Status Surveys for Class II areas. The surveys will be performed primarily using hand held sodium iodide detectors for in-situ field monitoring and High Purity Germanium Gamma-Spectroscopy to conduct on-site laboratory analysis of soil samples for identification of gamma emissions.

1.0 INTRODUCTION

This Radiological Sampling and Analysis Plan (RSAP) describes the scope and radiological survey and sampling approach for the proposed Non-Time Critical Removal Action (NTCRA) activities for three solid-waste disposal areas (SWDAs) located in the Site 12 residential housing area at the former Naval Station (NAVSTA) on Treasure Island (TI).

The Department of the Navy (Navy), Naval Facilities Engineering Command, Southwest (NAVFAC SW), and the Radiological Affairs Support Office (RASO) are directing this removal action. Figure 5 contains an outline of Controlling Agency Contacts. This RSAP is being prepared under contract to Shaw Environmental, Inc. Contract Task Order (CTO) 0010 and Environmental Multiple Award Contract N68711-01-D-6011. The radiological surveying, sampling and analysis activities described in this RSAP will be performed by New World Technology (NWT) of Livermore, California under regulatory compliance with NRC Radioactive Materials License # 04-27745-01.

Based on the site's operational history described in the *Final Historical Radiological Assessment* (HRA) (Weston, 2006) and the recommendations of the California Environmental Protection Agency (CalEPA) Integrated Waste Management Board (IWMB) (2001), the Navy has determined that this site will require radiological surveying, sampling and analysis during excavation activities. Although it was expected that few or no radiological devices are present in the SWDAs, initial survey results showed increased levels indicative to the presence of radioactive materials. The planned radiological sampling and analysis activities will serve to verify that the SWDAs pose little or no potential threat of future direct exposure, migration and/or off-site release of radioactive material to the surrounding environment. Or in the event radioactive materials are found to be present, the planned radiological sampling and analysis activities will identify, segregate and quantify such materials. MARSSIM methods will be used for radiological surveys of excavated soil for non-radiological disposal, and identifying the "as left" radiological conditions of excavation area prior to backfilling.

The HRA (Weston, 2006) listed radium-226 (^{226}Ra) as the potential radionuclide of concern (ROC) for the areas located in Site 12. However, based on HRA research, the Navy expected to find few or no radiological devices in the SWDAs. As of the date of this plan revision, Ra-226 has been identified by HPGe laboratory analysis as a radionuclide of concern that is present in both soil and devices. Some devices have been segregated and determined to contain Ra-226 in μCi quantities. When radioactive material is encountered above the radiological remedial objectives (RROs) during the survey activities, it is removed and stockpiled for disposal as radioactive waste. Disposal of radioactive waste will require a revision to the Waste Management Plan (Appendix D in the Site 12 Work Plan) specifying the appropriate location

and means of disposal. The material will remain stockpiled in a secure location on TI until the revised Waste Management Plan is approved.

This RSAP describes the overall scope and approach to the removal action and details the specific activities involved in the implementation of the planned radiological surveying, sampling, and analysis activities.

1.1 OBJECTIVES

The objectives of the removal action detailed in the Work Plan are to provide for:

- The protection of human health and the environment; and
- The reduction of the potential for housing area residents to contact chemical-, radioactive-, or solid-waste-contaminated soil within Site 12.

The survey, sampling and analysis activities detailed in this RSAP will provide data to meet the radiological component of the removal action objectives, while providing a safe work environment for both the Navy contractors and housing area residents.

1.2 SCOPE OF WORK

The scope of work presented in the Work Plan includes the excavation of soil to a depth of 4 feet below ground surface (bgs) in three SWDAs: Area A&B, Area 1207/1209, and Area 1231/1233 (Figures 2, 3, and 4, respectively). The three SWDA include residential housing common areas, backyards, and roadways; portions of the SWDAs are underlain by utilities. Following excavation, the sites will be backfilled.

The scope of work presented in this RSAP includes the following components:

- Perform insitu and laboratory surveys of each survey unit (i.e., the surface of each excavation lift, from 0 to 3 feet bgs).
- Perform Class 1 MARSSIM survey of the final 4-foot depth, site conditions permitting.
- Indicate in the field any areas of elevated readings for additional investigation and possible segregation from the project waste stream.
- Collect confirmation samples from each survey unit.

Sections 3.0 through 6.0 provide the detailed procedures that will be followed to complete this scope of work and meet the project objectives.

1.3 SITE SAFETY

Occupational Safety and Health Administration (OSHA) excavation regulations and permit requirements will be followed. All excavations will be conducted in accordance with California Health and Safety Code, California Code of Regulations (CCR) Title 8, Sections 1539 through 1541, and 29 Code of Federal Regulations (CFR), Parts 1910 and 1926, requirements. All field activities will be conducted in accordance with Shaw Environmental Inc. Site-specific Health and Safety Plan (SHSP), which has been prepared as a stand-alone document.

1.4 RADIOLOGICAL CONTROL PRACTICES

NWT has a Nuclear Regulatory Commission (NRC) Type A Broad Scope License #04-27745-01. NWT will ensure that the radiological control program and work practices are implemented and performed in accordance with acceptable industry standards and NRC license requirements.

1.5 PROJECT ORGANIZATION AND SCHEDULE

The completion schedules for each area are presented in Shaw's Work Plan.

The project organization will be comprised of managers, administrators, subcontractors, and professionals necessary to coordinate and implement the removal activities under this CTO. A project organization with a defined chain of command has been established for office and field operations. A project organization chart with contact numbers and project responsibilities is provided in Figure 5 of Shaw's Work Plan.

NWT's on-site group will consist of:

- License RSO/Project Manager - Responsible for the overall operations and safety of the NWT project team. Responsible for all activities involving radioactive materials under license conditions. Also responsible for coordination of work activities with Shaw management personnel.
- HP Supervisor/Radiological Control Technician (RCT) - Perform radiological surveys and coordinate sampling operations for radiological analysis under direction of License RSO.
- DART Operators - Perform maintenance on, and operation of the DART system.

2.0 SITE DESCRIPTION AND BACKGROUND

2.1 SITE DESCRIPTION

Site 12 is located on the northwest portion of TI on a relatively flat 93-acre area. The site consists of multiplex housing units with private backyards and common area front yards, side yards and surrounding greenbelts.

2.2 SITE BACKGROUND

The northwestern portion of TI currently designated as Site 12 was originally used as a parking lot during the 1939-1940 Golden Gate International Exposition. After Navy occupation of the island in 1940, the area was developed as bunker storage of munitions and other materials, as well as vehicle equipment and storage, recreational playing fields, and disposal and burning of solid waste. Beginning in the 1960s, areas of Site 12 were incrementally developed into housing for Navy personnel and their dependents.

2.3 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIATION ACTIVITIES

Numerous investigations and removal actions have been conducted at Site 12 since the early 1990s to identify areas of suspected debris disposal and to define chemical contamination related to previous site activities. Details of the previous investigations and removal actions relevant to the proposed soil removal action are summarized in the Work Plan. Previous investigations and remedial actions at Site 12 have been related to the physical and chemical hazards associated with subsurface debris areas, as is the remedial action proposed in this Work Plan; however, this RSAP is concerned only with possible radiological hazards within the SWDAs.

2.4 SUMMARY OF HISTORICAL RADIOLOGICAL ASSESSMENT FINDINGS

Extensive historical research conducted for the HRA (Weston, 2006) found no supporting evidence to indicate that radioactive devices or associated material was deposited in any debris disposal area on NAVSTA TI. NAVSTA TI's primary activities were training and not those of a facility for removal, repair, or disposal of radioluminescent devices. All known radiological material used for training, and radiological waste from two documented spills at NAVSTA TI, was transferred or disposed of off site. There are no known current uses of licensed or unlicensed radioactive materials on TI.

The HRA research found no documentation to suggest that radioactive materials were disposed in the Site 12 SWDAs or anywhere else on NAVSTA TI. However, the IWMB, in a letter dated

May 9, 2001, recommended precautionary field screening for radioactive material at the Site 12 SWDAs. The recommendation was based on their experiences in finding low-level radioactive material associated with municipal solid waste burn dumps, although they noted that "there is no direct evidence suggesting that radioactive material was disposed of in the Site 12 disposal pits."

Subsequent to the IWMB recommendation to screen the Site 12 SWDAs for radiological material, 580 test trenches were excavated over 80 percent of Site 12 to a depth of 4 feet below ground surface (bgs). The Navy conducted radiological surveying of the trench sidewalls and soil spoil with sensitive gamma scintillation detectors, but found no evidence of radioactive material disposal, either physical or measured (Shaw, 2004). Because the Site 12 SWDAs A&B, 1207/1209, and 1231/1233 were not included in the trenching activities and because their previous investigations occurred prior to the IWMB recommendation, they have not yet been screened for radiological material.

Although it was considered highly unlikely that any radiological material would be found in the SWDAs, based on the HRA research and the trenching results, the HRA recommended future screening of the SWDAs to fulfill the 2001 IWMB recommendation (Weston, 2006). The Navy, in a letter dated July 19, 2001, agreed with the IWMB recommendation.

2.5 CURRENT AND FUTURE NAVSTA TI USAGE

Site 12 currently contains four housing areas comprising 149 residential buildings, each with between four and eight residential units. Of these, 19 buildings are within or immediately adjacent to the three SWDAs. The majority of these buildings are unoccupied pending the Navy's environmental restoration activities.

Several alternative scenarios for future use are under review for development of the former NAVSTA that include some combination of residential, open space, and public use.

3.0 SITE PREPARATION AND EQUIPMENT

3.1 ACCESSIBILITY

Access to the site will be limited to only those personnel engaged in the surveys, approved visitors, regulatory agency representatives and appropriate Shaw personnel.

3.2 OFFICE SPACE AND RESTROOM FACILITIES

NWT will use Shaw's office trailer and restroom facilities in close proximity to the work site.

3.3 ELECTRICAL POWER

There is no electrical power available at the work area. Portable gasoline generators will supply electrical power as required.

3.4 CLEANUP GOALS

The HRA (Weston, 2006) identified ^{226}Ra as the ROC. Table 3-1 provides the RRO for the ROC for soil and water. Table 3-2 provides the RRO for equipment and materials, and Table 3-3 provides the derived air concentration (DAC) value for airborne radioactive material concentrations. If additional radionuclides are encountered, the cleanup goals will be established with the appropriate regulatory agencies.

Table 3-1: Radiological Remedial Objectives for Soil and Water

Radionuclide of Concern	Soil[a] (pCi/g)		Water[a] (pCi/L)[*]
	Residential	Outdoor Worker	
Radium-226	1.0[b]	1.0[b]	5.0

Notes:

[a] The 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 percent. The MDA is calculated per sample by considering background counts, amount of sample used, and counting time.

[b] Limit is 1 pCi/g above background; per agreement with EPA.

* Release criteria for water have been derived from *Radionuclides Notice of Data Availability Technical Document* (U.S. Environmental Protection Agency, 2000) by comparing the limits from two criteria and using the most conservative limit.

pCi/g – picocurie per gram
pCi/L – picocurie per liter

Table 3-2: Radiological Remedial Objectives for Equipment and Materials

Radionuclide of Concern	Removable[a] (dpm/100 cm^2)	Total[a] (dpm/100 cm^2)
Radium-226	20 α	100 α

Notes:

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

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

cm^2 – square centimeters
dpm – disintegrations per minute

Table 3-3: Derived Air Concentration Values for Airborne Radioactive Material Concentrations

Radionuclide of Concern	Worker	
	DAC (μCi/mL)	10% DAC (μCi/mL)
Radium-226	3.0E-10	3.0E-11

Notes:

The above guideline values were determined using the NRC's 10 CFR, Part 20, Appendix B.

μCi/mL – microcuries per milliliter (activity)
CFR – Code of Federal Regulations
DAC – derived airborne concentration
NRC – Nuclear Regulatory Commission

4.0 RADIOLOGICAL CONTROL PLAN

4.1 RADIOLOGICAL HEALTH AND SAFETY

If radioactive materials are discovered during excavation and surveying operations, NWT Standard Operating Procedures (SOPs) and the SHSP will be used to address controls necessary for radiologically safe operations. A SHSO will be present at all active work areas to ensure that work is conducted in a safe manner.

Personnel assigned to site work will then be required to understand the requirements and sign a Radiation Work Permit (RWP) prior to commencing work. RTMs will manage implementation of the radiological aspects of Work Plans. RWP compliance will be monitored by a RCT, who will be present during all work activities. License compliance shall be ensured by the NWT RSO and Shaw Project Manager.

Dose rate, and contamination surveys, and air monitoring will be performed as necessary. Personal protective equipment (PPE) levels, dictated by radiological conditions and physical and chemical safety issues identified at each work location, will be assigned or modified, according to the approved RWP and SHSP.

4.2 ALARA

If radioactive materials are discovered, all work to be performed under this plan shall employ the basic as low as reasonably achievable (ALARA) concepts. The ALARA concept of radiation protection specifies that exposures to ionizing radiation and releases of radioactive material should be managed to reduce collective doses to workers and the general public as low as reasonably achievable

4.3 TRAINING

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

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

If radioactive materials are discovered during excavation and surveying activities, additional training will be required for personnel working in the field. It will include the following:

- Radiation awareness training

a. Recognition of RAM and/or radiation producing devices.

b. Whom to contact if RAM is found in an area where it is not allowed.

c. Whom to contact and expected actions in the event of an emergency, breakage or spill of RAM

d. Risks associated with the types of RAM and radiation producing devices commonly encountered on the project site.

Awareness training may be conducted by group briefings, videotape or by written handouts approved by the RSO and provided to personnel.

- RWP and Work Plan training for the specific site or task

4.4 WHOLE-BODY DOSE MONITORING

Dosimeters shall be issued and worn by all NWT personnel performing fieldwork under this plan. The dosimeters shall be National Voluntary Laboratory Accreditation Program (NVLAP)-approved and obtained from a NVLAP-certified provider. Personnel issued dosimetry must complete a NRC Form 4. The original Form 4 will be maintained by the organization issuing the dosimetry with a copy or the original kept at the project field office at TI.

4.5 RADIATION WORK PERMITS

If radioactive materials are discovered during excavation and surveying activities a RWP will be prepared that will specify the radiological safety requirements for activities performed under this RSAP. Personnel assigned to site work will be required to understand the requirements and sign the RWP prior to beginning work.

4.6 RADIOLOGICAL CONTROL PROCEDURES

Only pre-authorized areas will be used to store radioactive materials at TI. These areas will be selected with concurrence of RASO, the RSO, and the CSO. Security measures for these areas will be coordinated with the CSO and the Shaw or subcontractor NRC licensee.

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

- Access to areas is restricted where radioactive materials are known to be present.
- Surveys of radioactive materials storage areas are completed at least weekly.
- Radioactive material inventories are kept up-to-date.

4.7 INVESTIGATION LEVELS

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

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

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.

4.7.1 Investigation Levels for Gamma Radiation Surveys

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

4.7.2 Investigation Levels for Alpha and Beta Radiation Surveys

If radioactive material is discovered, for alpha and beta surveys on material and equipment, the investigation level will be the release criteria or a statistical-based parameter (e.g., reference area mean + 3σ), if used.

4.8 RADIATION DETECTION INSTRUMENTATION

Various instruments will be used to detect the radioactive material that may be present within the excavation areas. Instrument calibration, performance checks and operation shall be done 1) as applicable, the NWT SOP(s) governing preparation of portable radiation and contamination survey meters and instruments for field use, and 2) in accordance with any additional instructions specified in this plan. The instruments selected shall be able to detect the radionuclide of concern (^{226}Ra) and are, in relation to the survey or analytical technique, capable of measuring levels that are sufficient to support the DQOs presented in this plan. Table 4-1 identifies the instrumentation that may be used for radiological surveys.

Radiation detection instrumentation used during the survey will be maintained and calibrated to operate within manufacturers' specifications, so that the required sensitivity and precision will be

maintained. Specific calibration and maintenance will be conducted by personnel familiar with the equipment or by manufacturers' technical representatives.

Operational procedures have been developed for all field equipment to verify that the equipment is operating properly and that the data will be valid with instrument calibrations that are traceable. These procedures include functional operational checks, routine maintenance, calibration procedures, and operational instructions.

Instrumentation used during the FSS will be field-checked prior to starting work each day. All of the instruments are required to be within the +/- 20 percent criteria established when setting up background information for the instruments. If an instrument does not meet the criteria, it will be removed from service and returned to the manufacturer for maintenance and calibration.

Table 4-1: Instrumentation for Radiological Surveys

Measurement/ Technique	Primary Use	Type of Instrumentation		Typical Background	Typical Total Efficiency (%)	Detection Sensitivity	Typical Minimum Detectable Concentration
		Detector Type and Ludlum Model Number(s)	Meter Description and Ludlum Model Number(s)				
Surface alpha/beta scans	Equipment, materials, and debris	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/100 cm^2 β 100 dpm/100 cm^2 α	553 dpm/ 100 cm^2 β 53 dpm/ 100 cm^2 α
Direct measurement static alpha/beta		Scintillation, Ludlum Model 43-89 (100 cm^2)		100-200 cpm β 0-5 cpm α			
Surface gamma scans	Equipment, materials, debris and excavations	NaI 2-inch x 2-inch scintillation Ludlum Model 44-10	Data Logger 2350-1	5,500 cpm γ	N/A	1,500 cpm γ 1.6 pCi/g ^{137}Cs 1.34 pCi/g ^{226}Ra	353 cpm γ
Direct measurement static gamma	Excavations						
Towed array surface gamma scans	Excavations	(12) NaI 2-inch x 2-inch scintillation Ludlum Model 44-10	Model 4612 Counter	5,500 cpm γ	N/A	0.58 pCi/g ^{226}Ra	353 cpm γ
Surface beta/gamma scans	Equipment, materials, debris, and personnel	Geiger-Mueller Ludlum Model 44-9	Ratemeter 3	20 to 50 cpm β γ	~15 β γ total efficiency	~ 1,000 dpm per probe area β γ	358 dpm/100 cm^2 β γ
Direct measurement static beta/gamma	Equipment, materials, debris, and personnel						
Exposure rates	All inclusive	MicroR Meter with integral 1-inch x 1-inch NaI scintillation	Ratemeter 19	7-8 µR/hr	N/A	2 µR/hr	N/A

Notes:

α – alpha
β – beta
γ – gamma

cm^2 – square centimeters
cpm – counts per minute
dpm – disintegrations per minute

N/A – not applicable
NaI – sodium iodide
pCi/g – picocurie per gram

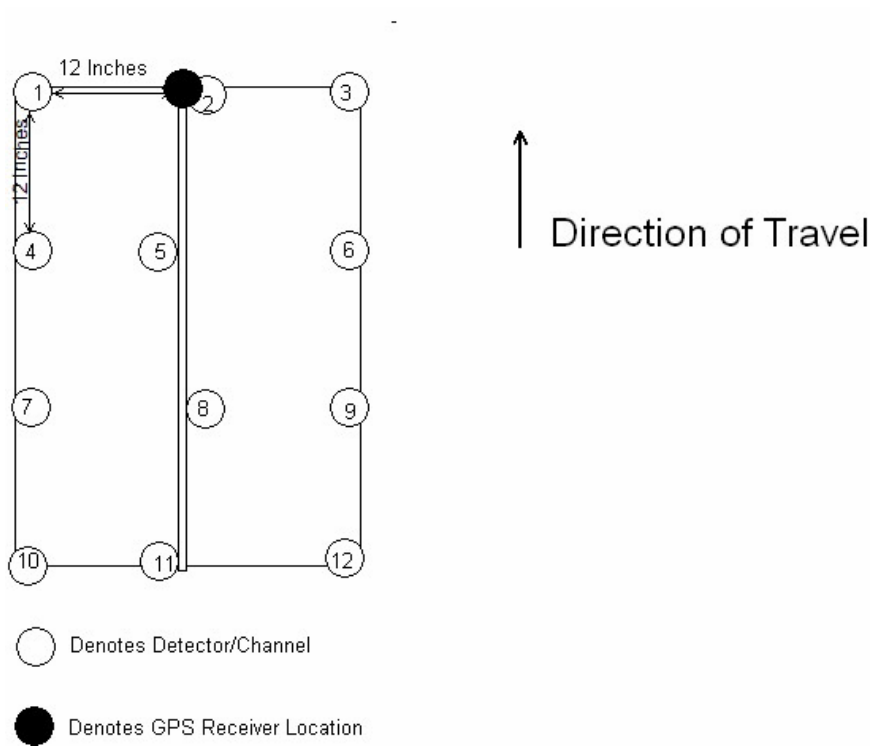
^{226}Ra – radium-226
µR/hr – microroentgen per hour

4.8.1 Instruments for Static and Scan Surveys for Gamma Activity

The excavation area gamma scan surveys will be performed using a Ludlum Model 4612. The Ludlum Model 4612 features a single-channel analyzer assembly array equipped with a programmable computer that controls all necessary operating parameters. Up to 12 detector assemblies can be used with the instrument, each with independent high-voltage, threshold, and window parameter settings. Parameters are loaded from a built-in flash memory that initiates during the power-up sequence. The parameters also include settings for upper and lower level discriminator, count time, count time range, output time, and recycle mode or slave mode settings. When connected to a NaI detector, the instrument is capable of detecting gamma photon energies ranging from 60 kilo-electron volts (keV) to 3 mega-electron volts (MeV) . The instrument will be programmed to respond to the full spectrum of gamma photon energies.

Four arrays of three Ludlum Model 44-10 2-inch by 2-inch NaI detectors, spaced 12 inches apart, will be connected to a Ludlum Model 4612 instrument and a Global Positioning System (GPS), which will be used to plot and correlate logged data points to specific coordinates. The detectors will be positioned so that each will be maintained at a distance of 4 inches from the surface being surveyed. The instrument array will be positioned on the back of a tow vehicle so as to "follow behind" the path of the vehicle. Readings will be collected for a period of 6 seconds. Diagram 1 shows the layout of the towed array and detectors system.

Diagram 1



4.9 ON-SITE RADIOLOGICAL LABORATORY INSTRUMENTATION

An on-site mobile laboratory will be used to analyze the soil samples collected in the field from the surface and down to 3 ft bgs. The samples will be analyzed by gamma spectroscopy in accordance with the analytical procedure presented in Attachment 1 of this plan (NWT, 2004).

4.10 OFF-SITE RADIOLOGICAL LABORATORY INSTRUMENTATION

An off-site laboratory will be used to analyze the soil samples collected in the field at the final excavation depth of 4 ft bgs. The samples will be analyzed by gamma spectroscopy using the U.S. Department of Energy (DOE) Method 901.1M, (DOE, 1997).

4.11 QUALITY ASSURANCE CHECKS

QA checks shall be performed on the field 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.

4.11.1 Gamma Spectroscopy

Gamma spectroscopy analysis is performed using hardware features that include a high-purity Germanium gamma photon detector supported by software. Instrument hardware is calibrated using a multi-energy National Institute of Standards and Technology (NIST)-traceable source ranging from 10 keV to 2 MeV. Data results will be reviewed for QA and reported in units of picocurie per gram (pCi/g). Analysis and review processes will address count integration, efficiency and background corrections, as well as the processing of overlapping peaks. Gamma spectroscopy focuses on energetic photons emitted from ROCs. A spectral region of interest results around a specified energy range allows for identification and quantification of associated nuclides and daughter products.

4.12 INSTRUMENT EQUATIONS

The following equations are used to calculate efficiencies, minimum detectable concentrations (MDCs), and minimum detectable count rates (MDCRs). These equations are presented in Chapter 6 of MARSSIM and in NUREG 1507.

4.12.1 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 4-1 will be used to calculate the instrument efficiency in counts per particle; although, efficiency is typically reported as having no units or being unitless.

Equation 4-1

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

Where:

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

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

- Efficiency Check Sources. Efficiency check sources that emit alpha or beta radiation with energies similar to those expected from the contaminant in the field [similar to the expected ROC(s)] will be selected.
- Source Geometry Factors. Instrument efficiency will usually be determined with an efficiency check source equal to or greater than the area of the probe. If a source that is smaller than the probe is used, a conversion factor is applied to the MDC to account for the active region of the probe. It should be noted that Equation 4-1 is used when the calibration source is larger that the probe window active area.
- 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.

4.12.2 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.

In the absence of experimentally determined surface efficiencies, ISO-7503-1 [International Organization for Standardization (ISO), 1988] and NUREG-1507 (NRC, 1997), provide conservative recommendations for surface efficiencies. ISO-7503-1 recommends a surface efficiency of 0.5 for maximum beta energies exceeding 0.5 MeV and to use a surface efficiency of 0.25 for beta energies between 0.15 and 0.4 MeV and for alpha emitters (ISO, 1988; NRC, 1997). 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. At TI, a surface efficiency of 0.25 will be used for alpha and beta emitters.

4.12.3 Minimum Detectable Count Rate and Minimum Detectable Concentration for Gamma 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 4-2.

Equation 4-2

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

Where:

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

The required rate of true positives will be 95 percent, and the false positives will be 60 percent. From Table 6.5 of the MARSSIM (NUREG-1575, 2000), the value of d′, representing this performance goal, is 1.38.

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 towed array will collect a 6-second stationary reading with each detector. Therefore, the observation interval is 6 seconds.

4.12.4 MDC for Gamma Scans of Surface Areas (2-inch by 2-inch NaI Probe)

The scan MDC (in pCi/g) for land areas is based on the area of elevated activity, depth of contamination, and the radionuclide (energy and yield of gamma emissions.) To establish the scan MDC, the relationship between the detector's net count rate to net exposure rate must be established first. This is accomplished by determining the MDCR and then applying a surveyor efficiency factor. The MDCR is calculated using Equation 4-2 with the following variables:

d' = 1.38
b_i = 5,500 cpm / (60 seconds per minute/6 second observation) = 550 counts per second
i = 6 second (see Section 4.11.3 above)

Therefore, MDCR equals 324 cpm.

To get the $MDCR_{Surveyor}$, a surveyor efficiency factor p is applied as shown below in Equation 4-3, obtained from Chapter 6 of MARSSIM:

Equation 4-3

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

The $MDCR_{Surveyor}$ can then be calculated assuming a surveyor efficiency (p) of 0.7 and the estimated background count rate of 5,500 cpm and assuming a 6-second scan observation interval as follows:

$$MDCR_{Surveyor} = \frac{MDCR}{\sqrt{p}} = \frac{324}{\sqrt{0.7}} = 387\,cpm$$

NOTE: The towed array collects static readings at a fixed distance (4 inches) from the surface, and a fixed spacing interval (1 foot). This reduces the probability of a surveyor error during performance of the surveys. Therefore, a surveyor efficiency factor of 0.7 is used in the above calculation.

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 ROC. 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 4-4, a dose rate can be calculated for a given count rate and vice versa.

Equation 4-4

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

Where:

$MDCR_{Surveyor}$ = 387 cpm (calculated in Equation 4-4)

cc = calibration constant = 4.55 x 10^{10} counts/R (average)

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

$MDER$ = 0.51 μR/hr

Next, the relationship between the radionuclide concentration and exposure rate is established. This is accomplished by modeling (using MicroShield™ software [Grove Engineering, 1996]) 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 of 10 centimeters (cm) (4 inches) above the soil
- The density of material in grams per cubic centimeter (g/cm^3)
- Derived concentration guideline level (DCGL) of the ROC in pCi/g
- The depth of detection for the DCGL
- The circular dimension of the cylindrical area of detector capability [square meters (m^2)]

The concentration of the ROC (Scan MDC) necessary to yield the MDER may be calculated by taking the ratio of the MDER to the exposure rate calculated by MicroShield (Grove Engineering, 1996) as shown in Equation 4-5, using the following input parameters:

- The dose point of 4 inches above the soil was used.
- The density of 1.6 g/cm^3 was used for soil.
- The ^{226}Ra concentration of 1.0 pCi/g was used.
- The depth of the area of elevated activity was 15 cm.
- The circular dimension of the cylindrical area of elevated activity was 0.25 m^2.

MicroShield Version 5.05 (Grove Engineering, 1996) calculates the exposure rate to be 0.7384 μR/hr for ^{226}Ra (which accounts for buildup). The radionuclide concentration of ^{226}Ra (scan MDC) necessary to yield the MDER calculated in Equation 4-4 (0.51 μR/hr) may be calculated by taking the ratio of the MDER to the exposure rate calculated by MicroShield.

Equation 4-5

$$Scan\ MDC\,(pCi/g) = \frac{DCGL\ pCi/g * MDER\,\mu R/hr}{Microshield\ Exposure\ Rate\,\mu R/hr} = 0.69\ pCi/g$$

Where:

DCGL = 1.0 pCi/g (from Table 3-1)

MDER = 0.51 µR/hr (from Equation 4-4)

MicroShield Exposure Rate = 0.7384 µR/hr

4.12.5 MDC for Static Gamma Measurements

For gamma surveys, MDC is calculated in cpm. Equation 4-6 is used to calculate the MDC.

Equation 4-6

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

Where:

3+4.65	=	constant factor provided in MARSSIM
R_B	=	background count rate (cpm)
T_B	=	background counting time (min)

The inputs observed in the reference area will be used in Equation 4-6 to calculate the MDC for the Ludlum Model 2350-1 or Model 4612 for ^{226}Ra.

4.12.6 MicroShield ™ Modeling Code Calculations for a 3.0 µCi Ra-226 Device

3.0 µCi is recognized throughout the industry as a nominal level for many types of radium containing devices.

Modeling (using MicroShield ™ Version 5.05) was used to determine the net exposure rate produced by a 3.0 µCi radium gauge at a depth of 12 inches below the soil surface.

The factors considered in the modeling included:

- The radium gauge dimensions were:
  - 3 inches in diameter
  - 0.5 inches thick
- ^{226}Ra and its daughters (^{214}Pb and ^{214}Bi) were assumed to be in equilibrium.

- The dose point of 4 inches above the soil was used.
- The density of 1.6 g/cm^3 was used for soil.
- The depth of the radium gauge was 12 inches below the soil surface.

The corresponding minimum detectable exposure rate was then determined for a 2" by 2" NaI(Tl).

Using Table 6.7 of MARSSIM the count rate to exposure rate for a 2" by 2" NaI(Tl) detector for ^{226}Ra is 760 cpm per μR/hr.

The modeling code performed the appropriate calculations and determined an exposure rate of 3.41 μR/hr for ^{226}Ra (which accounts for buildup).

A count rate due to the presence of a 3.0 μCi radium gauge 12 inches below the soil surface can then be calculated by the following:

$$\frac{760 \text{ cpm}}{\mu\text{R/hr}} x \ 3.41 \ \mu\text{R/hr} = 2591 \text{ cpm}$$

4.13 SURVEY IMPLEMENTATION

Radiological control procedures may be implemented to support remediation activities for the three areas to be excavated if radioactive material is found during the radiological screening process. These procedures are intended to protect the health and safety of project personnel and the general public, to comply with NRC license requirements under which the work is to be performed, and to comply with ALARA principles. The following subsections describe the survey procedures that may be performed during implementation of this RSAP.

4.13.1 Reference (Background) Areas

Prior to performing surveys in the three SWDAs an average background level will be determined by performing a minimum of 16 measurements at systematic or random locations within a designated background area. There is a possibility that more than one background reference area will be selected. The detector probe will be held approximately 10 cm (4 inches) from the surface area for gamma radiation. Instrumentation will be allowed to stabilize before background readings are taken. The average of the readings taken will determine the background for each energy emission. Background exposure rates will also be collected for reference data.

Site background reference areas will be chosen that have similar characteristics as the survey unit being evaluated. Background reference areas will be selected from non-impacted areas, but will not be limited to natural areas undisturbed by human activities. The reference areas selected should not be part of the survey unit being evaluated.

Some solid samples will need to be collected in the background area for comparative analyses of post-excavation sample analyses. The Site Geologist will record a description of the soil in the background area. Background soil will be compared to soil in the excavations to ensure that like material is being assessed. In the event that the soils differ significantly, another background location will be sought which has soil similar to that found in the excavation.

The same survey methodology and instruments used to collect the background data will be used to perform measurements within survey units. (Survey units are defined in Section 5.2.)

Data collected in the background 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 are consistent with a normal distribution and that the variability of the background is not too high.

4.13.2 Scan Surveys for Gamma Radiation (Towed Array)

Scan 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.

Soil scan surveys for gamma radiation will be performed using the towed array described in Section 4.8.4.

4.13.2.1 Scan Surveys for Gamma Radiation (Walkover)

Surface scan surveys for gamma radiation will be performed by traversing a path at a maximum speed (scan rate) of approximately 0.08 meter per second, while maintaining the detector approximately 10 cm (4 inches) above the area being surveyed.

4.13.2.2 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 count accumulation.

4.13.3 Swipe Sample Measurements

Swipe sampling may be performed to assess the presence of radioactive contamination that is readily removed from a surface. If required, swipe samples will be taken to evaluate the presence of alpha and beta/gamma surface activity.

4.13.4 Equipment and Material Surveys

Equipment and material surveys may be performed following the methods in Sections 4.11.2, 4.11.3, and 4.11.5. Table 4-3 provides acceptable levels of contamination based on the AEC

Regulatory Guide 1.86 limits (1974) . In the event that survey results indicate that levels of contamination exceed the limits listed in Table 4-3, appropriate decontamination methods may be performed to minimize waste. If decontamination methods are unsuccessful, the material will be disposed of as radioactive waste.

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.

4.13.5 Personnel Surveys

Properly trained staff may 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.

4.13.6 Soil Sampling

Soil samples will be collected for radiological analysis. Shaw personnel will collect the samples under the supervision of the NWT RCT. Subsequent sections of this plan and the site Sampling and Analysis Plan (Shaw 2006) describe the methods for collecting samples, sample numbering, sample labeling, sample shipment, and completion of the associated chain-of-custody and other required documentation. Soil samples will be analyzed by an on site mobile laboratory and an off site (samples collected at the final excavation depth of 4 feet bgs) laboratory by gamma spectroscopy analysis.

4.13.7 Air Sampling

If required, and as specified in the RWP (if required), airborne activity monitoring (continuous or grab samples) will be used 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, with concurrence from RASO, will be implemented if required to maintain airborne concentrations below 10 percent of the applicable derived airborne concentration (DAC) value for the ROCs (Table 3-3). At a minimum, air sampling for radionuclides will be performed upwind, downwind, and at the excavation location.

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.

4.14 SAMPLING PROTOCOL

In support of this RSAP, numerous soil samples will be collected to determine the radionuclide concentrations in the soil. Direct surface radiation measurements will be performed at each location before initiating sampling to identify any presence of gross contamination if the sampling area is not submerged. If elevated radiation levels are present, samples and equipment will be treated as radioactive and handled accordingly. Section 7.0 also discusses the various types and quantities of samples that will be collected during the performance of this work.

4.15 DECONTAMINATION PROCEDURES

If required, NWT SOPs will be used to decontaminate equipment and materials. Equipment or materials that cannot be easily or cost-effectively decontaminated will be evaluated for possible limited use in radioactive material use areas, or disposed of as radioactive waste. Decontamination water will be collected and sampled before being disposed of.

5.0 FINAL STATUS SURVEYS

The MARSSIM (DoD et al., 2000), the *Nonparametric Statistical Methodology for the Design and Analysis of the Final Status Decommissioning Survey Guide* (NUREG-1505; NRC, 1998), and the *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions Guide* (NUREG-1507; NRC, 1997) were used as guidance in designing and conducting the FSS.

5.1 OBJECTIVE OF THE FINAL STATUS SURVEY

MARSSIM (DoD et al., 2000), NUREG-1505 (NRC, 1998), and NUREG-1507 (NRC, 1997) were used as guidance documents in the design and conduct of this RSAP. The objective of the FSS is to demonstrate that residual radioactivity levels inside the excavated area meet the release criterion. In demonstrating that this objective is met, the null hypothesis (H_o) is tested for residual contamination that exceeds the release criterion; the alternative hypothesis (H_a) is then tested for residual contamination that meets the release criterion.

5.2 SURVEY AREA CLASSIFICATION

The classification of areas for the FSS is a critical step in the survey design process so that each site area receives adequate survey coverage. The working hypothesis of MARSSIM (DoD et al., 2000) is that all impacted areas being evaluated for release have a potential for radioactive contamination above the DCGL. MARSSIM sets forth three possible area classifications: Class 1, Class 2, and Class 3. Class 3, which has the least stringent survey requirements, will not be used at any of the Site 12 SWDAs. Class 1 and Class 2 criteria are described below.

Class 1 Areas: Areas that have, or had prior to remediation, a potential for radioactive contamination (based on site operational history) or known contamination (based on previous radiation surveys) above the release limits. Examples of Class 1 areas include:

- site areas previously subjected to remedial actions
- locations where leaks or spills are known (or suspected) to have occurred
- radioactive material storage areas
- areas with contaminants in discrete solid pieces of material or high specific activity

*Class 2 Area*s: Areas that have, or had prior to remediation, a potential for radioactive contamination or known contamination but are not expected to exceed the soil activity release limits provided in Table 3-1. To justify changing the classification from Class 1 to Class 2, there

should be measurement data that provides a high degree of confidence that no individual measurement would exceed the release limits. Other justifications for reclassifying an area, as Class 2 may be appropriate, based on site-specific considerations. Examples of areas that might be classified as Class 2 include:

- locations where radioactive materials were present in an unsealed form
- areas downwind from the main areas of concern (AOC)
- areas handling radioactive materials
- areas on the perimeter of former contamination control areas

Class 1 areas have the greatest potential for contamination and, therefore, receive the highest degree of survey effort, followed by Class 2 and then Class 3 areas.

Based upon process knowledge, and the operational history, the three SWDAs to be excavated will be classified as *Class 1* areas.

Survey units for Class 1 surveys are limited in size based on classification and site-specific conditions. MARSSIM (DoD et al., 2000) recommends areas for survey units according to the following:

Classification	**Suggested Area**
Class 1 Land Areas	up to 2,000 m^2 (21,527 ft^2)

The limitation on survey unit size ensures that each area is assigned an adequate number of data points.

5.3 SURVEY UNITS

The three individual SWDAs to be excavated will be divided into *Class 1* survey units. Each survey unit will undergo a one hundred percent scan survey for gamma radiation, before the initial one foot lift, and following each subsequent one foot lift until the target depth of 4 feet bgs is reached, or the presence of free standing water or saturated soils prevents the performance of the gamma scans, whichever occurs first. The concentrations of radioactive material in each of the survey units are not expected to vary significantly from one survey unit to the other. Although the size of each survey unit may vary, each will receive the same survey and sampling frequency coverage.

A minimum of 16 discrete surveillance points will be spaced using the square grid pattern in Equation 5-1, originating from a random start point during each one foot lift in each survey unit.

Table 5-1 presents a summary of the three SWDA survey units.

Table 5-1: Summary of Site 12 SWDA Survey Units

Area/Survey Unit	Survey Unit Size in m^2 / ft^2	MARSSIM Class	Number of Survey Units [1]	Number of Soil Samples	Length of Grid Pattern in m / ft
SWDA A&B	~ 1,942/ 20,900	1	20	16 per survey unit	11 / 36 See Note 2
SWDA 1207/1209	~ 1,712 / 18,428	1	10	16 per survey unit	10.3 / 34 See Note 2
SWDA 1231/1233	~ 1,416 / 15,237	1	10	16 per survey unit	9.4 / 31 See Note 2

[1] Each area's survey units are in one foot depth increments down to 4 feet bgs.
[2] Actual grid spacing intervals will be calculated in accordance with Sections 5.4 prior to performing the survey.
Abbreviations: ft = feet, ft^2 = square feet, m = meters, m^2 = square meters.

5.4 GRID SYSTEM

A reference coordinate system will be laid out for each survey unit. Shaw personnel will lay out the grid system under the guidance of the NWT RCT. A square grid system will be used for the excavated areas. The length, L, of a side of the square grid is determined by the total number of soil samples to be collected. 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 Equation 5-1 below that was obtained from MARSSIM:

Equation 5-1

$$L = \sqrt{\frac{A}{n}}$$

Where:

L = length of squares grids [meters (m) or feet (ft)]
A = surface area of the survey unit (m^2 or ft^2)
n = statistically calculated number of samples

5.5 DATA QUALITY OBJECTIVES

The DQO process is a series of planning steps for establishing criteria for data quality and survey design development. The level of planning is based on the complexity of the areas to be surveyed.

5.5.1 State the Problem

It must be determined if the site-specific release guideline has been met or if remediation is warranted. Therefore, the decision to be made can be stated as, "Do the survey results meet the soil RROs for the radionuclides of concern?"

It is anticipated that successful completion of activities described in this RSAP will provide sufficient data for the unrestricted release of the three SWDA areas to be excavated at Site 12 at NAVSTA TI. Resources available to provide the necessary data include the following:

- Activities outlined in this RSAP
- MARSSIM guidance (DOD et al., 2000) for ensuring statistically valid data
- The use of trained and experienced workers

5.5.2 Identify the Decision

The need to provide data for the unrestricted release of the three SWDA excavation areas in Site 12 requires performing radiological surveys and sampling as specified in this RSAP.

The primary uses of the data expected to result from completion of this RSAP is to provide information and statistical verification of data obtained to support the unrestricted release of the individual areas.

5.5.3 Inputs to the Decision

Radiological surveys required to support the unrestricted release of the three SWDA excavation areas in Site 12 will include:

- One hundred percent gamma scan surveys of each of the survey units at one foot increments in depth with 2-inch by 2-inch NaI detectors or equivalent. Results within 3 sigma of background levels are considered acceptable.
- One hundred percent gamma scan surveys of each of the survey units at the final excavation depth of 4 feet bgs (if soil conditions permit) with 2-inch by 2-inch NaI detectors or equivalent. Results within 3 sigma of background levels are considered acceptable.
- Systematic soil sampling of Class 1 survey units at one foot increments in depth. Results within the release criteria for soil contamination are considered acceptable.
- Systematic soil sampling of Class 1 survey units at the final excavation depth of 4 feet bgs. Results within the release criteria for soil contamination are considered acceptable.
- Laboratory data validation and statistical analysis of collected data.

5.5.4 Definition of Study Boundaries

The spatial boundaries for this FSS effort are confined to the areas to be excavated in the three SWDAs in Site 12. Each survey unit will be one hundred percent gamma scan surveyed. Solid samples will be collected at one foot increments in depth from systematic locations in each of the survey units.

5.5.5 Development of a Decision Rule

5.5.5.1 Release Limits

The release limits for this survey are listed in Table 3-1.

5.5.5.2 Alternative Actions

Readings greater than 3 sigma that of background or sample results that exceed the release limits will be further investigated to identify the extent of the contamination.

5.5.6 Limits on Decision Errors

Actions to minimize errors will be instituted during the data collection phase of the radiological survey. 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 the second phase where errors may arise. To avoid data errors for manual surveys, experienced personnel will record and transcribe data.

The ongoing on-site analyses and evaluation of survey results provides a final check for errors, which if detected, can be corrected.

A knowledgeable individual who is not involved in the direct data collection process (NWT Project Manager) will review the survey data on a daily basis. This will ensure an ongoing independent review for consistency of all survey data collected.

There are two types of decision errors that can be made when performing the statistical tests described in this plan. 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-β, 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 that area grids exceeding the release limits will be missed (Type I Error) and area grids meeting the release limits will be rejected as too high (Type II Error). The probability of either of these occurring will be set at a maximum of 5 percent.

In demonstrating that this 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.

5.5.7 Optimizing Data Collection

5.5.7.1 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 on-site NWT Project Manager will review the information each day to verify that equipment is operating satisfactorily.

A knowledgeable individual 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 all survey data collected.

5.5.7.2 Develop Data Collection Design Alternatives

The MARSSIM guidelines (DoD et al., 2000) will be used and a 95 percent confidence level for detecting radioactivity above the release levels will be assumed with Type I and Type II errors limited to 5 percent.

5.5.7.3 Data Collection Design Alternatives

The data collection design alternatives may change slightly if assumptions are revised based on conditions in the field being different than the furnished information derived from historical research and current knowledge of the areas.

5.5.7.4 Select Most Resource-effective Survey Design

As indicated above, the survey design specified for use in this RSAP was developed to perform radiological FSSs. Combined with the use of qualified and experienced personnel, this design is considered as both efficient and resource effective.

5.5.7.5 Document Operational Details and Theoretical Assumptions

Operational details for the radiological survey process have been developed for and are included as part of this RSAP. The theoretical assumptions are based on guidelines contained in MARSSIM (DOD et al., 2000). Specific assumptions regarding types of radiation measurements, instrument detection capabilities, quantities and locations of data to be collected, and investigation levels are contained in this RSAP.

5.6 NULL HYPOTHESIS

Using the MARSSIM methodology, the null hypothesis is stated as "the residual activity in the survey unit exceeds the release criteria" (Rev. 1, August 2000). Thus, in order to pass the survey unit (that is, release the area), the null hypothesis must be rejected. If necessary, the Wilcoxon Rank Sum Test will be used on the survey data to test the statistical null hypothesis.

5.7 STATISTICAL TESTS

Since the ROC is present in background and gross gamma measurements (and not radionuclide specific) are being performed as part of this Final Status Survey, Chapter 8, Subsection 8.2.3 of MARSSIM suggests use of the Wilcoxon Rank Sum Test to test the statistical null hypothesis instead of the Sign Test.

Non-parametric tests are useful when the requirements of the parametric test cannot be met. For example, if observations can only be measured on a categorical scale, the sample size maybe too small, or other distributional assumptions do not hold. In many situations a non-parametric test is the only option, since many do not have parametric equivalents.

Regulatory guidance, as identified in MARSSIM (DoD et al., 2000), recommends use of the WRS test to conservatively evaluate surveillance results that will be obtained from this survey.

5.7.1 Wilcoxon Rank Sum Test

The WRS test is designed to test a hypothesis about the location of a population distribution. It is most often used to test the hypothesis about a population median and often involves the use of matched pairs. For example, reference area and survey unit data are tested for a median difference of zero. This test is also a non-parametric test that may be used when it is only necessary, or possible, to know if observed differences between two conditions are significant. The WRS test is structured to denote change in magnitude, as opposed to any attempt at the quantitative measurement. This effect is further amplified when used with the “Unity Rule” presented in MARSSIM.

The WRS test is a two-sample test that compares the distribution of a set of measurements in a survey unit to that of a set of measurements in a reference area. The test is performed by first adding the value of the release limits to each measurement in the reference area. The combined

set of survey unit data and adjusted reference area data are listed, or ranked, in increasing numerical order. If the ranks of the adjusted reference site measurements are significantly higher than the ranks of the survey unit measurements, the survey unit demonstrates compliance with the release criterion. The advantage of this nonparametric test is that it does not assume the data are normally or log-normally distributed. The WRS test also allows for "less than" measurements to be present in the reference area and the survey units.

For this case, the release limit value is added to each of background reference area measurement results that were obtained in the background reference area to obtain the adjusted reference area measurement Z_i.

The *m* adjusted reference sample measurements, Z_i , from the reference area and the *n* sample measurements, Y_i, from the survey unit are pooled and ranked in order of increasing size from 1 to N, where N = *m*+*n*. For this case N=32.

If several measurements are tied *(i.e.*, have the same value), they are all assigned the average rank of that group of tied measurements.

If there are *t* "less than" values, they are all given the average of the ranks from 1 to *t*.

Therefore, they are all assigned the rank t(t+1)/(2t) = (t+1)/2, which is the average of the first *t* integers. If there is more than one detection limit, all observations below the largest detection limit should be treated as "less than" values.

The ranks of the adjusted measurements from the background reference area are then summed, W_r.

Since the sum of the first N integers is N(N+1)/2, one can equivalently sum the ranks of the measurements from the survey unit, W_s, and compute $W_r = N(N+1)/2 - W_s$.

Compare W_r with the critical value given in Table I.4 found in Appendix I of MARSSIM for the appropriate values of n, m, and α. If W_r is greater than the critical value, the hypothesis that the survey unit exceeds the release criterion is rejected.

If the test shows that the first group is larger than the second, then the release criteria is not met.

5.7.1.1 Determining the Numbers of Data Points for the WRS Test

Since the ROC is present in background, the MARSSIM guidelines will be used and a 95 percent confidence level for detecting radioactivity above the investigation level will be assumed. Using the Wilcoxon Rank Sum Test, a release limit of 1 pCi/g of ^{226}Ra, a LBGR value of 0.5 pCi/g (one half of the release limit value), and a Standard Deviation value of 0.3 pCi/g (conservative estimate of 30% of the release limit value) with a false negative (β) error rate of 5 percent, and a

false positive error (α) rate of 5 percent, the number of survey/sampling data points can then be calculated.

The initial step in determining the number of data points is to calculate the relative shift, Δ/σ = (Release Limit Value-LBGR)/σ, from the release limit value, the lower bound of the gray region (LBGR), and the standard deviation of the contaminant in the survey unit, σ. Values of the relative shift that are less than one will result in a large number of measurements needed to demonstrate compliance.

The calculated value of the relative shift is 1.67.

The corresponding value of P_r from Table 5.4 in Chapter 5 of MARSSIM is 0.871014.

The number of direct measurement sample data points (N/2) can then be obtained directly from Table 5.3 in Chapter 5 of MARSSIM. For α = 0.05, β = 0.05 and Δ/σ = 1.67, a value of 16 is obtained for N/2. The table value has already been increased by 20% to account for missing or unusable data and uncertainty in the calculated value of N/2.

The Critical Value is 308.

6.0 FIELD IMPLEMENTATION

This section describes the specific activities and procedures involved in preparation for, and field implementation of, the excavation of the areas in Site 12. It will include restoration of the disturbed areas to a stable, safe condition. The planned activities include:

6.1 EXCAVATION OF SOILS

6.1.1 Excavation Approach

The three SWDAs within Site 12 will be excavated in one foot lifts to a maximum depth of 4 feet bgs. Figures 2, 3, and 4 depict the areas that are to be excavated within each SWDA. A gamma scan survey over 100% of each of the areas will be performed after each one foot lift. The survey results will be transmitted to on-site managers in a timely manner so as to avoid delays in excavation of the SWDAs. Following the surface scan, systematic soil samples will be collected from each of the survey units and sent to an offsite laboratory for gamma spectroscopy analysis. The excavation schedule will not be delayed to await laboratory results.

6.1.2 Survey Lanes

Survey lanes will be setup for the towed array. The lanes will be three feet wide and set up over 100 % of the individual SWDAs in Site 12.

6.1.3 Initial Surface Scans

Initial surface scans for radiation will be performed prior to the initial excavation of one foot in each of the areas. A one hundred percent scan survey of each SWDA will be performed using the towed array with a Ludlum Model 4612 Counter and twelve Ludlum Model 44-10 NaI probes supported by GPS equipment. This survey will be completed and the results accepted prior to beginning initial excavation activities.

6.1.4 Subsequent Lift Surface Scans

Surface scans for radiation will be performed following the completion of each one foot lift being excavated in each of the SWDA areas. A one hundred percent scan survey of each SWDA area will be performed using the towed array with a Ludlum Model 4612 Counter and twelve Ludlum Model 44-10 NaI probes supported by GPS equipment. This survey will be completed and the results accepted prior to beginning each subsequent excavation lift. The final “as left” excavation (4 feet bgs) will also receive a 100% surface scan.

NOTE: If free standing liquid is encountered or the soils are saturated, gamma scan surveys cannot be performed in those areas due to shielding and density factors which will decrease the detectors' detection capability. If standing water covers only a portion of the survey unit, then the gamma survey lanes will be set up in unsaturated areas.

6.1.5 Areas Exceeding Investigation Level

Collected field data will be logged and survey points plotted on survey unit grid maps to document survey results. The GPS data will be used to directly tie the locations of any elevated radiation measurements to the corresponding grid coordinates, which will be established during the development of the systematic sampling plan. Data analysis will be performed as it is received, and questionable areas will be flagged in the field for resurvey/verification.

Locations where surface radiation levels appear to be greater than 3 sigma of the mean background level will be noted on a grid map. Hand-held equipment featuring NaI detectors will then be used to perform one-minute static readings and verify the elevated measurements. Areas confirmed as having radiation levels greater than the established 3 sigma of the mean background area level will be evaluated further for the presence of radioactive material and additional biased sampling points. If radioactive material is confirmed, the area will be physically marked and the radioactive material removed, as described in Section 6.1.7.

6.1.6 Soil Sampling

After NWT PM and RASO review of the associated towed array data following each one foot lift in the three SWDAs, a minimum of 16 systematic soil samples will be collected in each survey unit. The samples will be systematically collected based on a random start point and sample spacing utilizing Equation 5-7 from the MARSSIM (NUREG-1575), as shown in Section 5.4. Table 5-1 provides the spacing intervals for each of the three SWDAs. The samples will be analyzed by gamma spectroscopy using an on-site mobile laboratory. In addition, the samples collected the final excavation depth of 4 feet bgs will be sent to an offsite laboratory for gamma spectroscopy analysis, Method 901.1M, (DOE, 1997).

Surface (0-6 inches below present ground surface) samples will be collected from each sampling location using a new disposable plastic soil sampling scoop.

Approximately 200-300 grams of soil will be collected from each sample location. Samples will be prepared by removing vegetation, rocks, and foreign objects exceeding ¼ inch in diameter. The samples, once prepared, will be placed into an appropriate container. Collection methodology, chain of custody, and analysis requirements are detailed in NWT's Field Operation Procedures and the site SAP (Shaw, 2006).

6.1.7 Removal of Radioactive Material

If radioactive material is identified and confirmed during the gamma scan surveys, GPS coordinates will be recorded so the location can be marked and flagged. If the RCT observes a questionable reading during the field survey, the location will be immediately flagged for further inspection. The field survey team or the data group analyzing collected field information will notify the Shaw and NWT PM who will then inform RASO. Radiological support personnel under the supervision of an RCT will remove the radioactive material.

Typical removal actions will involve an area within a radius of 1 foot around the coordinates of the suspected radioactive material. Under RCT oversight, the location with an elevated radiation level will then be excavated using an excavator fitted with a smooth blade bucket and/or hand-digging tools. Soil removal will continue until the source of the elevated gamma activity is removed.

Following removal of the source of elevated gamma activity, an additional foot of soil in all directions from the source will also be removed and disposed of as radioactive waste. After the radioactive material and surrounding soil is excavated, the resulting pit will be resurveyed by the assigned RCT. If elevated gamma emitters persist, further examination of the soil will be made until the source of high gamma radiation is found and removed.

If the source of elevated radioactivity cannot be readily identified as a point source and removed, the material will be segregated for disposal. All soil removed from a location due to elevated radioactivity will be placed in a separate stockpile at TI Site 6, where it will be covered and held until proper disposal has been arranged. If the radioactive material is a point source, it will be given a unique identification number and recorded in a logbook. Radioactive point sources will be placed in plastic bags (if feasible) and stored in a designated and posted radioactive material storage area for subsequent packaging and disposal by a certified waste broker under the direction of the Navy LLRW Disposal Program.

Discovery of radioactive material exceeding the release limits may trigger an upgrade to Class 1 survey of that SWDA. In that event, all work at the SWDA will cease until modification to this RSAP and the Excavation Plan are completed prior to proceeding with further work. Work in other, unaffected, SWDAs will continue uninterrupted.

6.2 DEMOBILIZATION

Upon completion and acceptance of the work in each of the SWDA excavation areas. Associated radiological survey and supporting equipment will be removed from the area(s). Acceptance of the work shall include scan survey results and final confirmatory sampling data.

7.0 QUALITY ASSURANCE

7.1 PROJECT AND PERSONNEL REQUIREMENTS

NWT personnel training requirements and inspection programs are described below.

7.1.1 Personnel Training/Certification Requirements

Project personnel training/certification requirements are as follows:

- OSHA 40-hour Hazardous Waste Operations and Emergency Response and annual 8-hour refresher training
- Radiation awareness training (if required)
- RWP and Task-specific Plan training for the specific site or task (if required)
- AHA training for the specific task
- SHSP training, as required

All project personnel will be trained according to Shaw's compliance policies and procedures, including Shaw's or NWT's Radiological Protection Program, or equivalent, if necessary. NWT's personnel records will be verified prior to beginning project activities.

Project-specific training/certification records will be kept on site until project completion. At project completion, the records will be filed within the project files.

7.2 EQUIPMENT

The instruments and systems will be calibrated on an annual frequency using the manufacturers' calibration protocol to National Institute of Standards and Technology (NIST) traceable sources.

The survey instruments will be source checked each day prior to the start of the survey activities each day to verify proper operation of detectors and detection systems.

7.2.1 Records And Reports

The Project Manager is responsible for reviewing data for accuracy and completeness before on-site activities are concluded. Electronic records may be substituted, provided appropriate access authorization procedures are in place and quality assurance requirements are met.

All data, notes, measurements, calibrations, and other information pertinent to a survey site must be recorded and maintained. Records must conform to the following basic requirements:

- Marked with date of entry.
- Signed or initialed (by hand or electronically) by the author of the entry.
- Written or printed in a legible manner.
- Contain all pertinent information in a concise, accurate entry.

Column headings or requested information on record data forms may be inappropriate or incorrect for specific site situations. If so, appropriate handwritten changes must be made on the forms. When certain information requested on the presented form is not required, the space or columns should be crossed through or marked "NA" (not applicable) as an indication that such information was not required, rather than having possibly been forgotten.

If data corrections are necessary a single line will be drawn through the entry. New data, initials of the surveyor, and date of correction will be recorded. Data will not be obliterated by erasing or with the use of white-out.

All training records and accident investigation documents will be maintained. The training records will include brief biographies (resumes) certifications, or documents that demonstrate the qualifications of the personnel performing the work.

The Final Status Survey Report will contain records and information necessary to document and support the Final Status Survey effort. All generated records for the project shall be maintained in the on-site office. Records that must be controlled and maintained during the project and presented in the Final Status Survey Report, in addition to site activities include but are not limited to:

- Description of survey design;
- ALARA evaluation/discussion;
- Instrument calibration data;
- Description of area to be released and its radiological use and history;
- Daily instrument performance check data;
- Instrument efficiency determination data;
- Survey records;

- Dates surveys were performed;
- Survey results and data;
- Description of instrumentation used;
- Instrumentation MDC calculations;
- Smear sample location records;
- Identification of release limits used;
- Sample analysis results;
- Survey maps;
- Quality control data;
- Comparison of survey results to release limits;

Listed records will be maintained on site during project activities. All listed records will be transmitted with the final project report and will be maintained at the NWT corporate office in Livermore, CA.

8.0 REFERENCES

Atomic Energy Commission. 1974. *Regulatory Guide 1.86*. Termination of Operating Licenses for Nuclear Reactors. June.

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New World Technology, Inc. (NWT). 2004. New World Technology Analytical Procedure. *"Soil, Solid And Liquid Gamma Radioactivity Determination Using HpGe Gamma Spectroscopy"*.

Nuclear Regulatory Commission (NRC). 1997. *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions Guide*. NUREG-1507, U.S. Nuclear Regulatory Commission: Washington, D.C.

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Shaw Environmental, Inc. (Shaw). 2006. *Internal Draft Construction Work Plan, Site 12 Final Remedy Removal Action, Treasure Island San Francisco, California*. November, 2006.

U.S. Department of Defense (DOD), Department of Energy (DOE), Nuclear Regulatory Commission (NRC), and U.S. Environmental Protection Agency (EPA). 2000. *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) *NUREG-1575*. August, 2000.

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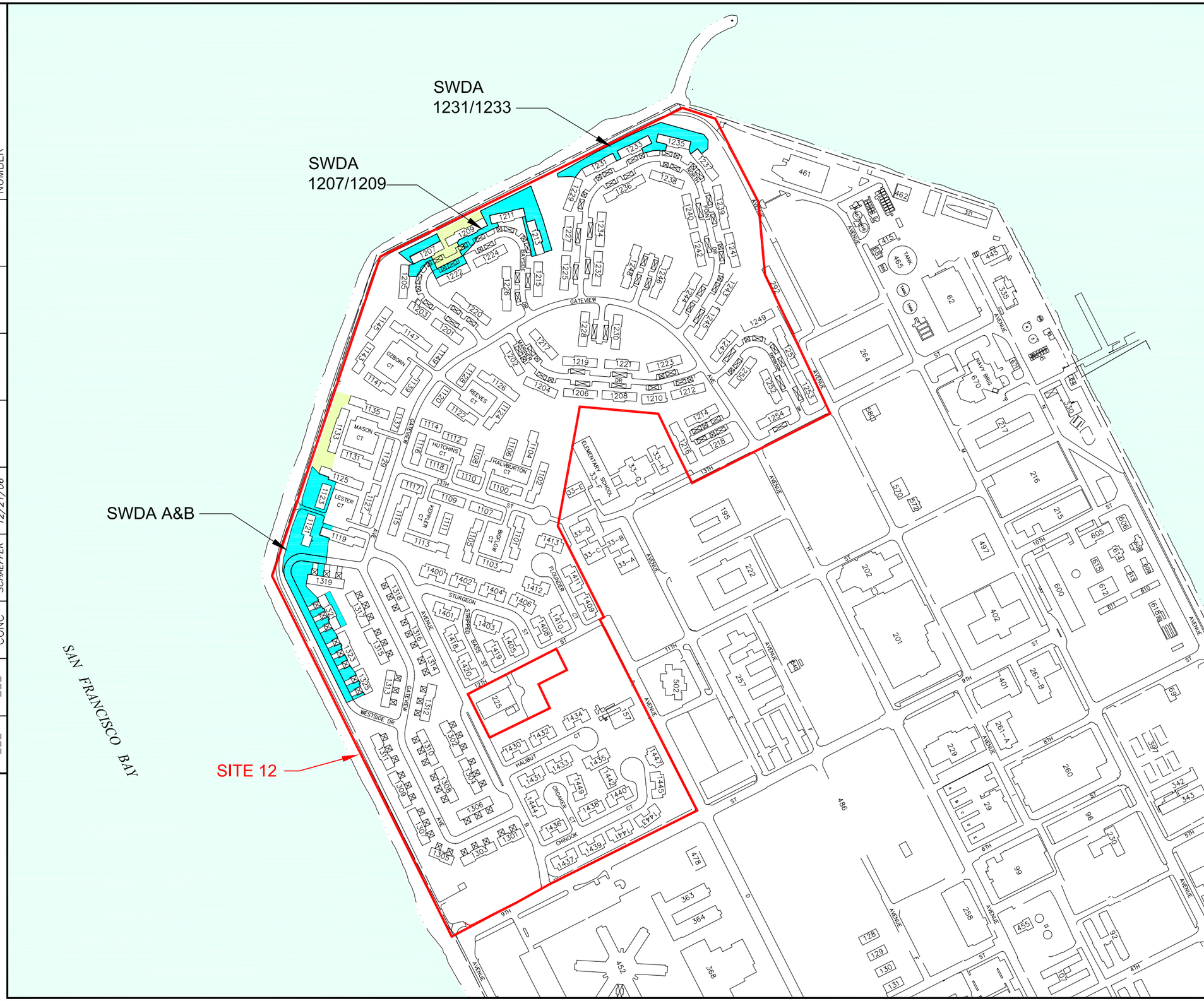
U.S. Environmental Protection Agency (EPA). 2000. *Radionuclides Notice of Data Availability Technical Support Document*. Targeting and Analysis Branch, Standards and Risk Management Division, Office of Groundwater and Drinking Water, EPA. March.

Weston Solutions, Inc. (Weston). 2006. *Final Treasure Island Naval Station Historical Radiological Assessment.* February, 2006.

Figures



LEGEND:

- SITE 12 SOLID WASTE DISPOSAL AREAS
- PREVIOUSLY EXCAVATED AREAS
- SITE 12 BOUNDARY

NOTE:
MAP BASED ON ENGINEERING EVALUATION/COST ANALYSIS FOR SITE 12, SulTech, 2006.

N

SCALE
0 400 800 FEET

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SAN DIEGO, CALIFORNIA

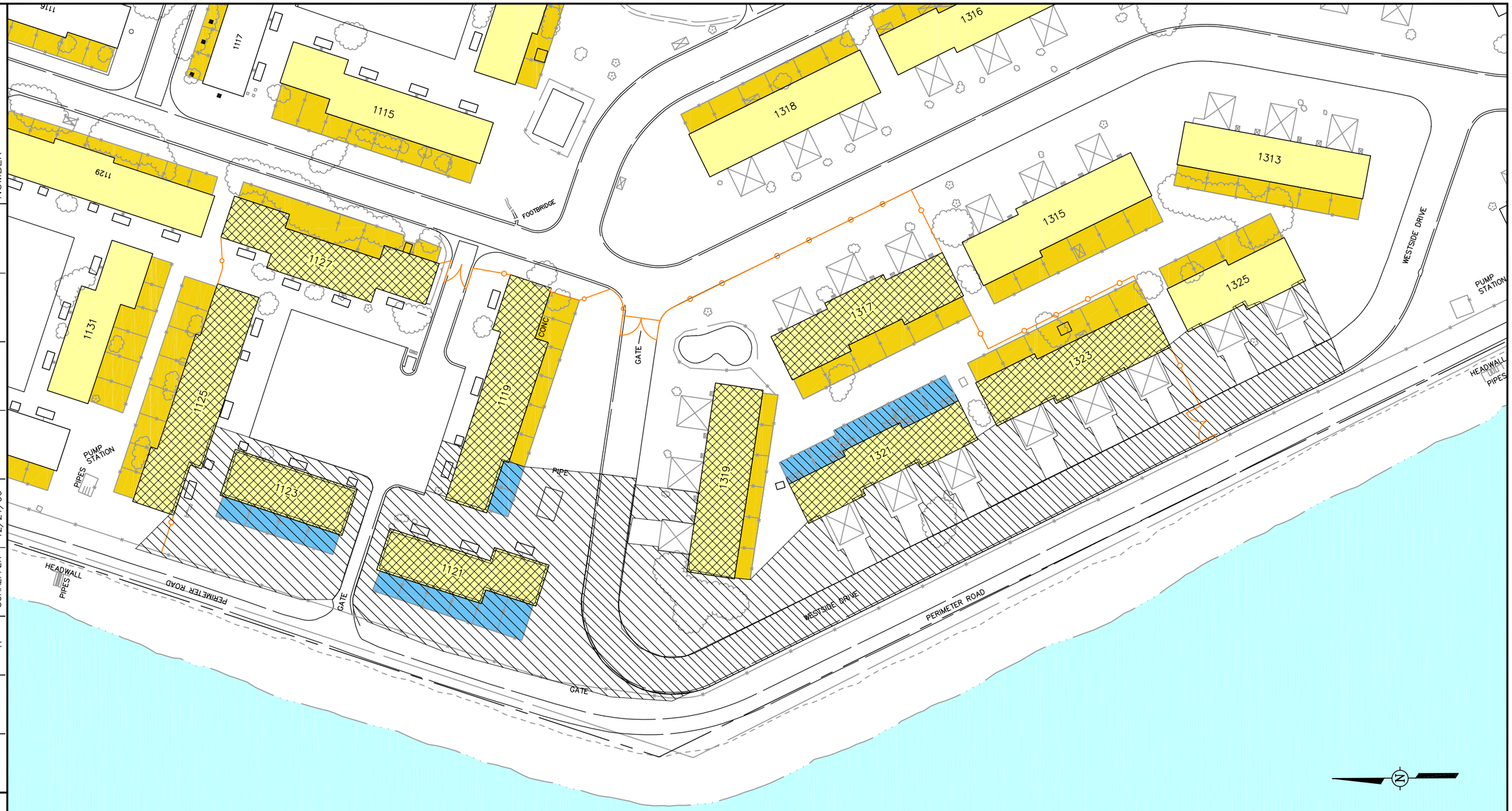
FIGURE 1

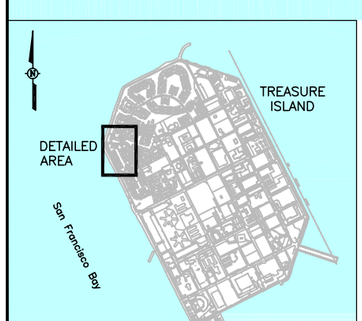
SITE 12 MAP

NAVAL STATION TREASURE ISLAND

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
122412-B18			SCHAEFFER 12/21/06	CONC	---	---

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
122412-B19			SCHAEFFER 12/21/06	TI	---	---





LEGEND:

- SOLID WASTE DISPOSAL AREAS (BACKYARDS AND COMMON AREAS THAT ARE INCLUDED IN EECA) TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- BACKYARDS
- CURRENT SWDA FENCE CONFIGURATION
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK
- CARPORT
- TREES, SHRUBS

SCALE

0 80 160 FEET

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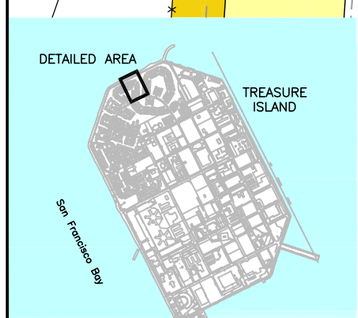
FIGURE 2

SWDA A & B EXCAVATION AREAS
INSTALLATION RESTORATION SITE 12
NAVAL STATION TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	TI	SCHAEFFER 12/21/06			122412-B20



LEGEND:

- SOLID WASTE DISPOSAL AREAS (BACKYARDS AND COMMON AREAS THAT ARE INCLUDED IN EECA) TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- PREVIOUSLY EXCAVATED
- BACKYARDS
- CURRENT SWDA FENCE CONFIGURATION
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK
- CARPORT
- TREES, SHRUBS

SCALE

0 50 100 FEET

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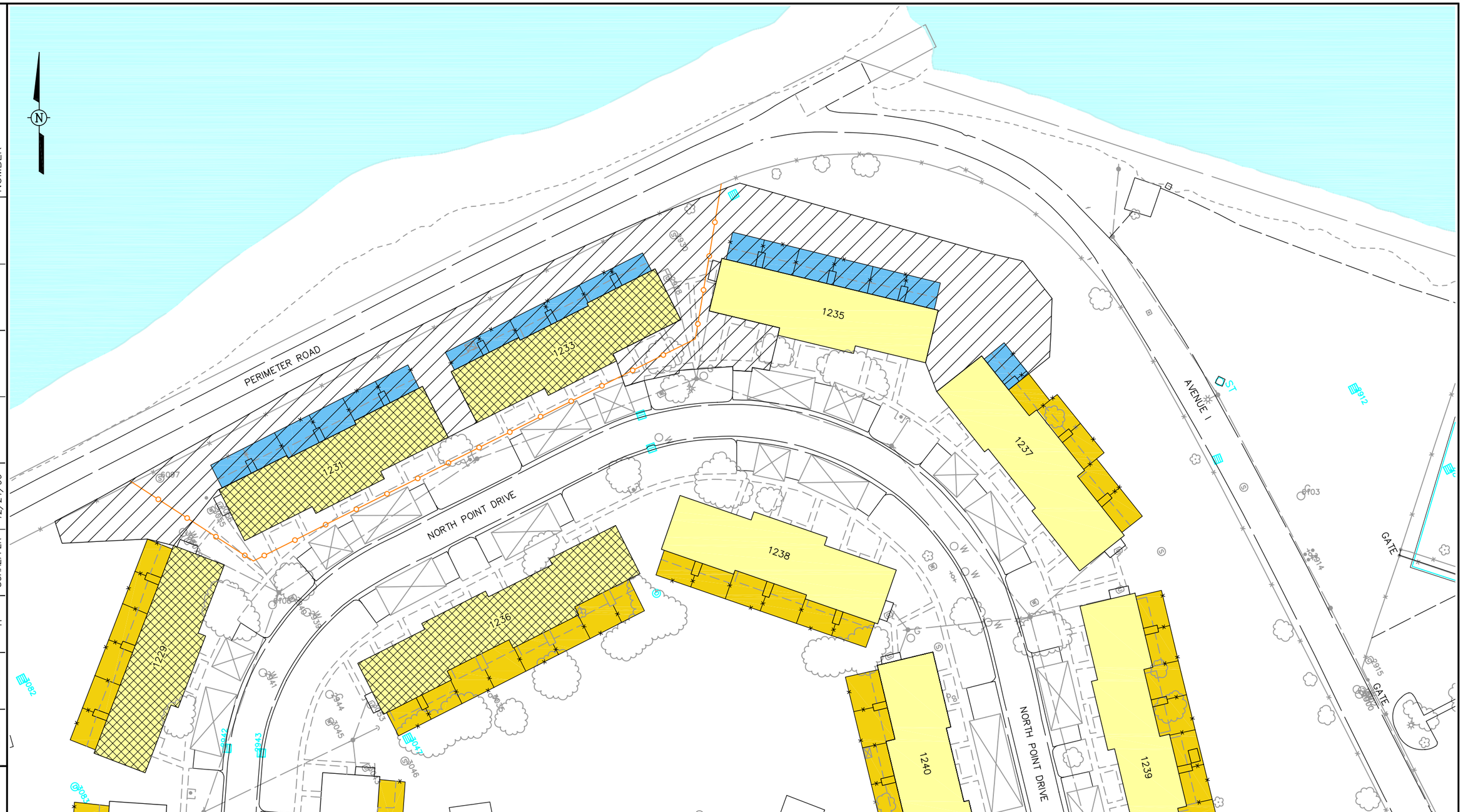
FIGURE 3
SWDA 1207/1209 EXCAVATION AREAS
INSTALLATION RESTORATION SITE 12

NAVAL STATION TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	TI	SCHAEFFER 12/21/06			122412-B21



LEGEND:

- SOLID WASTE DISPOSAL AREAS (BACKYARDS AND COMMON AREAS THAT ARE INCLUDED IN EECA) TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- BACKYARDS
- CURRENT SWDA FENCE CONFIGURATION
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK
- CARPORT
- TREES, SHRUBS

SCALE

0 60 120 FEET

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SAN DIEGO, CALIFORNIA

FIGURE 4
SWDA 1231/1233 EXCAVATION AREAS
INSTALLATION RESTORATION SITE 12

NAVAL STATION TREASURE ISLAND

Figure 5

Controlling Agency Contact Information

1. **United States Nuclear Regulatory Commission Region IV**
   Attention: Director, Division of Nuclear Material Safety
   611 Ryan Plaza Drive, Suite 400
   Arlington, Texas 76011
   Phone: (817) 860-8221 Fax: (817) 860-8263

2. **United States Environmental Protection Agency Region 9**
   75 Hawthorne St., SFD-8-1
   San Francisco, CA 94105-3901
   Attn: Christine Katin
   Phone: (415) 972-3112 Fax: (415) 947-3520

3. **State of California**
   Department of Health Services
   Radiologic Health Branch
   P.O. Box 942732
   Sacramento, CA 94235-7320

4. **State of California,**
   Department of Health Services
   California Environmental Management Branch
   P.O. Box 997413 Mail Station 7405
   Sacramento, CA 95899-7413
   Attn: Diedre Dement
   Phone: (916) 449-5675

5. **State of California**
   Department of Health Services
   Department of Toxic Substances Control
   700 Heinz Ave., Suite 200
   Berkeley, CA 94710
   Attn: Henry Wong
   Phone: (510) 540-3770 Fax: (510) 849-5285

6. **U.S. Department of the Navy**
   Southwest Division
   Naval Facilities Engineering Command
   1220 Pacific Highway
   San Diego, California 92132-5187
   Phone: (619) 532-2540 Fax: (619) 532-2607

7. **U.S. Department of the Navy**
BRAC RPM
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310
Phone: (619) 532-0936 Fax: (619) 532-0983
Attn: James Whitcomb

8. **U.S. Department of the Navy**
ROICC SF Bay Area
2450 Saratoga St., Suite 200
Alameda, CA 94501-7545

Figure 6

Project Controlling Documents

1. New World Technology, NRC License #04-27745-01
2. Treasure Island Naval Station, Site 12 Final Remedy Removal Action Work Plan
3. New World Technology, Field Operations Procedures
4. New World Technology, Technical Procedures
5. Code of Federal Regulations, 10 CFR, 29 CFR and 40 CFR.
6. California Code of Regulations, Title 17.

Attachment 1

New World Technology

OPERATING PROCEDURE

TM-001-01-20

Operation of Contamination Survey Meters

Prepared by:

New World Technology
448 Commerce Way
Livermore, CA 94551

Controlled Copy No. _____

TM-001-01-20

New World Technology

Technical Manual

OPERATION OF CONTAMINATION SURVEY METERS

New World Technology
448 Commerce Way
Livermore, CA 94551

New World Technology

APPROVAL PAGE

Procedure Number/Name: **TM-001-01-20**, **Operation of Contamination Survey Meters,** has been reviewed and approved by the following:

APPROVAL SIGNATURES:

_____ _____
William G. Haney, Vice President, Operations Date

_____ _____
Doc Dennis, Radiation Safety Officer Date

_____ _____
Donald Wadsworth, President Date

Section **Title**

1.0 **Scope**

2.0 **Definitions and Precautions**

3.0 **References**

4.0 **Precautions, Limitations, Equipment**

5.0 **Responsibilities**

6.0 **Procedure**

7.0 **Records**

1.0 SCOPE

1.1 This procedure provides the methods for operating alpha/beta survey meters when performing contamination surveys. Adherence to this procedure will provide reasonable assurance that the surveys performed have reproducible results.

1.2 This procedure will be used by NWT personnel and subcontractors on projects to measure fixed and removable alpha and/or beta emitting radioactive material on facility surfaces, equipment, waste packages, personnel and personnel protective clothing.

2.0 DEFINITIONS AND PRECAUTIONS

2.1 Definitions

2.1.1 **Restricted Area** - An area containing radioactive materials to which access is controlled to protect individuals from exposure to ionizing radiation.

2.1.2 **Alpha/Beta Contamination Survey** - A survey technique to determine fixed plus removable alpha/beta contamination.

2.1.3 **Acceptance Range** - A range of values that describe an acceptable daily instrument source check result.

2.2 Precautions

2.2.1 Technicians will ensure that the thin Mylar or mica window on the probe face is protected from punctures during survey operations.

2.2.2 Check sources will be controlled at all times, to prevent accidental loss or release of radioactive materials.

2.2.3 If any instrument inconsistencies are observed (e.g., unusually high or low background counts, source checks outside the acceptable range, etc.), remove the instrument from use, label it "OUT OF SERVICE" and report the condition to the site supervisor.

2.2.4 A battery check, general observation of instrument condition and source check shall be performed each day before instrument use and daily, following work activities, as a final verification.

Survey instrument calibrations shall be performed by an approved NRC or Agreement State calibration facility with NIST traceable sources.

2.3 Quality Control

2.3.1 Contamination survey meters will be checked prior to each shift or daily with an alpha or beta check source as applicable to ensure the instrument is operating within the calibrated specifications.

Contamination survey meters will have current/valid calibration documentation attached to the meter or in the storage case.

3.0 REFERENCES

3.1 FM-020-01-20, Radiation and Contamination Surveys Techniques

3.2 ANSI N323-1978, Radiation Protection Instrumentation Test and Calibration

3.2 NUREG/1575, MARSSIM, Multi Agency Radiation Survey and Site Investigation Manual

4.0 PRECAUTIONS, LIMITATIONS, EQUIPMENT

4.1 Precautions

4.1.1 The Ludlum Model 43-89 scintillation detectors are not guaranteed light tight when outside of their protective casing.

4.1.2 When using this instrument in a known, or suspected contaminated area, seal the instrument in a protective media (i.e., plastic, poly) to prevent contamination of the instrument.

4.2 Limitations

4.2.1 The proper operation of the Ludlum Model 3's or equivalent depends strongly on the condition of the batteries in the survey meter it is being used with. Therefore, the battery check should be performed before each use and periodically during use to ensure proper operation.

4.2.2. Calibration shall be performed annually, after maintenance is performed, if the instrument fails the performance test or if proper operation is in question.

4.2.3 A daily performance test is required when this instrument is in use.

4.3 Equipment

4.3.1 For Alpha Surveys Ludlum Model 43-5 probe and Ludlum Model 3 Survey Meter or equivalent meter/probe combination.

4.3.2 For Beta Surveys Ludlum Model 44-9 Probe and Ludlum Model 3 Survey Meter or equivalent meter/probe combination.

5.0 RESPONSIBILITIES

5.1 NWT Radiological Field Operations Manager (Project Manager) is responsible for:

5.1.1 Implement this procedure.

5.1.2 Periodically review adherence to the requirements of this procedure.

5.1.3 Ensuring Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

5.1.4 Ensuring a copy of this procedure is available at the job site and that field technicians follow this procedure.

5.2 Health Physics Supervisors are responsible for:

5.3.1 Assignment of Health Physics Technicians performing this procedure.

5.3.2 Review and approval of documentation generated by the use of this procedure.

5.3 Health Physics Technicians are responsible for:

5.3.1 Performance of the requirements of this procedure.

5.3.2 Adherence to other procedures referenced.

5.3.3 Documentation of all work performed under this procedure.

6.0 PROCEDURE

6.1 Initial Preparations

6.1.1 Select the contamination survey meter and probe to be used in the survey and verify that the instrument is complete, has a valid calibration and that it has no visible damage or defects.

6.1.2 Turn the instrument selector switch to BATTERY TEST position and verify meter indication falls within the shaded region of the dial indicating the batteries have proper voltage to operate the instrument. Replace the "D" cell batteries if the indication is below the shaded region.

6.1.3 Turn the instrument selector switch to the X 0.1 position and let the instrument warm up for one minute.

6.1.4 Switch the audio toggle switch to "ON" and the response toggle switch to "FAST".

6.1.5 Check alpha detectors for light leaks (scintillation detectors only) by pointing the sensitive area on the detector toward a light source and observe the meter indication and listen for an increase of audible clicks on the speaker. If the meter indication or the audible clicks are above 10 counts per minute (CPM) contact the supervisor.

6.1.6 Check instrument response by placing probe over the check source and observing the meter indication. Record the meter indication on NWT Form 003 Daily Instrument Performance Test Log Sheet, and determine if indication is within stated values. If indication is not within stated values contact supervisor for instructions.

6.1.7 If the acceptable range for source checks hasn't already been calculated then follow the instructions below:

- Ensure the source and the detector are in documented reproducible positions, which will be used each time this check is performed.

- Use the check source in a low background area to obtain a measurement (allow the meter to stabilize approximately 60 seconds) in net CPM.

- Multiply the measured net CPM value by 0.8 and 1.2 and record the values as the acceptable range on NWT Form 003.

6.2 Contamination Survey Techniques

CAUTION:

The window area of alpha detectors is covered with a very thin (1 mg/cm^2) aluminized Mylar window and beta detector windows are 1.7 mg/cm^2 mica. Either window can be easily punctured; avoid surveying areas which have protruding fragments that might puncture the detector face. Remove these fragments before performing surveys. Be sensitive to the fact that any area you cannot see can contain something that will break the detector.

NOTE: Although beta particles travel several feet in air, the detection efficiency is calibrated with the detector probe held 1/2 inch or less from the calibration source. Therefore, the detector must be held at 1/2 inch or less from the survey surface to maintain calibrated detection efficiency. Alpha particles travel only a few centimeters in air. The detector must be held within 1/4 inch or less of the survey surface to detect alpha particles.

NOTE: Touching the surface with the detector may contaminate the detector - avoid contact with the surface to be surveyed.

6.2.1 Verify the instrument selector switch is in the X 0.1 position.

6.2.2 For a stationary reading, place the detector over the area to be measured and allow meter to stabilize. Record the average meter indication in either CPM α/PA (probe area) or CPM β/PA (probe area) as applicable on the forms provided in procedure FM-020-01-20.

6.2.3 For a scan survey move the detector slowly over the surface (less than one detector width per second). Observe meter indication and listen for increases in audible clicks from the speaker. If increased readings are observed, return to the area and obtain a stationary reading. Record maximum area meter indication in either CPM α/PA or CPM β/PA as applicable on the forms provided in procedure FM-020-01-20.

6.3 Interpretation of Results

The meter reading on the alpha and beta survey meters must be corrected for detector efficiency and detector surface area before comparing results with site specific contamination limits. The conversion from CPM α or β/PA (Probe Area) to DPM α or β/100 cm^2 is performed using the following equation.

$$(DPM/100cm^2) = \frac{\text{Gross CPM - Background CPM}}{\varepsilon_i * \varepsilon_s * \frac{W_A}{100}}$$

Where: ε_ι = Instrument Efficiency expressed as a decimal

ε_s = Surface Efficiency Factor

W_A =Physical Size of Detector Window in cm^2

In the absence of experimentally determined surface efficiencies, ISO-7503-1 and NUREG 1507, provide conservative recommendations for surface efficiencies. ISO-7503-1, recommends a surface efficiency of 0.5 for maximum beta energies exceeding 0.5 MeV, and to use a surface efficiency of 0.25 for beta energies between 0.15 and 0.4 MeV and for alpha emitters. NUREG-1507 provides surface efficiencies based on studies performed primarily at ORISE. In general, NUREG-1507 indicates that the ISO rule-of-thumb for surface efficiencies are conservative, particularly for beta-emitting radionuclides with end-point energies between 0.25 MeV and 0.4 MeV.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 NWTF-003, Daily Instrument Performance Test Log Sheet

8.0 FORMS

8.1 Forms

8.1.1 NWTF-003, Daily Instrument Performance Test Log Sheet

8.2 Exhibits

8.2.1 Daily Performance Test Check Sticker

8.2.2 Calibration Data Sticker

EXHIBIT 8.2.1
Daily Instrument Source Check Sticker

New World Technology
Daily Instrument Source Check

Instrument Serial Number	
Probe Serial Number	
Calibration Date	

Month *(Circle One)*											*Technician Initial & Date*
J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**

1	**2**	**3**	**4**	**5**	**6**	**7**
8	**9**	**10**	**11**	**12**	**13**	**14**
15	**16**	**17**	**18**	**19**	**20**	**21**
22	**23**	**24**	**25**	**26**	**27**	**28**
29	**30**	**31**				

EXHIBIT 8.2.2
Daily Instrument Source Check Sticker

Survey Meter Calibration

Model _____ **Serial No.** _____

***Range within 10% unless noted**

x _____ ☐ * _____

x _____ ☐ * _____

x _____ ☐ * _____

x _____ ☐ * _____

x _____ ☐ * _____

Ded. Ck. Source S/N _____

Act. _____ **Reads**

Cal. Date _____ **Due Date** _____

Calibrated by _____

LUDLUM MEASUREMENTS, INC.

Sweetwater, Texas (915) 235-5494

New World Technology

OPERATING PROCEDURE

FM-006-01-20

Decontamination of Equipment, Materials and Tools

Prepared by:

New World Technology
448 Commerce Way
Livermore, CA 94551

Controlled Copy No. _____

FM-006-01-20

New World Technology

Field Operations Procedure

DECONTAMINATION OF EQUIPMENT, MATERIALS AND TOOLS

New World Technology
448 Commerce Way
Livermore, CA 94551

New World Technology

APPROVAL PAGE

Procedure Number/Title: **FM-006-01-20, Decontamination of Equipment, Materials and Tools,** has been reviewed and approved by the following:

APPROVAL SIGNATURES:

_____ _____

William G. Haney, Vice President, Operations Date

_____ _____

Doc Dennis, Radiation Safety Officer Date

_____ _____

Donald Wadsworth, President Date

Section	Title
1.0	Scope
2.0	Purpose
3.0	References and Definitions
4.0	Precautions, Limitations
5.0	Responsibilities
6.0	Procedure
7.0	Records
8.0	Forms and Exhibits

1.0 SCOPE

This procedure establishes the procedural requirements for the decontamination of equipment, material, and tools, used on NWT projects, contaminated with radioactive material.

2.0 PURPOSE

The purpose of this procedure is to provide a instruction for the decontamination of equipment, material, and tools. Each decontamination operation is unique; thus, this procedure provides general, effective decontamination techniques and guidelines to be utilized by NWT field personnel. This document applies to all NWT personnel involved in the decontamination process.

3.0 REFERENCES AND DEFINITIONS

3.1 References

3.1.1 FM-020-01-20, Radiation and Contamination Survey Techniques

3.1.2 NRC's "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Materials (NRC 1993), Office of Nuclear Material Safety and Safeguards (NMSS)."

3.1.3 FM-021-01-20, Radiological Area Posting and Access Control

3.1.4 New World Technology Respiratory Protection Program

3.1.5 FM-003-01-20, Release of Material from Radiologically Controlled Areas

3.1.6 FM-004-01-20, Issue and Use of Radiation Work Permits

3.1.7 FM-005-01-20, Radioactive Material and Source Control

3.2 Definitions

3.2.1 **Decontamination** - The processes whereby contamination can be safely and effectively removed from equipment, tools and materials, to levels required by Reference 3.1.2.

3.2.2 **Herculite** - A plastic or polyethylene floor covering used for decontamination operations. HERCULITE is a brand name.

3.2.3 **M.S.D.S**. - Material Safety Data Sheet; Manufacturer directions, safety information and limitations for use of decontamination related solvents or cleaning solutions.

3.2.4 **Radiation Work Permit (RWP)** - A document generated by Health Physics to provide:

3.2.4.1 A description and scope of the work to be performed.

3.2.4.2 The existing radiological conditions in the work area.

3.2.4.3 The limitations placed upon the scope of work.

3.2.4.4 The maximum radiological limits allowed.

3.2.4.5 The protective measures to be employed during the work to protect the worker(s).

3.2.4.6 The period of time the RWP is valid.

3.2.4.7 Special instructions to workers and Health Physics Technicians during the course of work.

3.2.5 **Shall** - The word "shall" as used in this procedure is to be understood as denoting a mandatory requirement.

3.2.6 **Should** - The word "should" as used in this procedure is to be understood as denoting a recommendation that is a sound safety practice; it does not denote a mandatory requirement, however, is normally done unless job conditions require other actions.

4.0 PRECAUTIONS, LIMITATIONS

4.1 Precautions

4.1.1 All decontamination of contaminated tools or equipment shall be performed in accordance with the direction of the Health Physics Technician providing the job

coverage in accordance with this Procedure, and the RWP requirements.

4.1.2 Decontamination activities shall be performed within a controlled area established in accordance with the provisions of Reference 3.1.3.

4.1.3 Controls to contain the spread of loose contamination during the decontamination activity shall be determined prior to the decontamination of equipment, material, and tools.

4.2 Limitations

4.2.1 Protective clothing worn by the personnel involved in decontamination activities shall be determined according to the RWP.

4.2.2 Decontamination cleaning solvents/solutions shall only be used in accordance with the directions and limitations listed on the manufacturer supplied MSDS. Decontamination solutions/solvents shall be approved by the Project Manager prior to use. Solvents/solutions requiring a ph adjustment shall be modified prior to use.

4.2.3 Respiratory protection devices required by the RWP for decontamination operations shall be selected and used in accordance with the provisions of Reference 3.1.4.

4.2.4 A pre-job briefing shall be held to instruct Decontamination Technicians of the conditions of the RWP. All personnel performing work in the decontamination area shall sign the RWP prior to work.

4.2.5 Every effort will be made by NWT personnel to avoid re-contamination of decontaminated materials. Contamination controls shall always be observed throughout a decontamination operation.

4.2.6 Radiation and contamination surveys shall be performed in accordance with the provisions of Reference 3.1.1.

4.2.7 Release of equipment, materials, and tools from the decontamination area shall be performed in accordance with the provisions of Reference 3.1.5.

5.0 RESPONSIBILITIES

5.1. NWT Radiological Field Operations Manager

5.1.1. Implementation of this procedure.

5.1.2 Periodic reviews of the adherence of personnel to the requirements of this procedure.

5.1.3 Ensures the health Physics Technicians are qualified by knowledge, training and experience to perform the requirements of this procedure.

5.2 Health Physics Supervisor/Evaluator

5.2.1 The Health Physics Supervisor shall perform periodic surveillance of the decontamination operation and ensure adherence to applicable procedures.

5.2.2 The Health physics Supervisor shall write the RWP in accordance with the provisions of Reference 3.1.6.

5.2.3 The Health Physics Supervisor shall assign job coverage assignments to Health Physics Technicians.

5.2.4 The Health Physics Supervisor shall assure that the RWP is up-to-date prior to decontamination activities.

5.2.5 The Health Physics Supervisor or designee shall conduct the decontamination operation pre-job briefings.

5.2.6 The Health Physics Evaluator shall provide release evaluations of decontaminated materials in accordance with the provisions of Reference 3.1.5.

5.3 Health Physics Technician

5.3.1 The Health Physics Technician shall provide constant or intermittent job coverage as required by the RWP.

5.3.2 Prior to the start of decontamination operations, the Health Physics Technician shall assure that the area where decontamination is to be performed is properly established in accordance with Reference 3.1.3 and all engineering controls are in place and operable.

5.3.3 The Health Physics Technician performing the job coverage shall remain cognizant of changing radiological conditions which may require different levels of personal protection equipment and/or respiratory protection equipment than the levels originally assigned for a particular decontamination operation.

5.3.4 The Health Physics Technician performing job coverage shall be responsible for enforcing the provisions of the RWP and ALARA considerations.

5.4 Junior Health Physics/Decontamination Technician

5.4.1 The Junior Health Physics/Decontamination Technician shall decontaminate NWT equipment and tools in accordance with the provisions of this procedure.

5.4.2 The Junior Health Physics/Decontamination Technician shall adhere to the requirements of the RWP, and ALARA considerations. The Junior Health Physics/Decontamination Technician shall comply with all directions of the Health Physics Technicians.

5.4.3 The Junior Health Physics/Decontamination Technician shall advise Health Physics supervision if the work scope or job conditions change.

6.0 PROCEDURE

6.1 Pre-Decontamination Preparation

6.1.1 The Project Manager shall initiate decontamination instructions.

6.1.2 A radiological survey shall be performed by a Health Physics Technician on any object which is to be removed from a controlled area.

6.1.3 If radiological survey results indicate that a RWP is required for decontamination, the Health Physics Supervisor shall write the RWP in accordance with the provisions of Reference 3.1.6.

6.1.4 If a survey indicates that decontamination is required, the item should be bagged, wrapped, or contained under the direction of Health Physics Supervision. The Health Physics Technician shall label the item in accordance with the provisions of Reference 3.1.7.

6.1.5 The Project Manager shall approve or disapprove the decontamination operation based on conditions of the RWP and the cost effectiveness of the operation versus disposal costs.

6.2 Establishment of the Decontamination Area

6.2.1 The Project Manager and/or Health Physics Supervisor shall determine a location for set-up of the decontamination area.

6.2.2 Once a location has been established, the decontamination area shall be constructed by the Junior Health Physics/Decontamination Technicians under the direction of the Project Manager and/or Health Physics Supervisor.

6.2.3 The decontamination area should consist of:

6.2.3.1 Herculite (or equivalent) floor surfaces. A double layer of Herculite (or equivalent) may be laid on the floor at the Health Physics Supervisor's direction.

6.2.3.2 Herculite (or equivalent) wall surfaces, if applicable.

6.2.3.3 Engineering controls (HEPA ventilation, vacuum cleaners, containment tent walls, glove bags, etc.), if applicable. Engineering controls shall be determined on the basis of the ALARA considerations section of the RWP. All possible engineering controls shall be utilized when feasible to minimize the usage of respiratory protection equipment.

6.2.3.4 Safe, sturdy work stations with contamination resistant surfaces such as tables that will support decontamination attempts on heavy pieces of equipment.

6.2.3.5 Adequate supply of overhead light, adequate electrical/compressed air supply for the operation of electrical/pneumatic driven decontamination equipment.

NOTE: Use caution when decontaminating with compressed air tools to minimize spread of activity in the work area. A containment with filtered inlet and exhaust is recommended.

6.2.3.6 Overhead lifting equipment, if applicable.

6.2.3.7 Adequate supply of NWT approved cleaning solutions and solvents; adequate supply of decontamination equipment such as:

(a) Light duty decontamination equipment such as paper wipes, paper towels, massilin towels, etc.

(b) Medium to heavy duty decontamination equipment such as scrub pads, wire brushes, steel wool, files, sandpaper, etc.

(c) Fully stocked hand tool kit for disassembly of contaminated equipment.

(d) Power tools, such as drills, saws, needle guns, electric screwdrivers, etc.

(e) Radioactive material storage bags, stickers, etc.

(f) Buckets, barrels or drums for the storage of contaminated liquids, sludges or slurries, if applicable.

(g) Blotter paper or sorbent, if applicable.

(h) Approved absorbent material such as Oil-Dri™, etc., if applicable.

6.2.3.8 Storage drums/bags for the storage of contaminated protective clothing under direction of Health Physics supervision.

6.2.3.9 Proper surveillance instruments (air monitor/sampler, contamination monitor, friskers, dose rate meter, etc.) in accordance with the RWP.

6.2.3.10 An adequate supply of personal protective clothing, gloves, respiratory equipment, etc.

6.2.3.11 Step-Off Pad or Double Step-Off Pad in accordance with the provisions of the RWP.

6.2.3.12 A designated area within the decontamination area for the segregation of radwaste.

6.2.3.13 Fire extinguisher(s), if required.

6.2.4 Once the decontamination area has been established and stocked for operation,

the bagged or wrapped contaminated or controlled equipment should be placed in the decontamination work area by Junior Health Physics/Decontamination Technicians under the direction of the Project Manager and the Health Physics Technician. Contaminated or controlled items should always be escorted by a Health Physics Technician to the decontamination area.

6.3 Decontamination

6.3.1 After radiological posting of the decontamination area, all requirements of the RWP shall be observed.

6.3.2 The preparation for decontamination of a particular tool, material, or piece of equipment shall be performed as follows:

6.3.2.1 Position the wrapped item so that the written information on the wrapping is visible.

NOTE: Junior Health Physics/Decontamination Technicians may operate survey instrumentation for decontamination monitoring purposes. Senior Health Physics Technicians shall oversee Junior Health Physics/Decontamination Technicians when survey instruments are in use. Survey instruments used in a known or suspected contaminated area should be protected (wrapped in plastic, poly, etc.) against possible contamination before use.

6.3.2.2 The Health Physics Technician shall direct the removal of the item from the wrapping in such a manner (rolling plastic wrapping inside out, etc.) to control the spread of contamination.

6.3.2.3 An item that is highly contaminated with smearable contamination should be misted with an approved liquid. The water vapor will wet down the particulate contamination and help prevent the possibility of airborne contamination.

6.3.2.4 Once the item has been removed from the wrapping and has been properly positioned, discard the wrapping as radwaste.

6.3.3 The following decontamination techniques should be considered for the decontamination of equipment, materials, and tools:

6.3.3.1 Any equipment with inaccessible areas shall be dismantled so that all

surfaces are accessible for decontamination and for survey.

6.3.3.2 Decontamination shall be performed in a safe, effective manner.

6.3.3.3 The Health Physics Technician shall be notified IMMEDIATELY if the job conditions change (e.g. suspected asbestos found, presence of mercury in a switch or a light bulb, a fluid leak, or any other special circumstances).

6.3.3.4 A Junior Health Physics/Decontamination Technician shall be assigned as a fire watch if any spark creating decontamination techniques (grinding, etc.) are used. There shall be a dedicated fire extinguisher located within the decontamination area when these operations are performed.

6.3.3.5 In order to secure a safe cleaning surface, the item should be positioned on the work table (if size and weight allow) and locked into a vise.

6.3.3.6 The decontamination area shall remain organized and free of debris. The Junior Health Physics/Decontamination Technicians shall "clean as they go."

6.3.3.7 A HEPA vacuum cleaner may be used during the decontamination operation for cleanup or for small volume ventilation (containments). Permanent facility ventilation shall not be used to vacuum debris.

6.3.3.8 <u>Smearable Contamination Removal</u>

(a) When item is properly positioned for decontamination and the pre-survey has been completed, perform the following:

(b) Moisten the surface of the item with an approved liquid (e.g. pH adjusted SPRAY 9 or equivalent).

(c) Fold a paper or cloth wipe into sections, using one surface of the wipe, gently wipe contamination off in ONE direction AWAY from the body. This should reduce the possibility of personnel contamination.

(d) Re-fold the paper or cloth wipe so that a CLEAN surface is available (this should prevent cross-contamination) and continue until item is ready for survey.

(e) For some materials, duct tape will effectively remove smearable contamination. Wrap the duct tape loosely around the gloved hand, ADHESIVE side OUT. Roll the tape over the contaminated area.

(f) Re-survey.

6.3.3.9 Fixed Contamination Removal

CAUTION: High power removal techniques will make fixed activity loose and airborne. Controls to minimize contamination spread must be developed prior to the operation.

(a) There are many techniques that can be used to remove fixed contamination. The techniques selected for a particular decontamination operation is at the discretion of the Project Manager and the Health Physics Technician. The techniques can be divided into the following categories:

- Light hand decontamination
- Abrasive hand decontamination
- Power tool decontamination
- Machine decontamination (use of abrasive bead blaster, grit blaster, high pressure water wash systems, etc.)

  The specific implementation of these techniques is not included within the scope of this procedure.

- Cleaning solutions/solvents (use of ultrasonic cleaners, acid baths, electro-polishing, etc.)

  The specific implementation of these techniques is not included within the scope of this procedure.

(b) Light hand decontamination consists of using many of the

same techniques as described in Section 6.3.3.8 of this procedure.

(c) Abrasive hand decontamination shall be performed in the following manner:

- Remove as much smearable contamination as possible as indicated in Section 6.3.3.8 of this procedure.
- Moisten the surface of the item(s) to contain contamination.
- Use an abrasive cleaning tool (e.g. sandpaper, steel wool, steel brush, hand grinder, etc.) to loosen fixed contamination. Clean in one direction ONLY and clean AWAY from the body to prevent personnel contamination.
- Continue to moisten the surface of the item(s) to contain contamination.
- Remove as much smearable contamination as possible per Section 6.3.3.8 of this procedure.
- Re-survey.

6.3.3.10 Power tool decontamination shall be performed in the following manner only under the direction of the Health Physics Technician.

NOTE: WHEN USING POWER TOOLS, ALWAYS CONSIDER THE POTENTIAL OF INJURY DUE TO THE HAZARDS INVOLVED. POWER TOOLS SHALL BE USED CAUTIOUSLY AND IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

(a) Some of the electric power tools that can be used in decontamination operations are:

- Drills - used to drill out contaminated areas, to disassemble contaminated components and when used with grinding wheels or disks, may be used as an

abrasive tool

- Saws - used to separate contaminated pieces from clean pieces
- Grinders - used to grind fixed contamination from surfaces
- Electric Screwdrivers - used in the disassembly of component parts

(b) Some of the air-powered tools that can be used in decontamination operations are:

- Needle Gun - a pneumatic tool which can remove contamination from concrete and/or steel surfaces
- Socket tools or impact hammer - used in disassembly of component parts
- Jackhammer / Roto-hammer - a pneumatic tool for removing contamination from concrete and/or steel surfaces

(c) Power tool decontamination shall be performed in the following manner:

- Remove as much smearable contamination as possible as indicated in Section 6.3.3.8 of this procedure.
- Moisten the surface of the item lightly to contain contamination. Use a spray bottle for moistening. DO NOT USE ELECTRIC POWER TOOLS ON A WET WORKING SURFACE. KEEP LIQUIDS AWAY FROM ELECTRIC POWER TOOLS.
- Whenever feasible the use of containment devices (e.g. glove box, etc.) should be used to contain the spread of contamination when using power tools for decontamination operations.

- Use the power tool to remove fixed contamination. Clean in one direction ONLY and clean AWAY from the body to prevent personnel contamination.
- Re-survey.

6.4 Post Decontamination

6.4.1 If the decontamination was successful, the Junior Health Physics/Decontamination Technician shall notify the Health Physics Technician who shall perform a free release survey in accordance with Reference 3.1.5.

6.4.1.1 If the item satisfies the criteria for release as in Reference 3.1.5 remove the item to a holding area for disposal and document results as in Reference 3.1.5.

6.4.1.2 If the item remains contaminated, attempt a second decontamination, then perform 6.4.1.1.

6.4.1.3 If the item remains contaminated, attempt a third decontamination ONLY by direction of the Project Manager.

6.4.2 If an item cannot be effectively or economically decontaminated, the Project Manager shall direct the NWT work crew to volume-reduce (reduce to component parts) the equipment, material, or tools as much as possible. The individual parts can be surveyed and released in accordance with Section 6.4.1.

6.4.3 If an item is volume-reduced to its component parts and decontamination is not feasible, the item parts shall be considered radwaste. Radwaste is to be segregated into similar materials for shipment purposes by the direction of the Project Manager. The Health Physics Supervisor shall direct the segregation of radwaste into the following categories:

(a) Steel, hard metals

(b) Wood

(c) Transite, fiber products

(d) Paper

(e) Rubber

(f) Cloth (duct tape is considered a cloth)

(g) Aluminum, soft metals (brass)

(h) Glass

(i) Concrete

(j) Questionable items (e.g. light bulbs, pipe with lead solder, electronic component parts) which could be considered mixed or hazardous waste

(k) Other categories, if applicable

6.4.4 After all decontamination operations have been completed a Health Physics Technician shall perform a release survey of the decontamination area and de-post the area in accordance with References 3.1.1, 3.1.2, 3.1.3, and 3.1.5.

7.0 RECORDS

The records generated by the use of this procedure are documented in accordance with the provisions of Reference 3.1.5 and Reference 3.1.6. No new records are created.

8.0 FORMS

8.1 NWT-002 - Radiation Work Permit

8.2 NWT-006 - Smear Counting Analysis Report

8.3 NWT-001 - Radiological Survey Report

8.4 NWT-005 - Material Release Log

New World Technology

OPERATING PROCEDURE

FM-005-01-20

Control of Radioactive Materials

Prepared by:

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FM-005-01-20

New World Technology

Field Operations Procedure

CONTROL OF RADIOACTIVE MATERIAL

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New World Technology

APPROVAL PAGE

Procedure Number/Title: **FM-005-01-20, Control Of Radioactive Material** has been reviewed and approved by the following:

APPROVAL SIGNATURES:

_____ _____
William G. Haney, Vice President, Operations Date

_____ _____
Doc Dennis, Radiation Safety Officer Date

_____ _____
Donald Wadsworth, President Date

Section	Title
1.0	Scope
2.0	Purpose
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4.0	Precautions
5.0	Responsibilities
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1.0 SCOPE

The scope of this procedure encompasses the NWT requirements for use, handling, receipt, storage, and disposition of radioactive material on NWT projects. This procedure does not address or present any requirements for the control of radioactive material prepared and labeled for shipment under the requirements of 49 CFR, "Transportation".

2.0 PURPOSE

The purpose of this procedure is to describe and standardize the requirements and actions necessary to control radioactive material. In addition, the following specific goals will be achieved:

2.1 Prevention of unauthorized and unplanned exposure to personnel.

2.2 Accountability of radioactive material will be maintained.

2.3 Meet the requirements of cited references.

3.0 REFERENCES AND DEFINITIONS

3.1 References

3.1.1 DOE Order 5400.5, Radiation Protection of the Public and the Environment

3.1.2 DOE Order 5480.11, Radiation Protection for Occupational Workers

3.1.3 10 CFR 20, Standards for Protection Against Radiation

3.1.4 10 CFR 30, Domestic Licensing of Byproduct Material

3.1.5 10 CFR 34, Licensing for Radiography and Radiation Safety Requirements for Radiographic Operations

3.1.6 FM-003-01-20, Release of Materials From Controlled Areas

3.1.7 FM-021-01-20, Radiological Area Posting and Access Control

3.1.8 10 CFR 71, Packaging and Transportation of Radioactive Material

3.2 Definitions

3.2.1 **Accountable Radioactive Material** - For the purpose of this procedure, any material that contains activity in quantities that exceed the values listed in Reference 3.1.4, Schedule B and/or contains activity in concentrations that exceed values listed in Reference 3.1.5, Schedule A. This definition does not apply to material to be unconditionally released in accordance with Reference 3.1.6.

3.2.2 **Special Nuclear Material** - Includes Plutonium, Uranium- 233, or Uranium enriched in the isotopes Uranium-233 or Uranium-235, and any other radionuclide which the NRC determines to be special nuclear material.

3.2.3 **By-Product Material** - Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or utilizing special nuclear material.

3.2.4 **Radiography Source** - Any source contained within a device designed to move the source from a shielded to an unshielded position or back, for the purpose of making radiographic exposures.

3.2.5 **Samples** - Aliquots (portions) of material deposited on or placed within a container for the purposes of transferring and performing a quantitative or qualitative analysis of that material.

3.2.6 **Radiography** - The examination of a structure of materials by nondestructive methods, utilizing sealed sources of by-product material or x-ray producing machines.

3.2.7 **Receipt** - For the purpose of this procedure, receipt is defined as the act of receiving radioactive materials and/or sources at the NWT field project site.

3.2.8 **Radioactive Material** - Any material that emits ionizing radiation during the process of nuclear transformation or any item or other material contaminated with material which emits ionizing radiation.

3.2.9 **Closed Transport Vehicle** - Transport Vehicle equipped with a securely attached exterior enclosure that, during normal transportation, restricts access to unauthorized persons to the cargo space containing Radioactive Material. The enclosure may be temporary or permanent, and must limit access from the top, bottom, sides, and ends.

4.0 PRECAUTIONS

4.1 Radioactive Material Storage Areas must be posted in accordance with Reference 3.1.7.

4.2 If a smoke detector, electron tube, radioactively doped radiation detection crystal (generally not considered as licensed material) or other exempt quantity radioactive source(s) are damaged, Health Physics controls may be required during disposal.

4.3 The control of radioactive material shall be performed in accordance with the provisions of References 3.1.1, 3.1.2, 3.1.3, 3.1.6 and 3.1.8.

5.0 RESPONSIBILITIES

5.1 NWT Radiological Field Operations Manager (Project Manager) is responsible to:

5.1.1 Implement this procedure.

5.1.2 Periodically review the adherence of personnel to the requirements of this procedure.

5.1.3 Ensure Health Physics Technicians are qualified to perform the requirements of this procedure.

5.2 Health Physics Supervisors (HPS) are responsible to:

5.2.1 Ensure personnel using this procedure comply with all procedural requirements.

5.3 Health Physics Technicians are responsible to:

5.3.1 Perform the requirements of this procedure.

5.4 Junior Health Physics/Decontamination Technicians are responsible to:

5.4.1 Comply with all directions of the Health Physics Technicians regarding this procedure.

6.0 CONTROL OF RADIOACTIVE MATERIAL AND RADIOGRAPHY SOURCES

6.1 Radiography

6.1.1 General

6.1.1.1 Persons using gamma emitting sources for radiography at field sites under control of NWT, Inc. shall operate under the auspices of a Byproduct Material License issued by the US NRC and/or states and adhere to guidelines set forth by Reference 3.1.5 (or state laws) and in accordance with Reference 3.1.7.

6.1.2 Security and Storage; Receipt and Transfer

6.1.2.1 The NWT Radiological Field Operations Manager and the site Radiation Safety Officer shall designate suitable areas for the storage and securing of radiographic sources.

6.1.2.2 When not under the surveillance of a radiographer or radiographer's assistant, an exposure device shall be placed in a locked room or chained and locked to a secure unmovable structure. Health Physics shall ensure access to the exposure device is controlled.

6.1.2.3 The radiographer, or his designee, shall request permission from the Health Physics Supervisor prior to bringing a source onsite. The Health Physics Supervisor will ensure:

(a) That management has authorized the source to be allowed on site.

(b) That a sealed source leak test has been performed and the results were < 0.005 μCi.

(c) That the radiographer has a current license.

6.1.2.4 Each radiographic exposure device shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position.

(a) Each device shall be locked when not under the surveillance of the radiographer or assistant, and locked or secured within a room.

6.1.2.5 Upon arrival or departure of a radiography source under surveillance of its licensed radiographer, a Health Physics Technician shall perform an exposure rate survey of the device.

(a) If the dose-rate exceeds 200 mR/hr on contact with the device outer shield notify the Health Physics Supervisor, who will determine its status pursuant to 10 CFR 34.21.

(b) If the arrival and departure survey vary by more than 25 percent notify the Health Physics Supervisor.

6.1.3 Source Replacement and Leak Testing

6.1.3.1 Exchange, replacement, or leak testing of sealed sources shall only be performed with permission from the NWT Field Radiological Field Operations Manager and site Radiation Safety Officer and/or Site Manager and the following conditions have been met:

(a) Management has authorized the source be allowed on site.

(b) A Sealed Source Leak Test has been performed within the last 6 months on the new source and the results were < 0.005 μCi.

(c) The radiographer has a current license which allows source replacement and has procedures for this operation.

6.1.3.2 In addition to other reporting requirements, if the leak test of a sealed source reveals greater than 0.005 μCi of loose surface contamination, the Health Physics Supervisor, or his designee, shall be **IMMEDIATELY** notified.

6.2 Radioactive Material Control

6.2.1 Materials or equipment that are outside of contamination, high contamination, or airborne radioactivity areas, confirmed or suspected of having removable radioactive contamination above the values specified in Reference 3.1.7 shall be securely wrapped in plastic or placed in containers and labeled appropriately.

6.2.2 Materials or equipment with removable or suspected surface contamination levels in excess of 100 times the values set in Reference 3.1.7 shall require additional packing controls such as double-wrapping or the use of plastic bags inside of containers.

6.2.3 Materials or equipment that generate an exposure rate equal to or greater than 0.5 mR/hr or exceed the values of Section 3.2.1 shall be stored in a designated radioactive material area. The exception to this is during movement or staging, when the radioactive material shall be in the possession of either a radiation worker or a Health Physics Technician, working under a valid RWP. Possession

is defined as physical control or line-of-sight control. In addition, radioactive material with a contact (1 inch) exposure rate of 100 mR/hr shall be escorted continuously by a Health Physics Technician.

6.2.4 Protective clothing and equipment that exceed the criteria of Exhibit 1, Column 2 shall be stored within a Radioactive Materials Area except during transfer when in possession of a radiation worker, or a Health Physics Technician or in use within the Controlled Area by a radiation worker.

6.2.4.1 Protective gear that exceeds 0.5 mR/hr on contact shall not be issued for use.

6.2.4.2 Protective gear that exceeds the limits of Exhibit 1, Column 1 shall not be issued for use.

6.2.5 Materials or equipment that generate an exposure rate equal to or greater than 2mR/hr @ 30cm, but less than 100 mR/hr @ 30cm shall be stored in a Radioactive Materials Area and a Radiation Area, unless in possession of a Health Physics Technician or a radiation worker working under a valid RWP.

6.2.6 Material or equipment that generates an exposure rate equal to or greater than 100mR/hr @ 30cm shall be stored in a Radioactive Materials Area and a High Radiation Area.

6.2.7 The exception to this is during movement or staging, when the radioactive material shall be in possession of a Health Physics Technician who is working under a valid RWP.

6.2.8 Radioactive Materials contained in Contaminated, Highly Contaminated or Airborne Radioactivity Areas shall be surveyed, decontaminated when needed and handled in accordance with the requirements of this procedure prior to release to Controlled Areas.

6.2.9 Materials shall only be released to uncontrolled areas in accordance with Reference 3.1.6.

6.3 Receipt

6.3.1 Upon notification for Health Physics to receive Radioactive Material at a job site, complete Form NWT-014.

6.3.2 The following surveys must be performed within 3 hours after receipt, or within 3

hours after the beginning of the next working day, if received after working hours, for all radioactive material being received at the site.

6.3.2.1 Common Carrier (Non-Exclusive Use)

(a) Common carrier vehicles have no regulatory requirements for incoming surveys or release surveys; however,

(b) Determine the shipping requirements from the label affixed to the package. If the following exposure rates are exceeded, notification of the Health Physics Supervisor is required. Additional notifications are required in accordance with Section 6.7.

Label		Surface Exposure Rate Limit	1 Meter Exposure Rate Limit
White I		**0.5 mR/hr**	**Background**
Yellow II		**50 mR/hr**	**1.0 mR/hr**
Yellow III		**200 mR/hr**	**10 mR/hr**

(c) Perform an external smear survey of the package for βτ and α. If greater than 20 dpm/100cm^2 α and/or greater than 1,000dpm/100cm^2 βτ, post and control the package as deemed appropriate by the Health Physics Supervisor. If greater than 2,200 dpm/100cm^2 βτ and/or greater than 220 dpm/100cm^2 α, detain the vehicle and initiate notifications as required by Section 6.7

(d) If the material is vendor equipment that may have been used at other facilities, then perform a detailed survey of material and document results on form NWT-001.

Place at least two labels (RADIOACTIVE MATERIAL STICKER) on each package (e.g., top and front of

package) if the values of Exhibit 1 are met or exceeded.

6.3.2.2 Exclusive Use Vehicles

(a) Exclusive use vehicles shall have incoming surveys performed within areas designated by Health Physics Supervision.

(b) Perform a radiation survey of the vehicle and notify the Health Physics Supervisor if the dose rates in the table below are exceeded. On the supervisor's recommendation, initiate notifications required by Section 6.7.

Vehicle Area or Surface	Open Transport mR/hr	Closed Transport mR/hr
Exterior Surface of Package	200	1000
Outer Surface of Vehicle including top and underside	200	200
Flat Bed Vehicle: At any point on the vertical planes projected from the outer edge of the vehicle, on the load's upper surface (or enclosure used and on lower external surface of vehicle)	200	N/A
Two (2) meters from outer lateral surfaces of vehicle (excluding top and underside)	10	10
Occupied Position of Car or Transport Vehicle. NOTE: Does not apply to private motor carrier when persons occupying these positions are provided with Special Health Supervision, Personnel Radiation Exposure Monitoring Devices and Training	2	2

(c) Perform a survey of the vehicle and/or package(s) for contamination. If any levels exceed 1,000 dpm/100cm^2 $\beta\tau$ or 20 dpm/100cm^2 α, post and control in accordance with the provisions of Reference 3.1.7. If levels exceed 22,000 dpm/100cm^2 $\beta\tau$ or 2,200 dpm/100cm^2 α, notify the Health Physics Supervisor and initiate notifications required by Section 6.7 of this procedure.

6.4 Disposal

The requirements of Reference 3.1.7 and this procedure are in effect until such time as the material meets 49 CFR shipping requirements.

6.5 Labeling

6.5.1 Radioactive materials shall be labeled as follows:

6.5.1.1 Each container (drum, plastic bag, box, etc.) of radioactive material shall bear a durable, clearly visible label identifying the radioactive contents.

6.5.1.2 The label required shall bear the radiation caution symbol (trefoil) and the words:

or

6.5.1.3 The label can consist of bags, wrappings, etc. pre-marked with the above words, or a tag, sticker, etc. affixed to the container, bag, etc. with the above words and symbol (trefoil) included on the tag or sticker.

6.5.1.4 The label shall also provide sufficient information to permit individuals

handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposures.

6.5.1.5 As appropriate, the information will include radiation levels, if available, a list of materials, estimates of activity, contamination levels, date, and signature or initials of Health Physics Technician who performed the survey of the radioactive material in the container.

6.5.1.6 The information required in Step 6.5.1.5 can either be entered on the tag, sticker, or written in black permanent ink on the container provided the container meets the requirements of Steps 6.5.1.2 and 6.5.1.3 of this procedure.

6.5.2 The following are not subject to the labeling and posting requirements:

6.5.2.1 Materials surveyed and determined to have contamination levels less than the values of Exhibit 1.

6.5.2.2 Radioactive materials or containers packaged and labeled for off site shipment in accordance with Title 49 Code of Federal Regulations, Part 173.

6.5.2.3 Radiological control samples such as air, water and soil samples or smears that are in the possession of a Health Physics Technician.

6.5.2.4 Equipment or components undergoing maintenance covered by a RWP.

6.5.2.5 Contaminated portable tools and equipment permanently marked with yellow and/or magenta paint and maintained in the Controlled Areas.

6.5.2.6 Installed system components located within an area, the entrance to which is posted in accordance with Reference 3.1.7.

6.5.3 Tags and labels shall have a yellow background with a magenta (or black) standard radiation symbol and the lettering shall be magenta (or black).

6.5.4 Labels, tags, or writing on the surface of the container with permanent black ink shall include contact radiation readings, 30 cm radiation readings, transferable surface contamination levels (both alpha and beta-gamma), date of survey, surveyor's name and/or initials and description of items.

6.5.5 For packaged material, the radioactive material label shall be visible on/through

the package or affixed to the outside.

6.6 Storage Area Inspection

6.6.1 Radioactive material storage areas shall be inspected by health Physics Technicians during routine surveillance.

6.6.2 Health Physics Technicians shall note the physical status of storage areas on surveys noting:

(1) Locked/secure status.

(2) Labeling/posting.

(3) Condition of containers.

6.7 Regulatory Reporting

6.7.1 The NWT Radiological Field Operations Manager (Project Manager) will make all notifications through the office of the Site Manager.

6.7.1.1 The final delivering carrier must be immediately notified of excessive contamination and, in the case of excessive radiation levels, must be immediately notified by telephone, telegraph, mail-gram, or facsimile. These values are listed for each type of shipment class and vehicle type in Section 6.3 of this procedure.

6.7.1.2 The appropriate NRC Region must be immediately notified by telephone, telegram, telegraph, mail-gram, or facsimile of excessive contamination or radiation levels.

6.8 Miscellaneous

6.8.1 <u>Clean Trash</u>

6.8.1.1 For purposes of segregation, clean trash shall have clear or black plastic bags reserved for this use, to distinguish it from radiological trash which will be in yellow bags or clear plastic with yellow and magenta

bordering or markings with the standard radiation symbol.

(a) No radiological control material shall be discarded into clean trash (e.g., massilin cloth, yellow herculite, radioactive stickers/signs, radiation rope/ribbon, rad bags) unless the material is surveyed and meets the criteria for unconditional release and the material is shredded, cut, or defaced in such a way that the standard radiation symbol and associated wording is illegible.

6.8.1.2 All material to be surveyed as clean trash shall be surveyed in accordance with the provisions of Reference 3.1.6 and documented on forms NWT 005, and NWT-010.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 Form NWT-014 Receipt of Radioactive Material Investigation

7.2 Form NWT-005 Material Release Log

7.3 Form NWT-010 Unconditional Release Form

8.0 FORMS AND EXHIBITS

8.1 Forms

8.1.1 NWT-014, Receipt of Radioactive Material Investigation

8.1.2 NWT-005, Material Release Log

8.1.3 NWT-010, Unconditional Release Form

8.2 Exhibits

8.2.1 Exhibit 1, Summary of Surface Radioactivity Values

EXHIBIT 1

SUMMARY OF SURFACE RADIOACTIVITY VALUES

NUCLIDE *See Note 1*	**Column 1** Removable (dpm/100 cm^2) *See Note 2*	**Column 2** Total (Fixed + Loose) (dpm/100 cm^2) *See Note 3*
U-natural, U-235, U-238 and associated decay products	1,000 α	5,000 α
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90	1,000 $\beta\gamma$	5,000 $\beta\gamma$
Tritium organic compounds, surfaces contaminated by HT, HTO and metal tritide aerosols.	10,000	10,000

Notes:

1. The values in this Table apply to radioactive contamination deposited on, but not incorporated into the interior of the contaminated item. Where contamination by both alpha and beta-gamma emitting nuclides exists, the limits established for the alpha AND beta-gamma emitting nuclides apply independently.

2. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by swiping the area with dry filter or soft absorbent paper while applying moderate pressure and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. For objects with a surface area of less than 100 cm^2, the entire surface should be swiped, and the activity per unit area should be based on the actual surface area. Except for transuranics, Ra-228, Ac-227, Th-228, Th-230, Pa-231 and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual contamination levels are below the values for removable contamination.

3. The levels may be averaged over 1 square meter provided the maximum activity in any area of 100 cm^2 is less than three times the values in Exhibit 1 of this procedure.

New World Technology

OPERATING PROCEDURE

FM-004-01-20

Issue and Use of Radiation Work Permits

Prepared by:

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Controlled Copy No. _____

FM-004-02-20

New World Technology

Field Operations Procedure

ISSUE AND USE OF RADIATION WORK PERMITS

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APPROVAL PAGE

Procedure Number/Title: **FM-004-02-20, Issue and Use of Radiation Work Permits,** has been reviewed and approved by the following:

APPROVAL SIGNATURES:

_____ _____
William G. Haney, Vice President, Operations Date

_____ _____
Doc Dennis, Radiation Safety Officer Date

_____ _____
Donald Wadsworth, President Date

Section	Title
1.0	Scope
2.0	Purpose
3.0	References and Definitions
4.0	Precautions, Limitations, Discussion
5.0	Responsibilities
6.0	RWP Issue and Use
7.0	Records
8.0	Forms and Exhibits

1.0 SCOPE

This procedure describes the circumstances when a Radiation Work Permit (RWP) is required and addresses the requirements for planning, developing, issuing, modifying, using, and terminating RWPs. This procedure applies to all radiation workers working on NWT projects.

2.0 PURPOSE

The purpose of this procedure is:

2.1 To provide requirements and specifications for the preparation, use, modification, and termination of Radiation Work Permits.

2.2 To provide guidelines to specify appropriate protective measures within the scope of the work based upon the radiological conditions in the area.

2.3 To provide the documentation requirements for radiological surveys used to generate RWPs based upon sound radiological judgment for all NWT field project sites.

2.4 To provide a complete document addressing existing radiological conditions, work scope and limitations, radiological limitations, specific protective requirements, ALARA considerations and instructions to Health Physics Technicians.

3.0 REFERENCES AND DEFINITIONS

3.1 References

3.1.1 DOE Order 5480.11, Radiation Protection for Occupational Workers

3.1.2 10 CFR 20, Standards for Protection Against Radiation

3.1.3 ANSI N3.1-1987, Selection, Qualification and Training of Personnel for Nuclear Power Plants

3.1.4 Respiratory Protection Program for NWT

3.1.6 FM-010-01-20, Air Sampling and Analysis

3.1.7 FM-021-01-20, Radiological Area Posting and Control

3.1.8 FM-020-01-20, Radiation and Contamination Survey Techniques

3.1.9 FM-011-01-20, DAC-HR Tracking

3.2 Definitions

3.2.1 **Multi-Badging** - The placement of more than one dosimetric device to monitor dose received in non-uniform radiation fields.

3.2.2 **Non-Uniform Fields** - Radiation fields that deliver significantly different doses to body areas resulting in non-uniform whole body exposures.

3.2.3 **Stay Time** - The time a person is allowed to remain in a radiation field based upon exposure rate and remaining allowable dose.

3.2.4 **Alarming Dosimeter** - A device which continuously integrates the dose received and alarms at pre-set dose and/or exposure rate settings.

3.2.5 **ALARA Review** - A formal document in which ALARA requirements for a specific RWP are delineated.

3.2.6 **Self Reading Dosimeter** - A device which measures gamma and x-ray exposure and is usually worn adjacent the TLD or film badge.

3.2.7 **Health Physics Supervisor** - An individual who has the authority to approve an RWP for use.

3.2.8 **RWP Writer** - An individual who writes and submits an RWP for approval. This individual should be a qualified Sr. HP Technician

3.2.9 **Continuous** - A term used to describe job coverage requirements that means within line of sight or direct communication to the worker. The use of cameras and communication systems may be used.

3.2.10 **Modification** - Minor adjustments or alterations to an existing RWP.

3.2.11 **Extended RWP** - A RWP that has the end of the calendar year as an expiration date and used for ongoing routine work. An extended RWP is for work in areas with low radiological hazards.

4.0 PRECAUTIONS, LIMITATIONS, DISCUSSION

4.1 Precautions

4.1.1 Radiological work shall be stopped and placed in a safe condition if any unsafe condition or work practice is observed in the work area. Health Physics Technicians have Stop Work authority based upon radiological and/or safety considerations.

4.1.2 RWP surveys shall be performed periodically during work to determine the extent (if any) of changes in radiological conditions.

4.1.3 During a declared emergency situation, RWP requirements may be waived to facilitate medical actions, fire fighting, etc.

4.1.4 Copies of work plans/instructions should be placed with the RWP, if applicable. The detailed work instructions/plans are more in depth and should be referenced periodically during work.

4.1.5 Issue and use of RWPs shall be performed in accordance with the requirements and articles of References 3.1.1 and 3.1.2.

4.2 Limitations

4.2.1 Radiological limits and protective requirements specified in the RWP shall not be altered without specific written authorization by the Health Physics Supervisor or his/her designee.

4.2.2 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 conditions have not changed as determined by the Health Physics Supervisor or his/her designee.

4.2.3 When an RWP requirement is altered, all personnel under the RWP must be re-authorized on NWT-023, prior to resuming work, acknowledging the changes made.

4.3 Discussion

A requirement for continuous Health Physics coverage does not mean that a technician cannot leave the job site for a reasonable length of time to obtain air sampling supplies, instrumentation or other necessary equipment to perform his/her work.
It is a judgment made by the technician assessing the hazard and the probability of an unsafe condition developing during the time he is absent from the job site. It should be noted that Health Physics techniques are not rigid in their application because of large

number of variables that can be encountered during the course of work. Some degree of latitude is required to allow the technician to perform his work safely, effectively, and efficiently.

For example, a minimal hazard condition in which personnel are wearing full face filter type respirators may permit the technician to leave for several minutes to obtain equipment whereas a job in which personnel performing the work evolution are wearing full face airline respirators would preclude the technician from leaving the area for any length of time. In the second case, normally a second technician would assist the first in obtaining equipment or supplies.

5.0 RESPONSIBILITIES

5.1 NWT Radiological Field Operations Manager (Project Manager) shall be responsible to:

5.1.1 Implement this procedure.

5.1.2 Periodically review the adherence of personnel to the requirements of this procedure.

5.1.3 Ensure Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

5.1.4 Periodically review RWP practices to ensure procedural compliance.

5.1.5 Periodically review RWPs involving significant radiological conditions.

5.1.6 Approve RWPs covering High Radiation Areas and Very High Radiation Areas.

5.2 Health Physics Supervisors shall be responsible to:

5.2.1 Terminate or extend RWPs.

5.2.2 Review and approve RWPs for use.

5.2.3 Assign Health Physics Technicians performing RWP job coverage.

5.2.4 Perform pre-job RWP briefings with personnel using the RWP.

5.2.5 Ensure RWPs are written in a timely manner prior to the start of scheduled work.

5.3 Health Physics Technicians shall be responsible to:

5.3.1 Perform the requirements of this procedure:

5.3.1.1 RWP job coverage and associated surveys.

5.3.1.2 RWP surveys for RWP generation.

5.3.1.3 RWP writing.

5.3.2 Ensure workers are following the requirements of the RWP.

5.3.3 Stop work if:

5.3.3.1 Radiological conditions exceed the limits specified in the RWP.

5.3.3.2 Any unsafe condition exists in the work area.

5.3.3.3 Non-compliance with procedural requirements occurs.

5.3.4 Ensure dosimetry, including multiple dosimetry is properly placed on individuals prior to entering the work area (when required).

5.4 Junior Health Physics/Decontamination Technicians shall:

5.4.1 Perform the requirements of this procedure under direct supervision of a Health Physics Technician.

5.5 RWP Users shall be responsible to:

5.5.1 Read, understand, sign, and comply with all of the requirements and limitations of the RWP.

5.5.2 Meet all RAD worker qualifications required by the RWP, and maintain RAD worker qualifications current.

5.5.3 Complete the RWP sign in Log (NWT-023), if applicable.

NOTE: Form NWT-023 is required when respiratory protection is being used by workers, and/or, when work is being performed in a Radiation Area, High Radiation Area, Airborne Radioactivity Area, and Highly Contaminated Area as defined in Reference 3.1.7.

5.6 Industrial Hygiene (IH)/Safety Technicians shall be responsible to:

5.6.1 Review and approve the RWP for use if there are industrial hygiene/safety considerations (if applicable).

5.7 Health Physics Planner (Usually a Health Physics Technician or Health Physics Supervisor assigned to write the RWP) shall:

5.7.1 Write the RWP in accordance with the requirements of this procedure.

6.0 RWP ISSUE AND USE

6.1 Prerequisites

6.1.1 A RWP is required when:

6.1.1.1 Entering any posted radiological area, or

6.1.1.2 When work will occur in any controlled area where general area exposure rates exceeds 0.5 mR/hr gamma or 2.5 mrad/hr corrected beta @ 30cm or

6.1.1.3 Health Physics determines that a situation warrants radiological controls in the form of an RWP.

6.2 Initiation and Issue

6.2.1 The Health Physics Supervisor shall perform, or assign a Health Physics Technician to perform a survey of the work area in accordance with Reference 3.1.8, paying particular attention to the following:

6.2.1.1 Prior to performing a work area survey, the <u>surveyor</u> shall be as knowledgeable as possible about the nature of the work to be performed (disassembly, grinding, decontamination, jack hammering, welding, etc.), the specific component or equipment to be worked on, the positions the workers may take to perform the work (lying under a pump, leaning against one component to work on another, etc.), and the possibility of the presence of highly radioactive debris.

- All surveys used to assess work conditions in preparation for a job shall clearly describe all the radiological hazards present in

the work area. The following guidelines should be considered when performing a work area survey:

- What are the contamination, radiation and airborne radioactivity levels at the position(s) where the individual is to work?
- Where are designated radiation, high radiation, contaminated areas boundaries?
- Are there any special radiological hazards or hot spots to avoid?
- Is the area currently wet or greasy or will it become wet or greasy from the work?
- If work on a specific component is required, what are the contact and 30cm dose rates for the component?
- Is there or could there be any highly radioactive debris present?
- What additional safety hazards may be encountered at the job site?

6.2.2 Upon completion of the radiological survey, the survey shall be reviewed/approved by the Health Physics Supervisor in accordance with Reference 3.1.8. and a copy forwarded to the Health Physics Technician/Supervisor (Planner) assigned to write the RWP.

6.2.3 The Health Physics Technician assigned to write the RWP shall complete Section I of the RWP (NWT-002).

6.2.3.1 Above Section I

- Indicate if the RWP is a regular RWP that will expire when the job is completed.
- Completed or an extended RWP that will cover ongoing work and expire at the end of the year.
- Enter the RWP number.

6.2.3.2 Section I

- Complete all parts of Section I.
- A clear description of the work activity is very important. Information regarding the exact location and scope of work is essential to adequately establish the current and anticipated radiological conditions in the area.
- Words such as "troubleshoot" or "repair" are discouraged. The full extent of the job should be described.

6.2.4 The Health Physics Technician shall complete Section II of the RWP entering all existing radiological conditions, source of survey information, and the number of the RWP survey.

6.2.5 The Health Physics Technician or ALARA designee will complete the ALARA Considerations Form (NWT-024), if applicable, and attach to the RWP (NWT-002).

6.2.6 The Health Physics Technician will complete the radiological limits in Section III of the RWP.

6.2.7 An Industrial Hygiene/Safety Technician will complete the industrial hygiene/safety concerns section of Section III of the RWP if applicable.

6.2.8 The Health Physics Technician will complete the individual sections of Section IV based upon the recommendations in Exhibit I.

6.2.8.1 Protective clothing requirements.

6.2.8.2 Dosimetry requirements.

6.2.8.3 Special Instructions.

6.2.8.4 Respiratory protection requirements.

6.2.8.5 Respirator filter cartridge requirements.

6.2.8.6 Applicable stay times.

6.2.9 The Health Physics Technician shall sign NWT-002 and give the partially complete RWP to the Health Physics Supervisor for completion.

6.2.10 The Health Physics Supervisor or his/her designee shall complete RWP Section V.

6.2.10.1 Job coverage requirements.

6.2.10.2 Survey requirements and frequencies.

6.2.10.3 Air sampling frequencies.

6.2.10.4 ALARA Considerations (if applicable).

6.2.11 The Health Physics Supervisor or his/her designee shall review Section I through Section V for accuracy and correctness as necessary.

6.2.11.1 The Health Physics Supervisor shall notify the NWT Corporate office of any special dosimetry requirements.

6.2.11.2 The Health Physics Supervisor shall notify the NWT Corporate office if any special instrumentation is required.

6.2.11.3 The Health Physics Supervisor shall notify the NWT Corporate office if respiratory protection equipment is to be used.

6.2.12 Upon completion of Step 6.2.11, the Health Physics Supervisor or his/her designee shall sign and approve the RWP for use unless:

6.2.12.1 The RWP is for a High Radiation Area or Very High Radiation Area, in which case the NWT Radiological Field Operations Manager (Project Manager) shall also review and approve the RWP.

6.2.12.2 In addition to the radiological conditions, there are industrial hygiene/safety aspects which could impact upon the safe completion of the work of the RWP. In this case, the Industrial Hygiene/Safety Technician shall review the RWP; ascertain that the proposed work description is acceptably safe and is accordance with the provisions of the Industrial Hygiene Safety Pre-Job Checklist (NWT-025) and industry standards, and shall approve the RWP for use.

NOTE: If the RSO, IH/Safety Group, signatures are not required, the Health Physics Supervisor shall indicate Not-Applicable (N/A) in Section H of NWT-002. All blanks spaces on the RWP shall be filled out with the appropriate information/data.

If there is no data entered in a section of the RWP, or that section is not applicable, the Health Physics Supervisor shall indicate Not-Applicable (N/A) in the section or space of concern.

6.2.13 Upon approval, the Health Physics Supervisor shall notify the NWT work crew that the RWP has been issued.

6.3 Use of the RWP

6.3.1 Prior to the initial use of any RWP, the user(s) shall read, and sign Section VI (Personnel Authorized to Perform Work & Acceptance of Responsibility) of the RWP to indicate that he/she understands the requirements of the RWP. Any questions shall be answered by the Health Physics Supervisor.

6.3.2 Prior to the initial use of the RWP, the Health Physics Supervisor or his/her designee shall conduct a pre-job briefing with the work crew members.

6.3.2.1 Pre-job briefings shall be documented on Forms NWT-025 (Industrial Hygiene/Safety) or NWT-026 (Health Physics) and accompanied by a NWT-027 Training Record.

6.3.3 The RWP user shall:

- Sign in on the RWP Access Log, NWT-023, if applicable.
- Adhere to all RWP requirements.
- Contact Health Physics if work scope or job conditions change.
- Sign-out of the RWP Access Log, when leaving the work area, if applicable.
- Wear dosimetry as prescribed by the RWP.
- Attend pre-job briefings and post-job briefings.
- Follow stop work instructions when issued.

6.3.4 A copy of the RWP will be kept at the work area location at all times.

6.4 RWP Modification or Extension

6.4.1 In the event that conditions or scope of the work changes that do not justify the generation of a new RWP, two modifications or extensions of the RWP may be made by the Health Physics Supervisor.

6.4.2 When modifying the RWP, all copies must be modified in the same manner.

6.4.3 The Health Physics Supervisor shall obtain all copies of the RWP and make the necessary changes. Each change shall be made in the following manner:

- Each change will be made with a single line cross out of the text, or area of concern.
- The Health Physics Supervisor shall initial and date adjacent to each change made to the RWP.
- The Health Physics Supervisor can add any additional comments adjacent to the change, to help justify the change being made.

6.4.3.1 The modification of the RWP shall be annotated on all copies by placing "R-1" (first modification) or "R-2" (second modification) and the date in the upper right hand corner of the RWP.

6.4.3.2 A RWP may be modified or extended two times. In the event more changes are necessary, the RWP will be terminated and a new RWP generated.

6.4.4 Upon completion of the modification or extension of the RWP and prior to use, the approval/review signatories of the original RWP shall initial and note agreement with the modification by placing "R-1/initials" or "R-2/initials" and the date in the block for RWP approval by position.

6.4.5 The Health Physics Supervisor shall communicate all changes made to the RWP to the affected work crew, and work crew supervisors.

6.5 RWP Termination

6.5.1 The RWP shall be terminated by signing the "Termination" (Section I) block for any of the following reasons:

- Job completion.
- Significant change in work scope.

- Significant change in radiological conditions that exceed RWP limits.
- For cause (RWP violations).
- RWP revision.
- End of the calendar year.

6.5.2 Upon termination of an RWP, the original RWP will be retained in the permanent project file. All other copies will be kept at an NWT designated office.

7.0 RECORDS

The following records will be generated and retained in the permanent project file as a result of using this procedure.

7.1 NWT-001 - Radiological Survey Report

7.2 NWT-002 - Radiation Work Permit

7.3 NWT-023 - RWP Access Log

7.4 NWT-024 - ALARA Considerations Form

7.5 NWT-025 - Pre-Job Briefing Checklist (IH/Safety)

7.6 NWT-026 - Pre-Job Briefing Checklist (Health Physics)

7.7 NWT-027 - Training Record

8.0 FORMS AND EXHIBITS

8.1 Forms

8.1.1 NWT-001 - Radiological Survey Report

8.1.2 NWT-002 - Radiation Work Permit

8.1.3 NWT-023 - RWP Log

8.1.4 NWT-024 - ALARA Considerations Form

8.1.5 NWT-025 - Pre-Job Briefing Checklist (IH/Safety)

8.1.6 NWT-026 - Pre-Job Briefing Checklist (Health Physics)

8.1.7 NWT-027 - Training Record

8.2 Exhibits

8.2.1 RWP Radiation Protection Recommendations for RWP Generation

EXHIBIT 1

RWP RADIATION PROTECTION RECOMMENDATIONS FOR RWP GENERATION

PROTECTIVE CLOTHING AND EQUIPMENT	
>500 K dpm/100cm^2 loose βγ and/or >50 K dpm/100cm^2 loose α	Cloth Coveralls Plastic Suit w/Hood 2 pr. Rubber Gloves 2 pr. Plastic Shoe Covers Cloth Hood Cotton Liners Rubber Overshoes Tape all openings Respiratory Protection
Wet conditions with loose contamination	Cloth Coveralls Plastic Suit w/Hood 2 pr. Rubber Gloves 2 pr. Plastic Shoe Covers Cloth Hood Cotton Liners Rubber Overshoes Tape all openings Respiratory Protection Respirators should be used based upon estimated re-suspension values
>50 K dpm/100cm^2 loose βγ and/or >5 K dpm/100cm^2 loose α	Cloth Coveralls Paper Outer Coveralls 1 pr. Rubber Gloves 1 pr. Plastic Shoe Covers Cloth Hood Cotton Liners Rubber Overshoes Tape all openings Respiratory Protection based upon work scope
>1K dpm/100cm^2 loose βγ and/or >20 dpm/100cm^2 loose α	Cloth or Paper Coveralls Cloth or Paper Hood Cotton Liners 1 pr. Rubber Gloves 1 pr. Plastic Shoe Covers Rubber Overshoes Tape all openings

EXHIBIT 1
-continued-

RECOMMENDED HEALTH PHYSICS RWP SURVEILLANCE FREQUENCIES	
0.2 mR/hr to 100 mR/hr	Pre-job briefing Intermittent coverage Worker review of radiological survey
100 mR/hr to 1000 mR/hr	Pre-job briefing Worker review of radiological survey Continuous coverage Alarming dosimeters
1000 mR/hr to 5000 mR/hr	Pre-job briefing ALARA briefing Continuous coverage Alarming Dosimeters Stay time calculations Reliable communication system Worker review of radiological survey
Hot Particle Controls	Pre-job briefing Worker review of radiological survey Continuous coverage w/particle surveys at specified frequencies
Radioactive System Breach	Pre-job briefing Continuous coverage during breach
RECOMMENDED DOSIMETRY FOR RWP USE	
0.2 mR/hr to 100 mR/hr Whole Body	Whole Body TLD (or film badge) 0-200 mR PIC*
100 mR/hr to >5000 mR/hr Whole Body	Whole Body TLD (or film badge) 0-500 mR PIC* 0-5 R PIC* Alarming dosimeter Stay time calculation (@ > 1R/hr)
Non-uniform Fields Whole Body	Multiple TLDs (or film badges) arrayed to monitor body locations Additional dosimetry as described above
> 5:1 ratio of extremity exposure rate to whole body exposure rate and at least 100 mR/hr	Extremity TLDs
> 3:1 beta eye exposure rate to gamma whole body exposure rate	Shield the eyes with safety glasses of at least 700 mg/cm^2 density thickness or monitor eye exposure with a forehead TLD (or film badge)

* PIC Selection should be based on dose estimate, not dose rate.

New World Technology

OPERATING PROCEDURE

FM-003-01-20

Release of Materials from Controlled Areas

Prepared by:

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448 Commerce Way
Livermore, CA 94551

Controlled Copy No. _____

FM-003-01-20

New World Technology

Field Operations Procedure

RELEASE OF MATERIALS FROM CONTROLLED AREAS

New World Technology
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Livermore, CA 94551

New World Technology

APPROVAL PAGE

Procedure Number/Title: **FM-003-01-20 Release of Materials From Controlled Areas**, has been reviewed and approved by the following:

APPROVAL SIGNATURES:

_____ _____
William G. Haney, Vice President, Operations Date

_____ _____
Doc Dennis, Radiation Safety Officer Date

_____ _____
Donald Wadsworth, President Date

Section	Title
1.0	Purpose
2.0	References
3.0	Apparatus
4.0	Precautions and Limitations
5.0	Prerequisites
6.0	Calibration
7.0	Procedure
8.0	Records
9.0	Forms and Exhibits

1.0 SCOPE

This procedure sets forth the specific requirements for release of materials from controlled areas applicable to New World Technology (NWT) projects.

2.0 PURPOSE

The purpose of this procedure is to specify requirements for releasing material from controlled areas and to minimize the potential for unintentionally releasing contaminated items to uncontrolled areas in accordance with the provisions of Reference 3.1.1.

3.0 REFERENCES AND DEFINITIONS

3.1 References

3.1.1 DOE Order 5400.5 (2-8-90), Radiation Protection of the Public and the Environment

3.1.2 DOE Order 5480.11 (12-21-88), Radiation Protection for Occupational Workers

3.1.3 10 CFR 20 (5-22-91), Standards for Protection Against Radiation

3.1.4 FM-020-01-20, Radiation and Contamination Survey Techniques

3.1.5 NRC's "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Materials (NRC 1993), Office of Nuclear Material Safety and Safeguards (NMSS)."

3.1.6 ANSI N3.1-1987, Selection, Qualification and Training of Personnel for Nuclear Power Plants

3.1.7 TM-003-01-20, Operation of the Ludlum Model-2929

3.1.8 TM-001-01-20, Operation of Contamination Survey Meters

3.1.9 FM-021-01-20, Radiological Area Posting and Access Control

3.1.10 FM-005-01-20, Control of Radioactive Material

3.1.11 FM-004-01-20, Issue and Use of Radiation Work Permits

3.2 Definitions

3.2.1 **Activity** - The rate of disintegration (transformation) or decay of radioactive material. The units of activity for the purpose of this procedure are disintegrations per minute (dpm), Becquerel (Bq), or micro-Curies for loose contamination and disintegrations per minute or millirad/hour for fixed contamination.

3.2.2 **Contamination** - Deposition of radioactive material in any place it is not desired, particularly where its presence may be harmful. The harm may be actual exposure to individuals or release of the material to the environment or general public. Contamination may be due to the presence of alpha particle, beta particle or gamma ray emitting radionuclides.

3.2.3 **Controlled Area** - Any area to which access is controlled in order to protect individuals from exposure to radiation and radioactive materials and/or to prevent the release of radioactive materials to the uncontrolled areas.

3.2.4 **Fixed Contamination** - Radioactive contamination that is not readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk smear, or massilinn.

3.2.5 **Minimum Detectable Activity (MDA)** - For purposes of this procedure, MDA for removable radioactive contamination is defined as the smallest amount of sample activity that will yield a net count with a 95% confidence level based upon the background count rate of the counting instrument used.

3.2.6 **Evaluator** - An individual designated by the Radiological Field Operations Manager to evaluate materials or items in accordance with Sections 6.2, 6.3 and Step 6.5.6.

3.2.7 **Release for Unconditional Use** - A level of radioactive material that is acceptable for use of property without restrictions due to residual radioactive material without license conditions or controls. Under normal circumstances, authorized limits for residual radioactive material are set equal to, or below, the values specified in Reference 3.1.5, Table 1.

3.2.8 **Survey Exempt Materials** - The contents of sealed containers which remain unopened while in a controlled area are exempt, the outside surfaces are not exempt.

4.0 PRECAUTIONS, LIMITATIONS

4.1 Precautions

4.1.1 Instruments used to perform release surveys shall be operated in accordance with the respective operating procedure:

4.1.1.1 Ludlum Model-2929 - Reference 3.1.7

4.1.1.2 Ludlum Model-3 - Reference 3.1.8

4.1.2 MDA for the Ludlum Model-2929 shall be in accordance with Reference 3.1.7.

4.1.3 Large area smears may be used to augment (but not replace) the 100 cm^2 smear survey. Large area wipes may be counted with the Ludlum Model-3 or equivalent. Large area smears are used to obtain immediate information concerning loose contamination for the purpose of radiological protection and to minimize time spent performing disc smears on an item easily identified as contaminated.

4.1.4 A release document package shall include the following forms:

4.1.4.1 NWT-005 - Material Release Log.

4.1.4.3 NWT-001 - Radiological Survey Report or NWT-010, Unconditional Release of Equipment or Items Report and/or NWT-006, Smear Counting Analysis Report.

4.1.4.4 NWT-003 - Daily Instrument Performance Test Log or equivalent.

4.1.5 The release document shall include the following information:

4.1.5.1 The date of the release survey.

4.1.5.2 The number of the release survey.

4.1.5.3 A description or identification of the item.

4.1.5.4 The identity of the Health Physics Technician performing the release survey.

4.1.5.5 The evaluator of the material for release.

4.1.5.6 The release approval of the Health Physics Supervisor or designee.

4.1.6 All surveys performed for the release of material shall be documented on a Radiological Survey Report (NWT-001) and/or on an Unconditional Release of Equipment or Items Report (NWT-010).

4.1.7 Radiation and contamination surveys shall be performed in accordance with Reference 3.1.4.

4.1.8 Items identified as radioactive during the release survey shall be controlled in accordance with Reference 3.1.10.

4.1.9 Personnel performing release surveys shall be logged in on a Radiation Work Permit in accordance with Reference 3.1.11 (if applicable).

4.1.10 Audible response instruments must be used during direct scan surveys.

4.1.11 Instruments used for release surveys shall be within current calibration and shall have had a performance test check performed daily or prior to use in accordance with the instrument's operating procedure.

4.1.12 Release of materials from controlled areas shall be performed in accordance with the provisions and directives of References 3.1.1, 3.1.2, and 3.1.3.

4.1.13 Items presented for release shall be direct scanned in an area of low background.

4.2 Limitations

4.2.1 The maximum probe speed during direct scan surveys of surfaces shall be 2 cm/sec.

4.2.2 A response check shall be performed at the completion of the work day for instrument's used for direct scan surveys in accordance with the instruments operating procedure.

4.2.3 The probe face shall be held within 1/4 inch of the surface being surveyed for alpha, and within 3/8 inch of the surface being surveyed for beta-gamma.

4.2.4 If an instrument used to perform release surveys fails any operational check, it shall be removed from service. All data collected during the period of instrument failure must be evaluated by the Health Physics Supervisor.

4.2.5 Posting and access control of controlled areas shall be performed in accordance with the provisions of Reference 3.1.9.

5.0 RESPONSIBILITIES AND QUALIFICATIONS

5.1 Responsibilities

5.1.1 NWT Radiological Field Operations Manager

5.1.1.1 Implements the requirements of this procedure.

5.1.1.2 Designates qualified evaluators.

5.1.1.3 Reviews the adherence of personnel to the requirements of this procedure, periodically.

5.1.1.4 Ensure Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

5.1.2 Health Physics Supervisor

5.1.2.1 Review the release documentation.

5.1.2.2 Approve unconditional releases by signing the NWT-005 form.

5.1.3 Health Physics Technicians

5.1.3.1 Perform the requirements of this procedure.

5.1.3.2 Adhere to other procedures (referenced in this procedure).

5.1.3.3 Document all releases.

5.2 Qualifications

5.2.1 Health Physics Technicians shall be qualified in accordance with the requirements of Reference 3.1.6 to perform release surveys of materials.

5.2.1.1 Documentation supporting qualifications shall be obtained and kept in the permanent project files.

5.2.2 Junior Health Physics/Decontamination Technicians may perform release surveys under the direct supervision of a Health Physics Technician meeting the requirements of Section 5.2.1.

5.2.3 Evaluators shall be designated by the NWT Radiological Field Operation Manager (Project Manager).

6.0 PROCEDURE

6.1 Release Limits For Gross Activity (Unknown Isotopes) - Regulatory

EMISSION	REMOVABLE (dpm/100 cm^2)	TOTAL (Fixed and Removable) (dpm/100 cm^2)
Alpha	20	100
Beta-Gamma	200	1000

NOTE: If <u>all</u> of the actual isotopic constituents of the contamination are known <u>and</u> documented on the release documents, the release limits of Table 1 of Reference 3.1.5 may be applied.

6.2 Inaccessible Surfaces

6.2.1 Items with inaccessible surfaces should be disassembled as completely as possible to facilitate release surveys. Items with inaccessible surfaces will not be unconditionally released unless evaluated by a designated evaluator who authorizes and documents the release.

6.2.2 The following guidance will be used when performing evaluations:

- A history of the item should be reviewed.
- The actual release survey shall be reviewed.
- Determination of the radiological conditions in the area the item has been used or stored shall be reviewed.
- Use of sensitive detectors such as NaI(T1) or equivalent should be considered. (These detectors may indicate internal contamination that the Model-3 or equivalent may not detect due to its lower sensitivity to photon emissions).

6.3 Materials considered hazardous due to their physical or chemical nature and fragile items shall not be unconditionally released unless evaluated. For example, gases, pyrophoric materials, easily damaged electronic devices, or other easily damaged materials cannot be

directly or indirectly surveyed. These materials will be evaluated on a case by case basis for release in a manner consistent with Section 6.2.2. Evaluation for release shall be performed by a designated evaluator only.

6.4 Survey Exempt Materials

6.4.1 Items such as briefcases, pens, papers, personal clothing, etc., are exempt from the Health Physics release survey requirements of this procedure.

6.4.2 Individuals shall survey the exempt items in the same manner as a whole body frisk when leaving a controlled area or have a Health Physics Technician perform the survey.

6.5 Survey Procedure

6.5.1 Upon receipt of an item presented for release, attempt to determine the history:

- Purpose of item.
- The current and past use of the item.
- The location(s) in which the item was used or stored.
- If the item was ever used for work with radio-active material or used in an area where radioactive material was used or stored.

This knowledge of the item history should provide the surveyor with information helpful in performing the release survey.

6.5.2 Using protective clothing such as gloves, perform large area smears of 100% of the accessible surfaces of the item using large area wipes (e.g. massilin).

6.5.2.1 Determine if transferable (loose) radioactive material is present by measuring the amount of activity on the surface of the cloth.

6.5.2.2 If the presence of radioactive material is indicated by a count rate above background, the item shall be treated as contaminated until the results of the disc smear survey are obtained and a determination is made concerning the actual 100 cm^2 loose contamination levels.

The material shall be controlled in accordance with Reference 3.1.10.

6.5.3 Perform a direct scan of 100% of all accessible areas of the item, in accordance with the instrument's operating procedure, and Reference 3.1.4.

NOTE: Items presented for release shall be direct scanned in an area of low background, preferably ≤ 100 CPM. The Health Physics Technician performing the release survey shall determine if the background is acceptable for direct scan of the item. Release surveys shall not be done in areas where background is ≥ 300 CPM.

6.5.3.1 If the scan indicates radioactive material on the surface of the item is less than the limits for release for total activity, proceed to 6.5.3.3.

6.5.3.2 If the scan indicates radioactive material on the surface of the item is greater than regulatory limits for total activity, the item cannot be released.

6.5.3.3 During the direct scan of the accessible surfaces of the item, a static measurement shall be taken:

- If an increase in the audible count rate is detected.
- After each minute of scanning.
- When the Health Physics Technician determines that an indication of fixed activity less than ten square centimeters may be present.

6.5.3.4 During the static measurement, the meter probe shall be held at the proper distance from the surface being surveyed for the proper response period to allow the meter reading to stabilize, in accordance with the instrument's operating procedure.

6.5.4 Perform disc smears of 100% of the effective surface area.

6.5.4.1 100% of the effective accessible surface means performing a 100 cm^2 disc smear on all accessible areas of the item <u>suspected</u> of being contaminated.

6.5.5 Count the smears in accordance with Reference 3.1.4.

6.5.5.1 Record smear data on the Smear Counting Analysis Report (NWT-006). If a Model-3 or equivalent was used, document the results on a Radiological Survey Report (NWT-001).

6.5.5.2 If the smear results indicate transferable activity below the release limits, proceed to Step 6.5.6.

6.5.5.3 If the smear results indicated transferable activity above the release limits, the item cannot be released.

6.5.6 If the item has internal or inaccessible surfaces, have NWT personnel disassemble the item and repeat Steps 6.5.2 through 6.5.5 or have the item evaluated for release by a designated evaluator.

6.5.7 If the item meets the release limits or is evaluated as meeting the unconditional release criteria, complete forms NWT-010, NWT-005, and/or NWT-001. Health Physics Supervision must review the release documents and approve the release prior to allowing the item to leave the controlled area.

6.5.8 Items identified as radioactive during the release survey shall be controlled in accordance with Reference 3.1.10.

7.0 RECORDS

The following records are generated by use of this procedure. These records will be maintained in the permanent project file.

7.1 NWT-001 - Radiological Survey Report

7.2 NWT-005 - Material Release Log

7.3 NWT-006 - Smear Counting Analysis Report

7.4 HP Daily Log

7.5 NWT-003 - Daily Instrument Performance Test Log

7.6 NWT-010 - Unconditional Release of Equipment or Items Report

8.0 FORMS

8.1 NWT-003 - Daily Instrument Performance Test Log

8.2 NWT-006 - Smear Counting Analysis Report

8.3 NWT-001 - Radiological Survey Report

8.4 NWT-005 - Material Release Log

8.5 NWT-010 - Unconditional Release of Equipment or Items Report

New World Technology

OPERATING PROCEDURE

FM-002-01-20

Sample Chain of Custody

Prepared by:

New World Technology
448 Commerce Way
Livermore, CA 94551

Controlled Copy No. _____

FM-002-01-20

New World Technology

Field Operations Procedure

SAMPLE CHAIN OF CUSTODY

New World Technology
448 Commerce Way
Livermore, CA 94551

New World Technology

APPROVAL PAGE

Procedure Number/Title: **FM-002-01-20, Sample Chain of Custody** has been reviewed and approved by the following:

APPROVAL SIGNATURES:

_____ _____
William G. Haney, Vice President, Operations Date

_____ _____
Doc Dennis, Radiation Safety Officer Date

_____ _____
Donald Wadsworth, President Date

Section	Title
1.0	**Scope**
2.0	**Purpose**
3.0	**References**
4.0	**Responsibilities**
5.0	**Procedure**
6.0	**General Information**
7.0	**Exhibits**

1.0 SCOPE

This procedure is to establish administrative controls for transfer of samples collected on NWT projects to the laboratory for analysis.

2.0 PURPOSE

The purpose of this procedure is to provide guidelines for administrative controls of samples collected and transferred to the subcontractor laboratory for analysis.

3.0 REFERENCES

3.1 Project/Site Health and Safety Plan

3.2 Project/Site Detailed Work Procedure

3.3 NUREG/1575, MARSSIM, Multi Agency Radiation Survey and Site Investigation Manual

4.0 RESPONSIBILITIES

4.1 NWT Radiological Field Operations Manager (Project Manager)

4.1.1 Implementation of this procedure.

4.1.2 Periodic reviews of adherence to the requirements of this procedure.

4.1.3 Ensure Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

4.2 Health Physics Supervisors

4.2.1 Assignment of Health Physics Technicians performing this procedure.

4.2.2 Reviewing and approving documentation generated by the use of this procedure.

4.3 Health Physics Technicians

4.3.1 Performance of the requirements of this procedure.

4.3.2 Adherence to other procedures referenced.

4.3.3 Documentation of all work performed under this procedure.

5.0 PROCEDURE

Note: In many instances the laboratory will supply chain of custody forms, in that case, instructions provided by the laboratory will be followed in filling out the chain of custody forms.

5.1 The sample collector must initiate a chain of custody form by filling in the requested information. Identifying data for the sample(s) must also be entered into the sample log in accordance with References 3.1 and 3.2.

5.2 Proper chain of custody is maintained when the sample(s) are maintained under the direct surveillance of an individual, in a controlled access facility, or the sample is in a tamper-proof container.

5.3 If the sample(s) are to be transported by any means other than hand delivery by the custodial individual, security seals must be used. Include a copy of the chain of custody form with the sample container.

5.4 Upon transfer of the samples to another individual, that individual shall sign as recipient. A copy of the chain of custody form will be maintained for record keeping purposes while the original will remain with the sample.

5.5 Upon arrival of the sample at the laboratory, the laboratory recipient shall inspect the sample for signs of tampering. If indication of tampering is noted, the laboratory shall notify site personnel who will collect another sample.

5.6 Once the sample(s) are in the custody of the laboratory, it shall be maintained in accordance with the laboratory's chain of custody and quality assurance procedures.

5.7 Samples sent to an off site laboratory for analysis shall be returned to the site after processing for disposal if this is the condition of the laboratory contract. There may be occasions where the laboratory will hold and/or dispose of the samples.

6.0 GENERAL INFORMATION

6.1 The chain of Custody/Analysis Record form must be completed in its entirety as follows:

- **Client Name -** New World Technology
- **P.O.#** - Purchase Order number obtained from technical support personnel.

- **Phone # / Fax #** - Project specific contact numbers in the event laboratory personnel have questions or concerns regarding samples received.

- **Project Name** - Name of the facility and the type of project or project tracking number.

- **Project Number** - A unique number which associates the project to specific records of analysis. This is as assigned by the Project Manager.

- **Sampler** - Individual performing sampling.

- **Sample ID #** - The unique number recorded in the sample log book, on the sample and on the chain of custody form for a sample.

- **Date Collected / Time Collected** - The date and time the sample was taken.

- **Sample Type** - Grab, Composite, Water, Soil, Oil, etc. as appropriate.

- **Total of Container**s - Number of containers with this Sample Identification Number.

- **Analysis Req'd** - Indicate the desired type of analysis for the laboratory to conduct.

- **Name of Shipper** - Person preparing the samples for shipment from project to the laboratory.

- **Air-bill No.** - Shipper's specific airbill number assigned to shipment for tracking purposes.

- **Date / Time of Shipment** - Date and time samples were dropped off for shipment to laboratory.

- **Sample Relinquished by** - Project personnel taking samples for shipment.

- **Date / Time** - Date and time sample shipment container sealed.

- **Sample Received by** - Laboratory personnel receiving and opening sample shipment.

- **Date / Time** - Date and time sample received at laboratory.

- **Received by (Lab)** - Name of Laboratory that received sample shipment.

- **Seals Intact? -** To be completed by laboratory.

- **Report Results By (Date) -** The date which you expect to get sample results by. ASAP is not appropriate.

- **Turnaround Time Requested -** The needed turnaround time for sample analysis. Circle Normal or Rush. Be aware of the increased costs for Rush turnaround time.

- **Report Results To -** Project Manager's Name, Address and Telephone number.

- **Disposal -** Project Manager will designate disposal method preferred and sign the '**Authorized for Disposal By**' block.

- **Date/Time of Disposal -** Laboratory will provide date and time samples were disposed of and sign the '**Disposed of By**' block.

NOTE: If multipurpose paper is not available, copies of the chain of custody will have to me made for tracking purposes.

6.2 The sampler is to retain the Pink copy of the Chain of Custody and forward the White (original) and Yellow copy with the sample shipment to the laboratory.

6.3 The laboratory shall return the Yellow copy to New World Technology upon completion to be included in documentation for the project Final Report.

7.0 EXHIBITS

Sample Chain of Custody

Sample Chain of Custody – Continuation Sheet

New World Technology

Chain of Custody

Page ____ of ___

Project Name: _____

Project #: _____

SAMPLE

Analysis Required **P.O.#:** _____

Sampler:

Notes:

Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	# of containers										Remarks	Check if RUSH

Name of Shipper	Airbill No.	Date	Time	Sample Relinquished By:	Date	Time	Sample Received By:	Date	Time

Received by (Lab)	Date	Time	Condition on receipt						

Turnaround Time Requested: (please circle) **Normal** **Rush**

(Rush TAT is subject to Client approval and Laboratory surcharge)

Report Results By: (Date) _____

Rush Results Requested by: (please circle) **Phone** **Fax**

Report Results To:

Address:

Telephone: **Fax:**

Type: (please circle) **HAZ** **RAD** **Mixed** **Unknown** **Disposal By:** (please circle) **Lab** **Client** **Contractor**

White Copy – (Original) Retain with Samples **Yellow Copy – Customer** **Pink Copy – Retain for Project Files**

New World Technology

Chain of Custody (Continuation Sheet)

Page ____ of ___

Project Name: _____

Project #: _____

SAMPLE

Lab ID#

COC#

Analysis Required

Sampler:

Notes:

Sample Identification	Date Collected	Time Collected	Grab	Composite	Soil	Water	Other	# of containers										Notes	Check if RUSH
1)																			
2)																			
3)																			
4)																			
5)																			
6)																			
7)																			
8)																			
9)																			
10)																			
11)																			
12)																			
13)																			
14)																			
15)																			
16)																			
17)																			
18)																			

White Copy – (Original) Retain with Samples Yellow Copy – Customer Pink Copy – Retain for Project Files

NEW WORLD TECHNOLOGY
ANALYTICAL PROCEDURE

SOIL, SOLID AND LIQUID GAMMA RADIOACTIVITY DETERMINATION USING HpGe GAMMA SPECTROSCOPY

New World Technology
448 Commerce Way
Livermore, CA 94551

New World Technology

APPROVAL PAGE

Procedure Number/Title**:** **RCHL-A-05, Soil, Solid and Liquid Gamma Radioactivity Determination Using HpGe Gamma Spectroscopy** has been reviewed and approved by the following:

APPROVAL SIGNATURES:

_____ _____
William G. Haney, Vice President, Operations Date

_____ _____
Paul S. Wall, Laboratory Manager Date

_____ _____
Donald Wadsworth, President Date

Section	Title

Introduction

1.0 Scope

2.0 Purpose

3.0 References

4.0 Precautions and Limitations

5.0 Test Method

6.0 Equipment

7.0 Reagents

8.0 Procedures

SOIL, SOLID AND LIQUID GAMMA RADIOACTIVITY DETERMINATION USING HpGe GAMMA SPECTROSCOPY

1.0 SCOPE

1.1 This procedure sets forth requirements for the preparation and analysis of soil, solid and liquid matrices that may require drying, grinding, chipping or other physical preparation techniques prior to the analysis for Gamma Radioactivity. The volatility of some radioisotopes may require the removal of aliquots from some samples prior to physical processing.

2.0 PURPOSE

2.1 The purpose of this procedure is to provide instructions for the determination of Gamma Radioactivity in soil, solid and liquid sample matrices.

3.0 REFERENCES

3.1 References

3.1.1 Ortec Gamma Vision-32 A66-B32

3.1.2 “Calibration Factors for Ge Detectors Used for Field Spectrometry,” Health Physics, Vol. 55, No 1 (July), 1988

3.1.3 HpGe System for Measurement of Contaminated Soils, PerkinElmer Instruments/ORTEC Oak Ridge TN (Sept), 2000.

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Precautions

4.1.1 HpGe (High Purity Germanium) detectors may be allowed to warm up to room temperature and subsequently re-cooled. These cycles should be minimized to extend the life of the crystal.

4.1.2 Ensure the detector cold-finger is submerged in liquid nitrogen at least 8 hours before applying a bias to the crystal.

4.1.3 Never exceed the manufacturer's recommended operating voltage for the detector.

4.1.4 All soil, solid, liquid and vegetation samples will be segregated and stored in a secure controlled location.

4.2 Limitations

4.2.1 The standards for this procedure are routinely counted for a wide variety of isotopes. Generally, Am-241, Cd-109, Co-57, Ce-139, Hg-203, Sn-113, Sr-85, Cs-137, Y-88, and Co-60 are used for reference detection limits in the analyses.

4.2.2 Soil, solid and vegetation sample counting geometry is a 250ml plastic jar. Sample weight should be 350 to 400g to achieve detection limits.

4.2.3 Liquid sample volume should be approximately 250ml to achieve detection limits.

5.0 TEST METHOD

5.1 Instrument Operation

5.1.1 A typical gamma-ray spectrometry system consists of a germanium detector, with a cryostat liquid nitrogen dewar, a preamplifier in conjunction with a detector bias supply, linear amplifier, analog to digital converter(ADC), acquisition interface module(AIM) and a multi-channel analyzer.

5.1.5 Germanium detectors used for the identification of gamma rays are actually semiconductor diodes having Positive-Intrinsic-Negative (P-I-N) structure in which the intrinsic (I) region is sensitive to ionizing radiation, particularly x-rays and gamma-rays. Upon the application of reverse bias, an electrical field extends across the intrinsic or depleted region. When photons interact with the material within the depleted range of the detector, charge carriers (holes and electrons) are produced then are swept by the electrical field to the positive (P) and negative (N) electrodes. This charge, which is proportional to the energy deposited in the detector by the incident gamma-ray, is converted into a voltage pulse by an integral charge sensitive preamplifier. The signal is then amplified(processed) and sent to an ADC where the signal is converted from an analog signal to a digital signal which can be interpreted by a computer. The digital signal is then sent to the AIM where the pulse is entered into a spectral channel corresponding to a particular gamma-ray energy. When acquisition is completed, the computer quantifies the events recorded in each channel of the sample spectrum. The peaks of the spectrum, characteristic of particular radionuclides and the quantity of these radionuclides in the sample, are identified by comparison to a nuclide table.

6.0 EQUIPMENT

6.1 High Purity Germanium detector with built in preamplifier

6.2 Lead Shield

6.3 Dewar flask with fill coller (30Liter)

6.4 Linear amplifier

6.5 Analog to Digital Converter (ADC)

6.6 Acquisition Interface Module (AIM)

6.7 Ethernet transceiver with cable or UBS conection

6.8 Multi-channel Analyzer

6.9 Computer with gamma analysis software

6.10 Balance (0 to 3000 grams capacity)

6.11 Drying Oven

6.12 Mortar and Pestle

7.0 REAGENTS

7.1 Liquid Nitrogen

7.2 NIST Traceable Standards

8.0 PROCEDURES

8.1 Soil Samples

8.1.1 Upon receiving a set of samples, check all sample identification numbers against chain of custody(COC) forms before preparing the sample for gamma spectroscopy analyses.

8.1.2 Determine which samples may require drying.

8.1.3 Take an aliquot, approximately 300 to 400 grams, from each primary sample requiring drying and place in an appropriately sized drying pan.

8.1.4 Place samples in a drying oven, which has been preheated to 200^0 C, for approximately 2.0 hrs. or until dry. If the sample has significant amounts of moisture, it may be necessary to remove the sample from the oven every half hour or so to break up any clumps of material to aid in the drying process.

8.1.5 Upon completion of the drying process, prepare all samples, dried and non-dried, for gamma spectroscopy.

8.1.6 Tare a 250 ml jar counting geometry for each soil sample.

8.1.7 Label each jar lid as follows:

- Sample ID/Location
- Date/Time
- Weight

8.1.8 Fill each counting jar to a level approximately 1.0 inch below the bottom of the jar threads insuring that there are no large void spaces. The best way to accomplish this is to gently tap the side of the counting jar with a small screw driver or other implement.

8.1.9 Seal counting jar lid by applying black electrical tape around the lid/jar seam.

8.1.10 Wipe down all surfaces of the counting jar.

8.1.11 Weigh sample jar and record weight.

8.1.12 Cover counting jar with plastic wrap.

8.1.13 Place counting jar onto high purity Germanium crystal(HpGe).

8.1.14 Enter sample information into counting laboratory logbook.

8.1.15 Start the gamma spectroscopy counting routine by clicking START on the windows task bar, then PROGRAMS, GAMMA VISION 32, and GAMMA VISION.

8.1.16 From GAMMA VISION opening screen, click LIBRARY, then SELECT FILE.

8.1.17 Select the library file appropriate for radio-nuclide identification of interest.

8.1.18 From GAMMA VISION opening screen, click CALIBRATE, then, RECALL CALIBRATION.

8.1.19 Select the calibration file appropriate for sample matrix and geometry. Return to GAMMA VISION opening screen.

8.1.20 From GAMMA VISION opening screen, click ANALYZE, SETTINGS, then, from the sub menu, select SAMPLE TYPE which opens the ANALYSIS OPTIONS page.

8.1.21 From the SAMPLE TAB, set ANALYSIS RANGE from 250 to 16000. Set RANDOM SUMMING to 0. Set BACKGROUND TYPE to 5-point. Browse NUCLIDE LIBRARY and select pertinent nuclide library. Browse CALIBRATION and select correct calibration for matrix and geometry of sample being counted.

8.1.22 Click on SYSTEM TAB. Enter all information necessary for determination of sample activity.

8.1.23 Click on DECAY TAB. Enter all information to correct for decay of nuclides in the sample.

8.1.24 Click on REPORT TAB. Click check boxes UNKNOWN PEAKS, LIBRARY PEAK LIST, LIBRARY PEAK MATRIX, NUCLIDE ABUNDANCE in Reporting Options block.

8.1.25 Click ACTIVITY and COUNTING in the Uncertainty Reporting block.

8.1.26 Click 2-SIGMA in Confidence Level block.

8.1.27 Click PRINTER in Output block.

8.1.28 Click on ANALYSIS TAB.

8.1.29 Select WAN 32 ANALYSIS in the Program Block.

8.1.30 Check LIBRARY BASED in the Peak Stripping Block.

8.1.31 Check DIRECT FIT in the Analysis Block, then, press OK to return to GAMMA VISION opening screen.

8.1.32 Click on AQUIRE, then, click START/SAVE/REPORT.

8.1.33 Fill in SAMPLE DESCRIPTION block, then, click OKAY.

8.1.34 Fill in SAMPLE SIZE block, then, click OKAY.

8.1.35 Fill in SAMPLE COLLECTION DATE/TIME BLOCK, then, click okay to start the spectral collection and analysis.

8.2 Liquid Samples

8.2.1 Upon receiving a set of samples, check all sample identification numbers against chain of custody(COC) form before preparing the sample for gamma spectroscopy analyses.

8.2.2 Tare a 250 ml jar counting geometry for each liquid sample.

8.2.3 Label each jar lid as follows:

- Sample ID/Location
- Date
- Time
- Weight

8.2.4 Place liquid into counting jar to a level approximately 1.0 inch below the bottom of the jar threads.

8.2.5 Seal counting jar lid by applying black electrical tape around the lid/jar seam.

8.2.6 Wipe down all surfaces of the counting jar.

8.2.7 Weigh sample jar and record weight.

8.2.8 Cover counting jar with plastic wrap.

8.2.9 Place counting jar onto high purity Germanium crystal(HpGe).

8.2.10 Enter sample information into counting laboratory logbook.

8.2.11 Follow sections 8.1.14 thru 8.1.34.

8.3 Vegetation Samples

8.3.1 Upon receiving a set of samples, check all sample identification numbers against chain of custody(COC) form before preparing the sample for gamma spectroscopy analyses.

8.3.2 Tare a 250 ml jar counting geometry for each solid sample.

8.3.3 Label each jar lid as follows:

- Sample ID/Location
- Date
- Time
- Weight

8.3.3 Dry if necessary, then, shred the individual pieces of vegetation using scissors, a knife and cutting board or other method.

8.3.4 Place shredded vegetation into counting jar to a level approximately 1.0 inch below the bottom of the jar threads.

8.3.5 Seal counting jar lid by applying black electrical tape around the lid/jar seam.

8.3.6 Wipe down all surfaces of the counting jar.

8.3.7 Weigh sample jar and record weight.

8.3.8 Cover counting jar with plastic wrap.

8.3.9 Place counting jar onto high purity Germanium crystal(HpGe).

8.3.10 Enter sample information into counting laboratory logbook.

8.3.11 Follow sections 8.1.14 thru 8.1.34.

TM-015-01-20

New World Technology

Technical Manual

OPERATION AND CALIBRATION OF THE LUDLUM MODEL 2350-1 DATA LOGGER

New World Technology
448 Commerce Way
Livermore, CA 94551

New World Technology

APPROVAL PAGE

Procedure Number/Title: **TM-015-01-20 Operation and Calibration of the Ludlum Model 2350-1 Data Logger**, has been reviewed and approved by the following:

APPROVAL SIGNATURES:

_____ _____

William G. Haney, Vice President Operations Date

_____ _____

Donald Wadsworth, President Date

Section	Title
1.0	Scope
2.0	Purpose and Scope
3.0	General
4.0	References, Records and Equipment
5.0	Procedure
6.0	Records

1.0 PURPOSE AND SCOPE

This procedure sets forth the specific requirements to be used for the operation and calibration of the Ludlum Model 2350-1 Data Logger and various Ludlum Detectors that connect to it.

2.0 GENERAL

2.1 Description – Ludlum Model 2350-1

The Model 2350-1 Data Logger is a portable microprocessor based counting instrument designed for use with Geiger-Mueller (GM), proportional and/or scintillation detectors for measurement of alpha, beta, gamma or neutron radiation. Radiation data is presented in four ways:

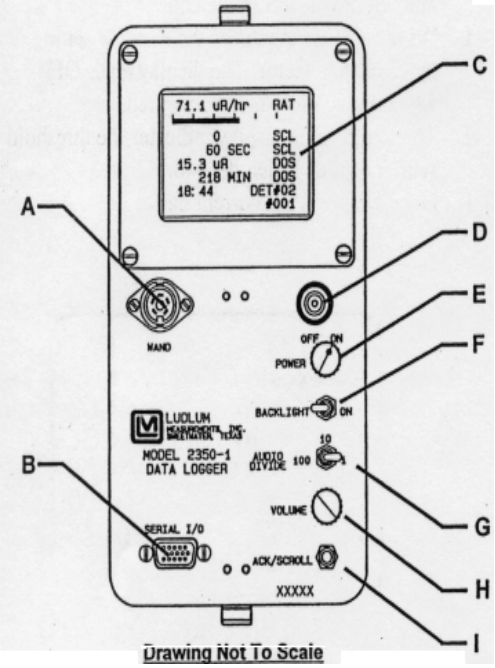
1. Auto-ranging digital rate meter
2. Timed Counter (scaler)
3. Integrated Dose Counter
4. Five decade logarithmic bar graph

All readouts operate from a single input and each display can be enabled or disabled if desired.

Up to sixteen different sets of detector parameters can be stored allowing for quick changing of detectors or operating parameters. Detector readings can be stored in the 1,000 data point memory with identifiers for the date, time, sample number, detector memory with identifiers for the date, time, sample number, detector number and the type of count that was logged. There are also 8 different location code identifiers, which include seven 5 character alphanumeric codes and a five-digit location coordinate. Other features include individual alarms for each readout, click-per-event audio divide and volume control, voltage sensitive amplifier, single channel analyzer, adjustable detector high voltage, adjustable window and threshold, detector overload sensing circuitry, adjustable dead time compensation, calibration constant and response time.

Controlling the Model 2350-1 is done by connection to a keypad. The instrument readout is an eight line by fifteen-character alphanumeric liquid crystal display (LCD). A display backlight can be turned on or off by a toggle switch on the front panel of the instrument. Batteries are externally accessible from the back of the instrument housing for quick and easy replacement when necessary.

2.2 Definitions



A. Wand: A plug that is used to connect an optional bar code reader wand to the instrument.

B. Serial I/O: A 15-pin RS-232 Connector that is used to connect the keypad to the instrument.

C. Display: An 8-line by 15-line character alphanumeric LCD.

D. Connector: Used to connect the detector to the instrument.

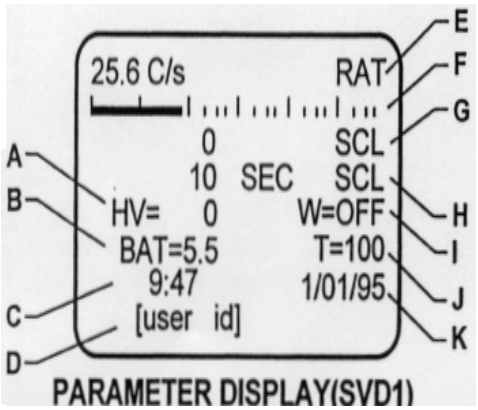
E. Power Switch: A two-position switch used to turn the instrument on and off.

F. Backlight: A two-position toggle switch that is used to turn the display backlight on and off.

G. Audio Divide: A three-position toggle switch that is used to adjust the audio divide between 1, 10, or 100 events-per-click.

H. Volume: A one-turn potentiometer used to adjust the volume of the audio.

I. ACK/Scroll: A pushbutton that is used to silence the audible alarm indicator and scroll through the various displays.



A. High Voltage: Provides a reading of the current HV setting.

B. Battery: Displays the cuurent battery voltage when the battery voltage reads 4.4 volts or less, the message LOW replaces the voltage reading.

C. Clock: Displays the current time of day in twenty-four hour format. If the battery voltage reads 4.4 volts or less the message LO BAT alternates with the time at 1 second intervals.

D. User ID: A 15 character alphanumeric display to allow for individual operator codes.

E. Digital ratemeter: An auto-ranging display. Low and high level alarm indicators (LOW) and (ALM) appear in place of the RAT indicator and the display will alternate at 1-second intervals until the alarm are reset. When overload or over range conditions occur the words OVER LOAD or OVER RANGE appear in place of the ratemeter and the display will alternate at one-second intervals until the condition is corrected. In the event an overload and over range condition occur simultaneously the overload message takes priority.

F. Log Bargraph Display: A bargraph ratemeter display that is presented in cps only and does not have dead time correction applied to it. The display ranges from 1 cps — 100 Kcps. (NOTE: the counting limit of the instrument is 50kcps)

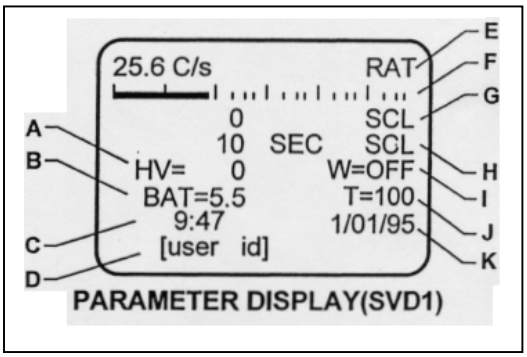
G. Scaler: A six digit gross counter. When a count is being taken the count message (CNT) is shown in place of the scaler indicator (SCL). When the instrument is in the data-logging mode the logging indicator (LOG) is displayed in place of SCL. When in an alarm condition the alarm indicator (ALM) displays and the display will alternate between the ALM and SCL indicators at 1-second intervals.

H. Scaler Time: Then scaler time is displayed on this line. The count time is always displayed in seconds and will do a count down to indicate the amount of time left in the count.

I. Window: This identifies the window setting of the chosen detector. The display reads OFF when the window is not activated.

J. Threshold: This display indicates the threshold setting of the chosen detector.

K. Date: Displays the current date.



A. High Voltage: Provides a reading of the current FIV setting.

B. Battery: displays the current battery voltage. When the battery voltage reads 4.4 volts or less, the message LOW replaces the voltage reading.

C. Clock: Displays the current time of day in twenty-four hour format. If the battery voltage reads 4.4 volts or less, the message LO BAT alternates with the time at 1-second intervals.

D. User ID: A 15 character alphanumeric display to allow for individual operator codes.

E. Digital ratemeter: An auto-ranging display. Low and high level alarm indicators (LOW) and (ALM) appear in place of the RAT indicator and the display will alternate at 1-second intervals until the alarm is reset.

When overload or over range conditions occur the words OVER LOAD or OVER RANGE appears in place of the ratemeter and the display will alternate at one-second intervals until the condition is corrected. In the event an overload and over range condition occur simultaneously the overload message takes priority.

F. Log Bargraph Display: A bargraph ratemeter display that is presented in cps only and does not have dead time correction applied to it. The display ranges from 1 cps — 100 Kcps. (NOTE: The counting limit of the instrument is 50kcps)

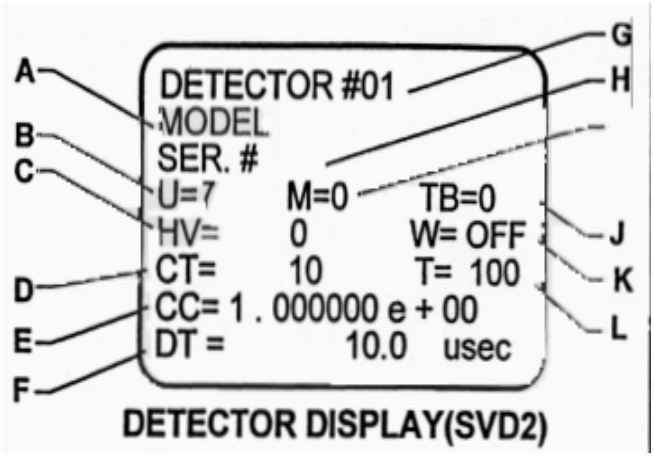
G. Scaler: A six digit gross counter. When a count is being taken the count message (CNT) is shown in place of the scaler indicator (SCL). When the instrument is in the data-logging mode the logging indicator (LOG) is displayed in place of SCL.

H. Scaler Timer: The scaler timer is displayed on this line. The count time is always displayed in seconds and will do a count down to indicate the amount of time left in the count.

I. Window: This identifies the window setting of the chosen detector. The display reads OFF when the window is not activated.

J. Threshold: This display indicates the threshold setting of the chosen detector.

K. Date: Displays the current date.



DETECTOR DISPLAY(SVD2)

A. Model: Used to identify the model number of the detector being used. (44-2, 44-3, etc.)

B. Display Units: Identifies the current display units used by the detector. (R, Sv, counts, etc.)

C. High Voltage: Provides a reading of the current HV setting.

D. Scaler Count Time: Displays the scaler count time in seconds for the detector.

E. Calibration Constant: Indicates the current calibration constant being used by the digital ratemeter and integrated dose counter for the detector.

F. Dead Time: Indicates the current dead time compensation factors that is being used for the detector.

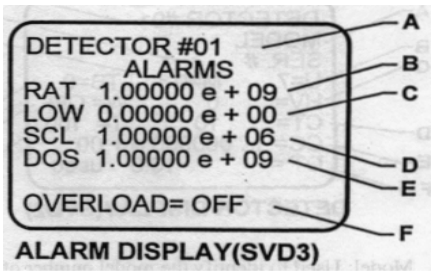
G. Detector: Identifies which detector parameters are being displayed.

H. Serial Number: Used to identify the serial number of the detector being used.

I. Multiplier Code: Identifies the current range multiplier being used. (The display multiplier can be auto ranging read in micro, milli, kilo, etc.)

J. Time Base: Indicates the current time base being used. (seconds, minutes, or hours)

K. Window: This identifies the window setting of the detector. The display reads OFF when the window is not activated. Threshold: This display indicates the threshold setting of the detector.



ALARM DISPLAY(SVD3)

A. Detector: Identifies which detector alarm settings are being displayed.

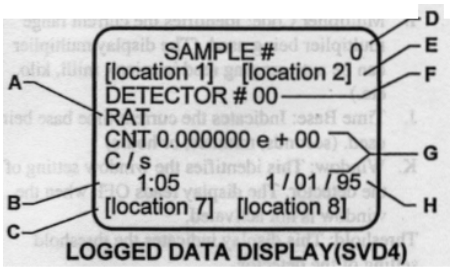
B. Ratemeter Alarm: Indicates the ratemeter alarm setting.

C. Ratemeter low alarm: Indicates the low alarm setting for the ratemeter. This alarm is used to identify a possible detector failure. When the counts from the detector drop below the alarm setpoint the alarm is activated.

D. Scaler Alarm: Indicates the scaler alarm setting.

E. Integrated Dose Alarm: Indicates the alarm setting for the integrated dose counter.

Overload: Indicates the current overloads current setting. When disabled the word OFF appears.



LOGGED DATA DISPLAY(SVD4)

A. Data Source: Identifies the source of the logged data. (i.e. ratemeter, scaler, or integrated dose)

B. Clock: Displays the current time of day in twenty-four hour format. If the battery voltage reads 4.4 volts or less the message LO BAT alternates with the time at 1 second intervals.

C. Location Codes 7&8: Identifies the preset location code 7 and location coordinate 8.

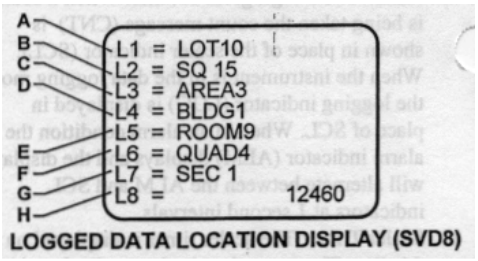
D. Sample Number: Identifies the sample number you are viewing.]

E. Location Code 1 & 2: Identifies the five character alphanumeric location codes 1 & 2. (These are the same codes that appear on the normal display).

F. Detector Number: Identifies the detector used in the logged sample.

G. Logged Count: Displays the actual count taken in exponential format. When ratemeter count or integrated dose count is taken the exposure rate will display. If a scaler count is taken the count time will display.

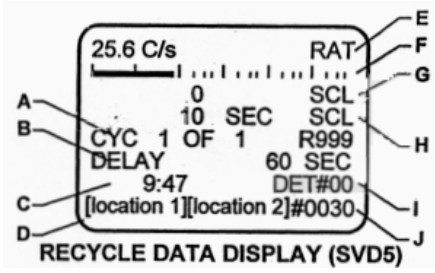
Date: This identifier indicates the current date.



LOGGED DATA LOCATION DISPLAY (SVD8)

This display provides the user with the eight different identifiers for each location. LI - L7 are strings of five alphanumeric characters and L8 is a five digit location coordinate.

A. L1: A five-character alphanumeric location identifier.
B. L2: A five-character alphanumeric location identifier.
C. L3: A five-character alphanumeric location identifier.
D. L4: A five-character alphanumeric location identifier.
E. L5: A five-character alphanumeric location identifier.
F. L6: A five-character alphanumeric location identifier.
G. L7: A five-character alphanumeric location identifier.
H. L8: A 5 digit location coordinate that can have a value from 0-65535 (the location coordinate can be set to automatically change by a set increment when data is logged.



RECYCLE DATA DISPLAY (SVD5)

A. Cycle Counter: Indicates the number of cycles that will be runs the number of the cycle in process, and the number of recycles remaining.

B. Cycle Delay: Indicates the time delay between each cycle.

C. Clock: Displays the current time of day in twenty-four hour format.

D. Location Codes 1 & 2: Identifies the five character alphanumeric location codes settings 1& 2

E. Digital Ratemeter: AN auto-ranging display. Low and high level alarm indicators (LOW) and (ALR) appear in place of the RAT indicator and the display will alternate at 1-second intervals until the alarm is reset. When overload or over range conditions occur the words OVER LOAD or OVER RANGE appears in place of the ratemeter and the display will alternate at one-second intervals until the condition is corrected. In the event an overload and over range condition occur simultaneously the overload message take simultaneously the overload message takes priority.

F. LOG BARGRAPH DISPLAY: A bar graph ratemeter display that is presented in cps only and does not have dead time correction applied to it. The display ranges from 1 cps — 100 kcps. (NOTE: the counting limit of the instrument is 50 kcps)

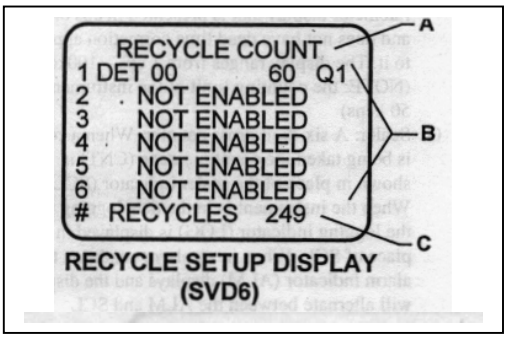
G. Scaler: A six digit gross counter. When a count is being taken the count message (CNT) is shown in place of the scaler indicator (SCL). When the instrument is in the data-logging mode the logging indicator (LOG) is displayed in place of SCL. When in an alarm condition the alarm indicator (ALM) displays and the display will alternate between the ALM and SCL indicators at one-second intervals.

H. Scaler Timer: The scaler timer is displayed on this line. The count time is always displayed in seconds and will do a count down to indicate the amount of time left in the count.

I. Detector Identifier: This identifies which set of detector parameters is currently being used.

J. Logged Reading Indicator: This indicator identifies the number of the last reading logged.

K. Recycle Disable: Indicates that recycle mode has been disabled. (Message replaces the recycle mode parameters)

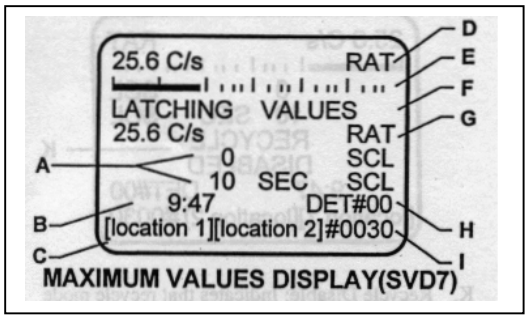


RECYCLE SETUP DISPLAY
(SVD6)

A. Identifier: Indicates that this is the Recycle Setup display.

B. Recycle Setup: Displays the parameters for cycles 1 —6. When enabled the cycle number, detector number, delay time between recycles, and logging mode (i.e. ratemeter, scaler, or integrated dose) are displayed.

C. Recycle Count: Indicates the number of recycles that will run once initiated.



A. Scaler: Displays the maximum scaler count logged and the count time used.

B. Clock: Displays the current time of day in twenty four-hour formats.

C. Location Codes 1 & 2: Identifies the five character alphanumeric location code settings 1 & 2.

D. Digital Ratemeter: An autoranging display. Low and high level alarm indicators (LOW) and (ALM) appear in place of the RAT indicator and the display will alternate at 1-second intervals until the alarm is reset.

When overload or over range conditions occur the words OVER LOAD or OVER RANGE appear in place of the ratemeter and the display will alternate at one-second intervals until the condition is corrected. In the event an overload and over range condition occur simultaneously the overload message takes priority.

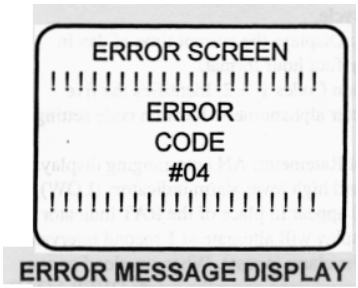
E. Log Bargraph Display: A bar graph ratemeter display that is presented in cps only and does not have dead time correction applied to it. The display ranges from 1 cps — 100 kcps. (NOTE: The counting limit of the instrument is 50 kcps)

F. Display Identifier: Displays the words MAXIMUM VALUES when the maximum values latching mode is off. When activated the words LATCHING VALUES display.

G. Ratemeter: Displays the maximum ratemeter reading logged.

H. Detector Identified: This identifies which set o detector parameters is currently being used.

Logged Reading Indicator: This indicator identifies the number of the last reading logged.



ERROR MESSAGE DISPLAY

COMMAND VERIFICATION DISPLAY

The error message display is activated when one of the following errors occurs.

1. Mathematical bit shift overflow
2. Multiply overflow
3. Divide by zero
4. Dead time multiplied by recorded rate> 1
5. Dead time-corrected count has exceeded 3 bytes
6. Accumulator overflow when adding new count
7. Accumulator overflow when correcting for new time constant
8. Counts per second larger than 4 bytes. This screen can not be called up. It appears alternately with whichever screen is currently active until the error is corrected.

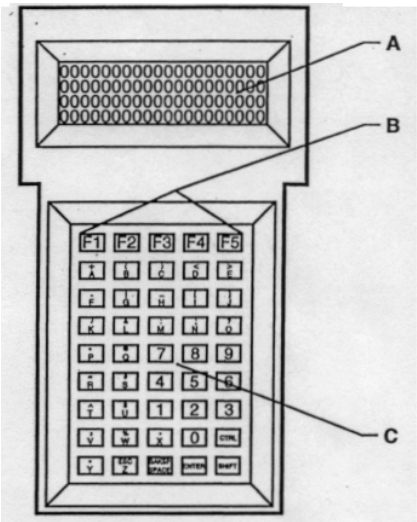
Commands that require the instrument to save parameters to memory or change or delete data require verification The following commands require command verification when executed.

SAA, SAC, SCA, SKD, SP, SSC, SSR

A. Display: 4 line by 20 character LCD display

B. Function Keys: Programmable multi-talk function keys

Keypad: 40 key complete alphanumeric soft-touch keypad



2.3 Quality Control

2.3.1 Annual Calibration

2.3.2 Daily Quality Control Check

3.0 REFERENCES, RECORDS AND EQUIPMENT

3.1 References

3.1.1 TM-001-00-20, Operation of Contamination Survey Meters
3.1.2 FM-020-09-20, Radiation and Contamination Survey Techniques
3.1.3 Manufacturer's Instruction Manual(s) for the Ludlum Model 2350-1 Data Logger

3.2 Records

3.2.1 NWT-01, Radiological Survey Report – Electronic Data Collection
3.2.2 NWT-003, Daily Instrument Performance Test Log Sheet

3.3 Equipment

For Alpha Measurements	For Beta Measurements	For Gamma Measurements	For Alpha/beta/gamma Measurements
Model 43-1	Model 43-20	Model 44-2	Model 44-7
Model 43-2	Model 43-68	Model 44-3	Model 44-9
Model 43-5	Model 44-1	Model 44-6	Model 44-88
Model 43-20	Model 44-6	Model 44-7	Model 44-89
Model 43-44	Model 44-7	Model 44-9	
Model 43-44-1	Model 44-9	Model 44-10	
Model 43-65	Model 44-21	Model 44-17	
Model 43-68	Model 44-38	Model 44-20	
Model 43-90	Model 44-88	Model 44-21	
Model 44-7	Model 44-89	Model 44-38	
Model 44-9	Model 44-92	Model 44-62	
Model 44-88	Model 44-94		
Model 44-89	Model 44-98		
Model 44-94	Model 44-116		

4.0 RESPONSIBILITIES AND QUALIFICATIONS

4.1 Responsibilities

4.1.1 NWT Radiological Field Operations Manager

4.1.1.1 Implementation of this procedure.

4.1.1.2 Periodic reviews of adherence to the requirements of this procedure.

4.1.1.3 Ensure Health Physics Technicians are qualified by training and experience to perform the requirements of this procedure.

4.1.2 Health Physics Supervisors

4.1.2.1 Perform periodic surveillance of the use and maintenance of the instrument.

4.1.2.2 Ensure the instrument is calibrated at specified intervals.

4.1.2.3 Ensure that records pertaining to the instrument are maintained on file throughout the duration of the project and copies retained in the permanent project file.

4.1.3 Health Physics Technicians

4.1.3.1 Performance of the requirements in Section 6.1, and 6.3 of this procedure.

4.1.3.2 Documentation of all records in this procedure.

4.1.3.3 Notification to Health Physics Supervision of any unsafe or unusual conditions observed during operation of the instrument.

4.1.4 Health Physics Instrument Personnel

4.1.4.1 Perform the requirements of Sections 6.2, 6.3, and 6.4 of this procedure.

4.2 Qualifications

4.2.1 Health Physics Technicians shall be qualified in accordance with the requirements of ANSI 3.1 - 1987 to operate this instrument for any of the following: Surveys, radiation work permits and job coverage.

4.2.2 Junior Health Physics and Decontamination Technicians may operate this instrument under direct supervision of a Health Physics Technician meeting the requirements of Section 4.2.1.

5.0 PROCEDURE

5.1 Precautions and Limitations

5.1.1 In the event of complete loss of power to the instrument, the Ludlum Model 2350-1 shall require re-programming.

5.1.2 The Ludlum Model 2350-1 is portable and requires four "D" cell batteries to operate.

5.1.3 Calibration shall be performed annually, after maintenance is performed, if the instrument fails the performance test or if proper operation is in question.

5.1.4 The instrument shall be performance tested daily when in use per TM-001-00-20, Operation of Contamination Survey Meters

5.2 Operation

5.2.1 Inspect the instrument for any obvious physical damage, which could interfere with its proper operation. It should include inspecting for loose, damaged knobs, buttons, broken cables, etc.

5.2.2 Battery Installation

The battery compartment is accessible from the back side of the instrument housing. When battery change out is necessary (<5.2 volts), proceed as follows:

a. Ensure that the power switch is in the OFF position. Open the battery lid by turning the thumb screw counterclockwise ¼ turn.

b. Install four "D" cell batteries in the compartment making sure to align the (+) and (-) marks on the battery door with the markings on the batteries.

c. Close the battery door and latch it by turning the thumbscrew ¼ turn clockwise until it latches firmly. Turn the power on. The instrument will perform a LCD check causing the display to go black then it will initiate a memory check. Once this has been completed the instrument will momentarily display the current battery voltage and then the last screen that was active when the instrument w~ turned off. Once this process is complete, turn the instrument off and connect it to the keypad and or bar code reader or connect it directly to a computer.

d. When batteries need to be replaced insure that the instrument is turned off and batteries are replaced as quickly as possible. The parameter memory is protected by a backup power supply for approximately 15 minutes before data is lost.

5.1.3 Keypad Setup

Connect the keypad to the Model 2350-1. Do not connect the detector.

5.1.4 Turn the Model 2350-1 ON. Read the battery voltage and CPU check on the meter display.

5.1.5 Press the F3 key on the keypad to produce the Detector Display on the meter. Verify that the model and the serial number shown match the detector you are planning to use. If it does not match, enter "Dx" on the keypad, where x is the detector number for your detector. These detector numbers are shown on the calibration sheets for the 2350-1.

5.1.6 Once the correct detector is shown on the meter's display, power off, then connect the detector to the 2350-1, then power on.

5.1.7 The various displays available on the 2350-1 are shown in Section 2.2, Definitions. The SVD0 display is normally used during surveys. Obtain the display by 1) hit SVD0 (enter) on the keypad, or 2) hit F1 on the keypad.

5.1.8 Perform any necessary source checks per TM-001-0-20.

5.1.9 Follow survey instructions in the survey work plan.

5.1.10 When logging survey data, use the command list given in the Attachment or in the Ludlum instruction manual.

5.1.11 When downloading logged data, use the command list given in the Attachment or in the Ludlum instruction manual.

6.0 RECORDS

Form NWT- 01, Electronic Data Collection, Radiological Survey Report

Attachment 1
Model 2350-1 Command Descriptions

LUDLUM MODEL 2350-1
DATA LOGGER
COMMAND DESCRIPTIONS

September 1995
Serial No. 126167 and succeeding
serial numbers

CPU Software Version 37122N20
Interface Software Version 37123N04

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SC - Sets the calibration constant 42
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G	9	RG	24
H	9	RH	25
I	10	RI	25
J	10	RJ	26
K	11	RK	26
L	11	RL	27
M	12	RM	27
N	12	RN	27
O	13	RO	28
P	13	RP	29
SAL	41	RCA	15
SB	41	RSB	29
SC	42	RSC	30
SD	42	RSD	30
SE	43	RSE	30
SID	44	RID	25
SL	45	RSL	31
SM	46	RSM	31
SNE	46	REN	21
SNI	46	RNI	28
SR	48	RSR	33
SSP	51	RSP	32
ST	53	RST	35
SU	53	RSU	35
SVC	54	RVC	36
SVM	55	RVM	37
SXG	56	RXG	38
SY	56	RSY	36
T	57	RT	36
W	57	RW	38

COMMANDS BY ACCESS LEVEL

Level 1	Pg No.
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D	7
E	8
F	8
I	10
J	10
K	11
L	11
P	13
Q	14
RBV	14
RCA	15
RCB	15
RCD	16
RCI	16
RCR	16
RCS	17
RCT	17
RD	17
REN	21
RF	24
RG	24
RH	25
RI	26
RID	25
RIO	26
RJ	26
RK	26
RL	27
RM	27
RN	27
RNI	28
RO	28
RP	29
RR	29
RSB	29
RSC	30
RSD	30
RSE	30
RSL	31

Level 1	Pg No.
RSM	31
RSN	32
RSP	32
RSQ	33
RSR	33
RSS	34
RST	35
RSU	35
RSY	36
RT	36
RVC	36
RVM	37
RVR	37
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SSC	49
SSE	50
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SSQ	51
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SVM	55
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REF	19
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REM	20
REO	21
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REQ	22
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RET	23
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SC	42
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SKB	44
SKD	45
SL	45
SM	46
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SSB	48
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M	12
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RCR	16
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REL	20
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RET	23
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RG	24
RH	25
RI	25
RID	25
RIO	26
RJ	26
RK	26
RL	27
RM	27
RN	27
RNI	28
RO	28
RP	29
RR	29
RSB	29

Read Commands	Page No.
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RSD	30
RSE	30
RSL	31
RSM	31
RSN	32
RSP	32
RSQ	33
RSR	33
RSS	34
RST	35
RSU	35
RSY	36
RT	36
RVC	36
RVM	37
RVR	37
RVS	37
RW	38
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O	13
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REO	21
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H	9
M	12
N	12
RD	17
REC	18
RED	19
REF	19
RH	25
RM	27

Detector Commands	Page No.
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RR	29
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RSL	31
RT	36
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SM	46
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SSF	50
SSG	50
SY	56
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C	7
E	8
F	8
RCS	17
RCT	17
RF	24

C

FUNCTION: Starts a scaler count

SYNTAX: C[ENTER]

ACCESS LEVEL: 1

COMMENTS: The scaler can be viewed on the Main Display (SVD0), Parameters Display (SVD1), Recycle Data Display (SVD5), or the Maximum Values Display (SVD7). When a scaler count is started, the scaler reading will go to zero and then the count will begin.

D

FUNCTION: Recalls a stored detector setup as the active detector.

SYNTAX: D(x)[ENTER]
Where (x) equals some whole number from 0 - 15.

> **NOTE: When using this command the detector should be disconnected from the instrument to prevent possible damage due to the possible change in the high voltage setting**

ACCESS LEVEL: 1

COMMENTS: There is capacity for sixteen different detector setups. The primary detector number is shown on the Main Display (SVD0), Detector Display (SVD2), Alarm Display (SVD3), Recycle Data Display (SVD5), or the Maximum Values Display (SVD7).

E

FUNCTION: Stops a scaler count in progress.

SYNTAX: E [ENTER]

ACCESS LEVEL: 1

COMMENTS: When executed this command will stop the scaler count in progress and the timer will reset to its original setting.

F

FUNCTION: Sets the scaler count time.

SYNTAX: F(x)[ENTER]
Where (x) equals some whole number from 1 - 65,535 seconds.

ACCESS LEVEL: 1

COMMENTS: The scaler count time can be set at any point from 1 - 65,535 seconds in one second intervals. The scaler timer is shown on the Main Display (SVD0), Parameters Display (SVD1), Detector Display (SVD2), Recycle Data Display (SVD5), or the Maximum Values Display (SVD7).

G

FUNCTION: Sets the ratemeter response time.

SYNTAX: G(x)[ENTER]
Where (x) equals some whole number from 0 - 2.
0 = Slow response
1 = Fast response
2 = Fixed response

ACCESS LEVEL: 2

COMMENTS: The Slow and Fast response times use a variable time constant that fluctuates based on the number of incoming counts. The fixed time constant is adjustable from 1 - 127 seconds in one second intervals. See related command SXG.

H

FUNCTION: Sets the detector high voltage.

SYNTAX: H(x)[ENTER]
Where (x) equals some whole number from 0 - 2500 volts.

ACCESS LEVEL: 2

COMMENTS: The voltage can be adjusted in one volt increments by using the "+" or "-" signs for the (x) value in place of a number. Each of the sixteen detector setups has its own high voltage setting. The current high voltage setting can be seen on the Parameters Display (SVD1), or the Detector Display (SVD2).

I

FUNCTION: Sets the user identification code.

SYNTAX: I(x)[ENTER]
Where (x) equals some alphanumeric character string of up to 15 characters.

ACCESS LEVEL: 1

COMMENTS: The user ID is downloaded with the logged data. The current user ID is shown on the Parameters Display (SVD1), or the Logged Data Display (SVD4).

J.

FUNCTION: Sets the ratemeter alarm.

SYNTAX: J(x) [ENTER]
Where (x) equals some number from 10^{-30} - 10^{30} .

ACCESS LEVEL: 1

COMMENTS: The ratemeter alarm can be entered as a whole number or in exponential format. Each detector setup has its own ratemeter alarm setting. The alarm setting is shown or the Alarm Display (SVD3).

K

FUNCTION: Sets the scaler alarm.

SYNTAX: K(x) [ENTER]
Where (x) equals some number from 1 - 4294967295 counts.

ACCESS LEVEL: 1

COMMENTS: The scaler alarm can be entered as a whole number or in exponential format. Each detector setup has its own scaler alarm setting. The alarm setting is shown on the Alarm Display (SVD3).

L

FUNCTION: Sets the location codes.

SYNTAX: L(a)(x) [ENTER]
Where (a) = a whole number from 1 - 8
For L1 - L7 (x) equals any alphanumeric string with up to 5 characters.
For L8 (x) equals any number from 0 - 65535

ACCESS LEVEL: 1

COMMENTS: The location codes allow for up to 8 different location identifiers for each set of logged data. L1 - L7 can have a string of up to five alphanumeric characters to identify each point and L8 is a location coordinate.

M

FUNCTION: Sets the detector model number.

SYNTAX: M(x) [ENTER]
Where (x) equals any alphanumeric string with up to 9 characters.

ACCESS LEVEL: 3

COMMENTS: Each detector setup has its own model number. The detector model number is shown on the Detector Display (SVD2).

N

FUNCTION: Sets the detector serial number.

SYNTAX: N(x) [ENTER]
Where (x) equals any alphanumeric string with up to 9 characters.

ACCESS LEVEL: 2

COMMENTS: Each detector setup has its own detector serial number. The detector serial number is shown on the Detector Display (SVD2).

O

FUNCTION: Sets the overload alarm.

SYNTAX: O(x) [ENTER]
Where (x) equals any number from 0 - 400.

ACCESS LEVEL: 3

COMMENTS: The 0 - 400 range represents a current from 0 - 40 microamperes. To turn the overload on replace the number (x) with ON, to turn the overload off replace the number (x) with OFF. The overload can also be increased or decreased in increments of 0.1 by using a "+" or "-" for (x).

EXAMPLES:
OON[ENTER]- Turns the overload alarm on
OOOF[ENTER]- Turns the alarm off
O+[ENTER]- increases the alarm setting by 0.1 (29.0 to 29.1)
O-[ENTER]- Decreases the alarm setting by 0.1 (29.0 to 28.9)

P

FUNCTION: Sets the integrated dose alarm.

SYNTAX: P(x) [ENTER]
Where (x) equals some number from 10^{-30} - 10^{30} .

ACCESS LEVEL: 1

COMMENTS: The integrated dose alarm can be entered as a whole number or in exponential format. Each detector setup has its own integrated dose alarm setting. The alarm setting is shown or the Alarm Display (SVD3).

Q

FUNCTION: Logs a ratemeter, scaler, or integrated dose count.

SYNTAX: Q(x) [ENTER]
Where (x) equals a number from 0 - 2 .
0 = ratemeter
1 = scaler
2 = integrated dose

ACCESS LEVEL: 1

COMMENTS: When this command is given the appropriate count is logged and the instrument automatically increments to the next sample number. If the data logging memory is full the message FULL will display in place of the sample number.

RBV

FUNCTION: Reads the instrument battery voltage.

SYNTAX: RBV [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed, a number from 0 - 6.2 will display on the keypad display or computer screen. This number represents the actual battery voltage in volts. A reading of 4.4 volts or less indicates the endpoint of the batteries and they should be changed.

RCD

FUNCTION: Reads the integrated dose elapsed time.

SYNTAX: RCD [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 64768 minutes will display on the keypad display or computer screen.

RCI

FUNCTION: Reads the integrated dose counter.

SYNTAX: RCI [ENTER]

RCS

FUNCTION: Reads the scaler count.

SYNTAX: RCS [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed the scaler count displays on the keypad display or computer screen. The instrument display has a maximum display of 999999 counts but the actual count,accurate to ten digits will display on the keypad display or computer screen.

RCT

FUNCTION: Reads the remaining scaler count time.

SYNTAX: RCT [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 65535 seconds is displayed on the keypad display or computer screen.

RD

FUNCTION: Reads the detector number of the active detector setup.

SYNTAX: RD [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 15 will display on the keypad display or computer screen.

REC

FUNCTION: Reads all of the detector setups in binary format.

SYNTAX: REC [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed a binary string of 848 bytes is dumped. The keypad will not read this correctly so the instrument should be connected to a computer or other device that is capable of reading 8 bit binary data with values ranging from 0 - 255. The data represents the detector setups in the following order:

# OF STRINGS	STRING	STRING LENGTH
16	Model number	10 (characters)
16	Serial number	10 (characters)
16	Display units	2 (integer)
16	Range multiplier	2 (integer)
16	Time base	2 (integer)
16	High voltage	2 (integer)
16	Window	2 (integer)
16	Scaler count time	2 (integer)
16	Threshold	2 (integer)
16	Calibration constant	4 (float)
16	Dead time	4 (float)
16	Ratemeter alarm	4 (float)
16	Low ratemeter alarm	4 (float)
16	Scaler alarm	4 (float)
16	Integrated dose alarm	4 (float)
16	Overload alarm	2 (integers)

RED

FUNCTION: Reads the active detector setup parameters.

SYNTAX: RED [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed, all parameters of the current detector setup are displayed in ASCII format in the following order:

Detector setup number	Model number
Serial number	Units
Range	Time base
High voltage	Window
Count time	Threshold
Calibration constant	Dead time
Ratemeter alarm	Low ratemeter alarm
Scaler alarm	Integrated dose alarm
Overload alarm	

REF

FUNCTION: Reads all of the detectors parameters .

SYNTAX: REF [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed all sixteen detector setups are displayed in fixed length ASCII format.

REL

FUNCTION: Reads the logged memory (ASCII).

SYNTAX: REL [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed all of the logged data is dumped as a series of strings. Each sample is separated by a $ sign. At 9600 baud all 1000 samples will be dumped in about three minutes.

I.D. Number	Sample Number
Location Code	Month
Day	Year
Hour	Minute
Detector Number	Logged Count
Scaler Count Time	Logging Mode
Instrument Status	

REM

FUNCTION: Reads the logged memory (formatted).

SYNTAX: REM [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed all of the logged data is dumped in a formatted series of strings with commas separating each variable in the string. This command is useful when data is being dumped to a printer. Data is presented in the following format:

Logged data from Model 2350-1 serial number 123456
User I.D:

Sample #	,Location Code	, Month	, Day ,
Year	, Hours	, Minutes	,Detector Setup#,
Logged Reading	, Count time	, Logging Mode	, M2350-1 status

REN

FUNCTION: Reads the instrument serial number.

SYNTAX: REN [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 999999 will show on the keypad display or computer screen.

REO

FUNCTION: Reads the logged data with all location code identifiers.

SYNTAX: REO [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed the logged data is dumped to the serial port with all eight location code identifiers, and the time down to a 2 second interval.

REP

FUNCTION: Reads the logged data with all location code identifiers.

SYNTAX: REP [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed the logged data is dumped to the serial port with all eight location code identifiers.

REQ

FUNCTION: Reads the logged memory (binary).

SYNTAX: REQ [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed all of the logged data is dumped in a binary string. The keypad will not read this correctly so the instrument should be connected to a computer or other device that is capable of reading 8 bit binary data with values ranging from 0 - 255.

# OF STRINGS	STRING	STRING LENGTH
1 - 1000	Location code	10 characters
1 - 1000	Log time	2 integer
1 - 1000	Log count data	4 float
1 - 1000	Scaler count time	2 integer
1 - 1000	Logging mode & detector number	1 character
1 - 1000	Instrument status	1 character
1 - 10	Sample no. of date change	2 integer
1 - 10	Month	1 character
1 - 10	Day	1 character
1 - 10	Year	1 character

RES

FUNCTION: Reads the logged memory (ASCII).

SYNTAX: RES [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed all of the logged data is dumped in a formatted series of strings with commas separating each variable in the string. This command differs from REL in that the time stamp is to the nearest 2 seconds instead of the nearest minute. This command is useful when data is being dumped to a printer. Each sample is separated by a carriage return and a line feed. The strings are formatted as follows:

I.D. Number, Sample Number, Location Code, Month, Day, Year, Hour, Minute, Second, Detector Number, Logged Count, Scaler Count Time, Logging Mode, Instrument Status

---

RET

FUNCTION: Reads the logged memory (formatted).

SYNTAX: RET [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed all of the logged data is dumped in a formatted series of strings with commas separating each variable in the string. This command is useful when data is being dumped to a printer. Data is presented in the following format:

Logged data from Model 2350-1 serial number 123456
User I.D:

Sample #	,Location Code	, Month	, Day ,
Year	, Hours	, Minutes	,Seconds ,
Detector Setup#	,Logged Reading	, Count time	, Logging Mode ,
M2350-1 status	,		

RF

FUNCTION: Reads the scaler count time.

SYNTAX: RF [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 65535 seconds will show on the keypad display or computer screen. The scaler count time is shown on the Main Display (SVD0), Parameters Display (SVD1), Detector Display (SVD2), Recycle Data Display (SVD5), and the Maximum Values Display (SVD7).

RG

FUNCTION: Reads the ratemeter response time.

SYNTAX: RG [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 2 will show on the keypad display or computer screen.

0 = Slow response
1 = Fast response
2 = Fixed response

The ratemeter response time is shown on the Detector Display (SVD2).

RH

FUNCTION: Reads the detector high voltage setting.

SYNTAX: RH [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 2500 volts will show on the keypad display or computer screen. The detector high voltage is shown on the Parameters Display (SVD1), and Detector Display (SVD2).

RI

FUNCTION: Reads the user identification code.

SYNTAX: RI [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed an alphanumeric string of up to 15 characters will show on the keypad display or computer screen. The user I.D. is shown on the Parameters Display (SVD1), and the Logged Data Display (SVD4).

RID

FUNCTION: Reads the integrated dose on/off status.

SYNTAX: RID [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 1 will show on the keypad display or computer screen.
0 = Off 1 = ON

RIO

FUNCTION: Reads the I/O board firmware number.

SYNTAX: RIO [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed the number of the firmware is shown on the keypad display or computer screen.

RJ

FUNCTION: Reads the ratemeter alarm setting.

SYNTAX: RJ [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from $10e^{-30}$ - $10e^{30}$ shows on the keypad display or computer screen. Each detector setup has its own ratemeter alarm setting.

RK

FUNCTION: Reads the scaler alarm setting.

SYNTAX: RK [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 1 - 4294967295 shows on the keypad display or computer screen. Each detector setup has its own scaler alarm setting.

RL

FUNCTION: Reads the location code.

SYNTAX: RL [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed an alphanumeric string of up to ten characters will be displayed on the keypad display or computer screen.

RM

FUNCTION: Reads the detector model number.

SYNTAX: RM [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed an alphanumeric string of up to nine characters is displayed on the keypad display or computer screen.

RN

FUNCTION: Reads the detector serial number.

SYNTAX: RN [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed an alphanumeric string of up to nine characters is displayed on the keypad display or computer screen.

RNI

FUNCTION: Reads the L8 location code auto-increment value.

SYNTAX: RNI [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 2500 will display on the keypad display or computer screen. This number represents the value by which the L8 number will change when set up to increment automatically when data is logged.

RO

FUNCTION: Reads the overload alarm setting.

SYNTAX: RO [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 400 is displayed on the keypad display or computer screen. Along with this number there is another number from 0 - 1. This number identifies if the alarm is on or off.

0 = Off
1 - On

The number from 0 - 400 is a representation of the alarm setting in microamperes from 0 - 40. The alarm can be adjusted in tenths of a microampere.

RP

FUNCTION: Reads the integrated dose alarm setting.

SYNTAX: RP [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from $10e^{-30}$ - $10e^{30}$ counts shows on the keypad display or computer screen. Each detector setup has its own integrated dose alarm setting.

RR

FUNCTION: Reads the raw counts from the detector.

SYNTAX: RR [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed the detector count rate is displayed on the keypad display or computer screen.

RSB

FUNCTION: Reads the ratemeter time base setting.

SYNTAX: RSB [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 2 will display on the keypad display or computer screen. Each detector setup has its own ratemeter time base setting.

0 = seconds
1 = minutes
2 = hours

RSC

FUNCTION: Reads the calibration constant.

SYNTAX: RSC [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 10^{-30} - 10^{30} shows on the keypad display or computer screen. Each detector setup has its own calibration constant.

RSD

FUNCTION: Reads the date.

SYNTAX: RSD [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed the date is displayed on the keypad display or computer screen.

RSE

FUNCTION: Reads which counters are being displayed.

SYNTAX: RSE [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 7 is displayed on the keypad display or computer screen.

0 = All counters off
1 = Ratemeter only
2 = Scaler only
3 = Ratemeter and scaler
4 = Integrated dose only
5 = Ratemeter and integrated dose
6 = Scaler and integrated dose
7 = All counters on

RSL

FUNCTION: Reads the dead time constant.

SYNTAX: RSL [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 10^{-12} - 1 seconds shows on the keypad display or computer screen. Each detector setup has its own dead time constant setting.

RSM

FUNCTION: Reads the ratemeter multiplier setting.

SYNTAX: RSM [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 7 displays on the keypad display or computer screen. Each detector setup has its own ratemeter multiplier setting.

0 = Auto ranging
1 = micro
2 = (m)illi
3 = None
4 = (k)ilo
5 = (M)ega
6 = (G)iga
7 = (T)era

RSN

FUNCTION: Reads the central processor (CP) firmware number.

SYNTAX: RSN [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed the firmware number for the CP board is displayed on the keypad display or computer screen.

RSP

FUNCTION: Reads the optional pushbutton logging operation.

SYNTAX: RSP [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 2 will display on the keypad display or computer screen.

0 - Logs a ratemeter count
1 - Logs a scaler count
2 - Logs a integrated dose count

RSQ

FUNCTION: Reads a count from a recycle.

SYNTAX: RSQ [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a series of numbers formatted in the following manner display on the keypad display or computer screen.

w, x, y, z
w = Cycle number (1 - 6)
x = Detector number (0 - 15)
y = Delay in seconds (0 - 65535)
z = Logging mode (0 - 2)
0 = Logs a ratemeter count
1 = Logs a scaler count
2 = Logs a integrated dose count

RSR

FUNCTION: Reads the number of active sub-cycles in a recycle.

SYNTAX: RSR [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 1 - 6 will display on the keypad display or computer screen.

RSS

FUNCTION: Reads a instrument alarm status.

SYNTAX: RSS(x) [ENTER]
Where (x) is a number from 0 - 1
0 = status byte 1
1 = status byte 2

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 255 is displayed on the keypad display or computer screen. To interpret the value returned the user must convert the number to its 8 bit binary format with bit 0 being the least significant digit.

(x) = 0	(x) = 1
Bit 0 = Ratemeter alarm	Bit 0 = Ratemeter alarm
Bit 1 = Scaler alarm	Bit 1 = Scaler Alarm
Bit 2 = Integrated dose alarm	Bit 2 = Integrated dose alarm
Bit 3 = Scaler overflow alarm	Bit 3 = Low ratemeter alarm
Bit 4 = ID overflow alarm	Bit 4 = ID overflow alarm
Bit 5 = Low battery alarm	Bit 5 = Low battery alarm
Bit 6 = Overrange alarm	Bit 6 = Overrange alarm
Bit 7 = Overload alarm	Bit 7 = Overload alarm

EXAMPLE: The user executes the command RSS and the number 154 is displayed. The binary equivalent of the number 154 is 10011010. When compared to the chart where (x) = 0 and starting with the least significant digit the alarm status is as follows:

Ratemeter alarm -	No
Scaler alarm -	Yes
ID alarm -	No
Scaler overflow alarm -	Yes
ID overflow alarm -	Yes
Low battery alarm -	No
Overrange alarm -	No
Overload alarm -	Yes

RST

FUNCTION: Reads the time.

SYNTAX: RST [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed the time is displayed on the keypad display or computer screen in twenty-four hour format.

RSU

FUNCTION: Reads the ratemeter and integrated dose units.

SYNTAX: RSU [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 9 is displayed on the keypad display or computer screen.

0 = (r)ad
1 = (G)ray
2 = rem
3 = Sv
4 = R
5 = C/kg
6 = (d)isintegrations
7 = (c)ounts
8 = Ci/cm²
9 = Bq/cm²

RSY

FUNCTION: Reads the number of recycles setpoint.

SYNTAX: RSY [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 999 is displayed on the keypad display or computer screen.

RT

FUNCTION: Reads the detector threshold setting.

SYNTAX: RT [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 1000 is displayed on the keypad display or computer screen. The threshold setting is shown on the Parameters Display (SVD1), and the detector Display (SVD2).

RVC

FUNCTION: Reads the low ratemeter alarm setting.

SYNTAX: RVC [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 10^{-30} - 10^{30} is displayed on the keypad display or computer screen.

RVM

FUNCTION: Reads the Maximum values latching mode.

SYNTAX: RVM [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 0 - 1 is displayed on the keypad display or computer screen.
0 = Latching mode off
1 = Latching mode on

RVR

FUNCTION: Reads the maximum ratemeter value.

SYNTAX: RVR [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 10^{-30} - 10^{30} is displayed on the keypad display or computer screen representing the maximum ratemeter reading.

RVS

FUNCTION: Reads the maximum scaler reading.

SYNTAX: RVS [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a number from 1 - 4294967295 counts is displayed on the keypad display or computer screen representing the maximum scaler reading.

RW

FUNCTION: Reads the detector window setting.

SYNTAX: RW [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a set of numbers (x,y) are displayed on the keypad display or computer screen.
x = Window setting; any number from 0 - 1000
y = 0; Window is OFF
y = 1; Window is ON

RXG

FUNCTION: Reads the ratemeter response time.

SYNTAX: RXG [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed one of the following responses will be displayed on the keypad display or computer screen.

If the response time is set to FAST or SLOW the response to the command is "VARIABLE"

If the response time is fixed the response to the command will be a number from 1 - 127 seconds

SAA

FUNCTION: Sets the access level and security codes to their default values.

SYNTAX: SAA(x) [ENTER]
Where (x) is the current security code
x = Any number from 0 - 65535

ACCESS LEVEL: 1

COMMENTS: The security code is set to 0 and the access level is set to 3. The current security code must be entered for the command to be executed.

SAC

FUNCTION: Sets the security code.

SYNTAX: SAC(x) [ENTER]
Where (x) = any number from 0 - 65535

ACCESS LEVEL: 3

COMMENTS: The security code is available to prevent unauthorized access level changes. When the security code is changed the command verification display will appear.

SAD

FUNCTION: Sets and starts an auto dump.

SYNTAX: SAD(x, y, z) [ENTER]
Where:
(x) = any number from 0 - 1
0 = Auto dump model off
1 = Auto dump mode on
(y) = any number from 1 - 10
1 = Ratemeter dump
2 = Scaler dump
3 = Ratemeter & scaler dump
4 = Integrated dose dump
5 = Ratemeter & integrated dose dump
6 = Scaler & integrated dose dump
7 = Ratemeter, scaler, & integrated dose dump
8 = Raw cps dump
9 = Ratemeter & raw cps dump
10 = Scaler
(z) = Any number from 1 - 65535 seconds

ACCESS LEVEL: 2

COMMENTS: The numbers x y and z are separated by a space. There is no space between the command and the number x. Scaler dump # 2 differs from scaler dump #10 in that it is set so that a reading is dumped according to the time z. Scaler dump #10 is set to dump only after a scaler count is complete and the time z has expired.

SAL

FUNCTION: Sets the access level.

SYNTAX: SAL(x) (y) [ENTER]
Where (x) = any number from 1 - 3
(y) = the user security code

ACCESS LEVEL: 1

COMMENTS: When entering the command there is no space between the command and the access level number. There is, however, a space between the access level and the security code.

SB

FUNCTION: Sets the ratemeter time base.

SYNTAX: SB(x) [ENTER]
Where (x) = any number from 0 - 2
0 = seconds
1 = minutes
2 = hours

ACCESS LEVEL: 3

COMMENTS: When executed this command sets the ratemeter time base to seconds, minutes, or hours.

SC

FUNCTION: Sets the calibration constant.

SYNTAX: SC(x) [ENTER]
Where (x) = any number from 10^{-30} - 10^{30}

ACCESS LEVEL: 3

COMMENTS: A separate calibration constant is stored with each detector setup. Calibration constant settings are shown on the Detector Display (SVD2).

SD

FUNCTION: Sets the date.

SYNTAX: SD(x) [ENTER]
Where (x) = the date in mm/dd/yy or mm-dd-yy format.

ACCESS LEVEL: 2

SE

FUNCTION: Sets which counters are displayed.

SYNTAX: SE(x) [ENTER]
Where (x) = a number from 0 - 7
0 = All counters off
1 = Ratemeter only
2 = Scaler only
3 = Ratemeter and scaler
4 = Integrated dose only
5 = Ratemeter and integrated dose
6 = Scaler and integrated dose
7 = All counters on

ACCESS LEVEL: 2

COMMENTS: All counters are displayed on the Main Display (SVD0). All counters are still active regardless of whether they are displayed or not.

SHR

FUNCTION: Starts the high voltage ramp routine.

SYNTAX: SHR(x) [ENTER]
Where (x) = any number from 0 - 1
0 = Results will not dump to serial port
1 = Results will dump to serial port

ACCESS LEVEL: 3

COMMENTS: This routine is ideal for running plateaus or peaking a detector for a particular isotope. For detailed instructions on operating the routine please look in the Calibration Routines section of the Routines, Parts List, and Schematic Manual.

SID

FUNCTION: Turns the integrated dose counter on or off.

SYNTAX: SID(x) [ENTER]
Where (x) = a number from 0 - 1
0 = Integrated dose counter off
1 = Integrated dose counter on

ACCESS LEVEL: 1

COMMENTS: When this command is executed it will either enable or disable the counter completely. When turned off the integrated dose counter will not accumulate counts or time.

SIZ

FUNCTION: Resets the integrated dose counter to zero.

SYNTAX: SIZ [ENTER]

ACCESS LEVEL: 2

COMMENTS: When this command is executed the integrated dose counter and timer is reset to zero. All integrated dose alarms are set to zero as well.

SKB

FUNCTION: Starts the cal constant and dead time routines with background subtract.

SYNTAX: SKB [ENTER]

ACCESS LEVEL: 3

COMMENTS: This routine uses the hi-lo method. For more information on this routine please see the calibration routines section of the Routines, Parts List, and Schematics Manual.

SKD

FUNCTION: Sets the current detector setup to default values.

SYNTAX: SKD [ENTER]

ACCESS LEVEL: 3

COMMENTS: All detector parameters for the active detector setup are reset to their default values. These values are as follows:

Model = (blank)	Threshold = 100
Serial number = (blank)	Cal. constant = 1.000000e+00
Display units = 7	Dead time = 0.000000e+00
Display multiplier = 0	Ratemeter Alarm = 10^9
Display time base = 0	Low ratemeter alarm = 0
High voltage = 0	Scaler alarm = 10^6
Window = 1000, OFF	Integrated dose alarm = 10^9
Scaler count time = 10	Overload alarm = 400, OFF

SL

FUNCTION: Sets the detector dead time.

SYNTAX: SL(x) [ENTER]
Where (x) = any number from 10^{-12} - 1

ACCESS LEVEL: 3

COMMENTS: To turn the dead time correction off, set the value to zero. Each detector setup has its own dead time correction factor. The dead time setting is shown on the Detector Display (SVD2).

SM

FUNCTION: Sets the ratemeter multiplier.

SYNTAX: SM(x) [ENTER]
Where (x) = A number from 0 - 7

0 = Auto ranging	1 = micro
2 = (m)illi	3 = None
4 = (k)ilo	5 = (M)ega
6 = (G)iga	7 = (T)era

ACCESS LEVEL: 3

COMMENTS: A separate ratemeter multiplier stores with each detector setup. If a fixed range is selected and the rate goes above that range then the ratemeter display will read 999 and EEEE will alternate with it at one second intervals.

SNE

FUNCTION: Enters the instrument serial number into memory.

SYNTAX: SNE(x) [ENTER]
Where (x) = any number from 0 - 999999

ACCESS LEVEL: 3

SNI

FUNCTION: Sets the L8 location code auto-increment value.

SYNTAX: SNI(x) [ENTER]
Where (x) = any number from 0 - 2500

ACCESS LEVEL: 1

COMMENTS: This number sets the amount that the L8 coordinate increases after a data point is logged.

SP

FUNCTION: Saves a detector setup.

SYNTAX: SP(x) [ENTER]
Where (x) = a number from 0 - 15

ACCESS LEVEL: 1

COMMENTS: When this command is executed a new or altered detector setup is saved to battery backed memory.

SQ

FUNCTION: Sets up a recycle configuration.

SYNTAX: SQ(w x y z) [ENTER]
Where (w) = cycle number; any number from 1 - 6
(x) = detector number; any number from 0 - 15
(y) = delay between recycles; any number from 0 - 65535 seconds.
(z) = logging mode; any number from 0 - 2
0 = log ratemeter
1 = log scaler
2 = log integrated dose

ACCESS LEVEL: 1

COMMENTS: There are six different count routines available in a recycle setup. This command is used in conjunction with SR to setup the proper number of routines. There is no space between the variable (w) and the command however there are spaces between the (w x y z) variables. The Recycle Setup Display is (SVD6).

SR

FUNCTION: Sets the number of count routines in a recycle mode.

SYNTAX: SR(x) [ENTER]
Where (x) = a number from 1 - 6.

ACCESS LEVEL: 2

COMMENTS: This command is used in conjunction with SQ to set up a recycle routine. A recycle routine can perform from one to six different count subroutines.

SSB

FUNCTION: Starts a single point cal routine w/background subtract.

SYNTAX: SSB [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed a single point routine will be performed to determine the calibration constant of a detector. Execution and operation of this routine is explained further in the Calibration routines section of the Routines, Parts List, and Schematics Manual.

SSC

FUNCTION: Clears all logged data memory.

SYNTAX: SSC [ENTER]

ACCESS LEVEL: 1

COMMENTS: This command will erase all logged data from the memory. Before this command is executed a verification screen will display requiring the user to answer yes or no to executing the command.

> **WARNING**
> When this command is executed all logged data will be erased.

SSD

FUNCTION: Initiates a dead time calibration routine with background subtract.

SYNTAX: SSD [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed a dead time calibration routine will be performed to determine the dead time of a detector. Execution and operation of this routine is explained further in the Calibration routines section of the Routines, Parts List, and Schematics Manual.

SSE

FUNCTION: Stops a recycle routine in progress.

SYNTAX: SSE [ENTER]

ACCESS LEVEL: 1

SSF

FUNCTION: Activates a recycle routine.

SYNTAX: SSF [ENTER]

ACCESS LEVEL: 1

SSG

FUNCTION: Restarts a stopped recycle routine.

SYNTAX: SSG [ENTER]

ACCESS LEVEL: 1

COMMENTS: This command will resume a recycle routine at the point it was stopped.

SSK

FUNCTION: Initiates a cal constant / dead time calibration routine.

SYNTAX: SSK [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed a cal constant / dead time calibration routine will be performed to determine the calibration constant and dead time of a detector. This routine does not use background subtract. Execution and operation of this routine is explained further in the Calibration routines section of the Routines, Parts List, and Schematics Manual.

SSP

FUNCTION: Sets up the logging operation of the optional pushbutton.

SYNTAX: SSP(x) [ENTER]
Where (x) = a number from 0 - 2
0 = logs a ratemeter count
1 = logs a scaler count
2 = logs an integrated dose count

ACCESS LEVEL: 1

COMMENTS: This command sets up the logging operation of an optional pushbutton that is connected to the serial port of the instrument once the instrument is setup.

SSQ

FUNCTION: Simulates the optional pushbutton logging operation.

SYNTAX: SSQ [ENTER]

ACCESS LEVEL: 1

COMMENTS: When this command is executed the instrument will log a count based on the setting of the command SSP(x).

SSR

FUNCTION: Initiates a cold start of the instrument.

SYNTAX: SSR [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed the instrument memory is cleared and all parameters are set at their default values. The security code is set to 0 and the access level is set to 1. A verification screen will appear prompting a user to make sure that this command is to be executed.

WARNING
When this command is executed all detector parameters and logged data will be erased.

SSS

FUNCTION: Initiates a single point calibration routine.

SYNTAX: SSS [ENTER]

ACCESS LEVEL: 3

COMMENTS: When this command is executed a single point calibration routine will be performed to determine the calibration constant of a detector. This routine does not use background subtract. Execution and operation of this routine is explained further in the Calibration routines section of the Routines, Parts List, and Schematics Manual.

ST

FUNCTION: Sets the time.

SYNTAX: ST(hh:mm) [ENTER]

ACCESS LEVEL: 2

COMMENTS: The time is set in twenty four hour format.

SU

FUNCTION: Sets the ratemeter and integrated dose display units.

SYNTAX: SU(x) [ENTER]
Where (x) = a number from 0 - 9
0 = rad (r)
1 = Gray (G)
2 = rem
3 = Sv
4 = R
5 = C/kg
6 = disintegrations (d)
7 = counts (c)
8 = Ci/cm²
9 = Bq/cm²

ACCESS LEVEL: 3

COMMENTS: The display units setting is shown on the Detector Display (SVD2). Each detector setup has its own display units setting.

SVC

FUNCTION: Sets the low ratemeter alarm. (used as a detector fail alarm)

SYNTAX: SVC(x) [ENTER]
Where (x) = any number from 10^{-30} - 10^{30}

ACCESS LEVEL: 1

COMMENTS: To turn the alarm off, set it to 0. Each detector setup has its own alarm setting. The low ratemeter alarm is shown on the Alarm Display (SVD3). This alarm is activated when the ratemeter count drops below the alarm setting. The low ratemeter alarm is useful, for example when using gas proportional detectors to identify when the counts drop off due to gas flow or detector failure. When the ratemeter is reset this alarm is disabled for 30 seconds to help prevent a false alarm.

SVD

FUNCTION: Selects the display to be viewed.

SYNTAX: SVD(x) [ENTER]
Where (x) = a number from 0 - 7
0 = Normal display
1 = Parameters display
2 = Detector display
3 = Alarm display
4 = Logged data display
5 = Recycle data display
6 = Recycle setup display
7 = Maximum values display

ACCESS LEVEL: 3

SVL

FUNCTION: Selects a logged sample to be viewed.

SYNTAX: SVL(x) [ENTER]
Where (x) = a number from 0 - 999

ACCESS LEVEL: 1

COMMENTS: This command is used to view the various logged samples. If several samples in a row are going to be viewed the sample number (x) can be replaced with a "+" or "-". This will allow the user to scroll forward or backward through the samples. When scrolling through samples the display will return to sample "0" after the last sample stored is viewed. Logged data is shown on the Logged Data Display (SVD4).

SVM

FUNCTION: Activated or deactivates the maximum value latching mode.

SYNTAX: SVM(x) [ENTER]
Where (x) = a number from 0 - 6
0 = Latching mode off
1 = Latching mode on
2 = Zeros ratemeter^{max} and scaler^{max} readings
3 = Zeros ratemeter^{max} reading
4 = Zeros scaler^{max} reading
5 = Zeros scaler^{max} and scaler readings
6 = Zeros ratemeter^{max}, scaler^{max}, and scaler readings

ACCESS LEVEL: 1

COMMENTS: The maximum values are shown on the Maximum Values Display (SVD7). If the latching mode is on the words "LATCHING VALUES" replace the maximum values identifier.

SXG

FUNCTION: Sets the fixed response time constant.

SYNTAX: SXG(x) [ENTER]
Where (x) = a number from 1 - 127 seconds

ACCESS LEVEL: 3

COMMENTS: This command is used when the response time set by command G is fixed; i.e. G(2).

SY

FUNCTION: Sets the number of recycles in a recycle routine.

SYNTAX: SY(x) [ENTER]
Where (x) = a number from 0 - 999

ACCESS LEVEL: 1

COMMENTS: This maximum allowed setting will depend on how many count subroutines there are in a recycle routine. If there is only one count being taken then the number of recycles can be as many as 999. If there is more that one count subroutine then the maximum number of recycles is 999 divided by the number of subroutines being done.

T

FUNCTION: Sets the detector threshold.

SYNTAX: T(x) [ENTER]
Where (x) = a number from 0 - 1000

ACCESS LEVEL: 3

COMMENTS: The threshold setting can be increased or decreased from its current setting in increments of "1" by replacing the (x) value with a "+" or "-" instead of a number. The threshold setting is shown on the Parameters Display (SVD1), and the Detector Display (SVD2). Each detector setup has its own threshold setting.

W

FUNCTION: Sets the detector window setting.

SYNTAX: W(x) [ENTER]
Where (x) = a number from 0 - 1000

ACCESS LEVEL: 3

COMMENTS: The window setting can be increased or decreased from its current setting in increments of "1" by replacing the (x) value with a "+" or "-" instead of a number. It can also be turned on or off by replacing the number (x) with "ON" or "OFF". The window setting is shown on the Parameters Display (SVD1), and the Detector Display (SVD2). Each detector setup has its own window setting.

X

FUNCTION: Resets an active alarm.

SYNTAX: X [ENTER]

ACCESS LEVEL: 1

Y

FUNCTION: Resets the audio only after an alarm.

SYNTAX: Y [ENTER]

ACCESS LEVEL: 1

COMMENTS: There is also an alarm acknowledge pushbutton on the front panel of the instrument that does the same thing as this command.

Z

FUNCTION: Zeros the ratemeter.

SYNTAX: Z [ENTER]

ACCESS LEVEL: 1

COMMENTS: This command also resets the ratemeter alarm, and the ratemeter^{max} reading.

STATEMENT OF WARRANTY

Ludlum Measurements, Inc. warrants the products covered in this manual to be free of defects due to workmanship, material and design for a period of 12 months from the date of delivery. The calibration of a product as it leaves Ludlum Measurements is warranted to be within its specified accuracy limits. In the event of instrument failure, notify Ludlum Measurements for repair, recalibration, or replacement at Ludlum Measurements option.

This warranty excludes the replacement of photomultiplier tubes, G-M and proportional tubes, and scintillation crystals which are broken due to excessive physical abuse or used for purposes other than those intended.

There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face thereof. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option of Ludlum Measurements. In no event will Ludlum Measurements be liable for damages, lost revenue, lost wages, or any other incidental or consequential damages arising from the purchase, use, or inability to use the product.

Attachment 2
Model 2350-1 Calibration Routines, Parts List, and Schematics

INSTRUCTION MANUAL

LUDLUM MODEL 2350-1
DATA LOGGER
Calibration Routines,
Parts List, and Schematics

LUDLUM MEASUREMENTS, INC.
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Serving The Nuclear Industry Since 1962

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1. INITIAL INSTRUMENT CALIBRATION

1.1 Equipment Required

All instruments used in calibrating the Model 2350-1 must be calibrated by standards traceable to the National Institute of Standards and Technology and must have a current calibration label attached.

1. Ludlum Model 500 Pulser.
2. High Impedance voltmeter with at least 1000 megohms meter resistance and an accuracy of 0.5%.
3. Overload simulator (1000 megohm resistor).

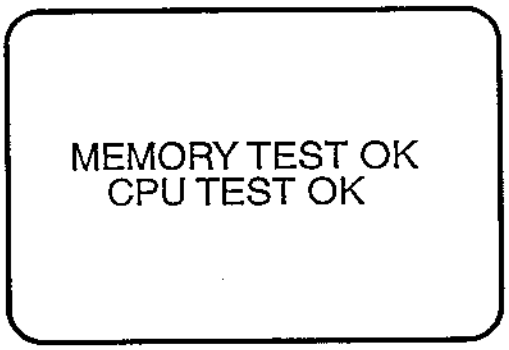
1.2 Instrument Calibration

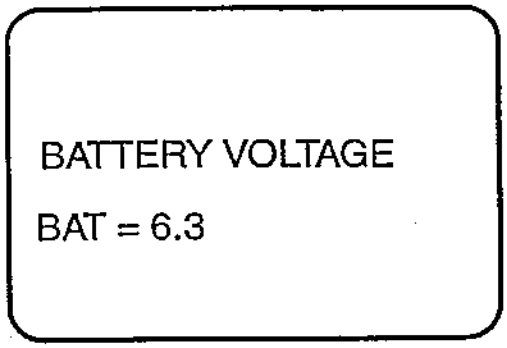
The following procedures will calibrate the electronics only. To program the instrument please refer to section 6. OPERATING INSTRUCTIONS of the Model 2350-1 Data Logger Manual.

WARNING:

The following procedures require that the instrument be re-initialized. This will clear all logged data and return all programmable settings to their default values. **DETECTOR SETUPS AND LOGGED DATA WILL BE PERMANENTLY LOST.**

1. Turn the Model 2350-1 ON. The display will temporarily go black and then the following two displays will appear for a few seconds each. Then the display that was active when the instrument was turned off will appear.





2. Re-initialize the instrument by entering the cold initialize command (**SSR**).
3. Check the battery voltage on the parameters display (**SVD1**). If it reads below 5.5 volts replace the batteries with fresh alkaline batteries and proceed.

Threshold and Window Calibration

4. Change the display time base to minutes (**SB1**) display units to counts (**SU7**), and the threshold to 100 (**T100**).
5. Turn the Model 500 Pulser polarity switch to the negative position.
6. Set the pulse amplitude range selector to the 50 mV position, and the LO-HI control to the maximum clockwise position.
7. Set the pulse frequency multiplier to the 1k position and adjust the pulse frequency so that the output is 400k cpm.
8. Connect the Model 2350-1 to the Pulser and verify that the ratemeter reads between 392-408kC/m.
9. Adjust the pulser amplitude control until the meter reads approximately 10 mV. The ratemeter display should read approximately 75% of the count input (**300 kC/m**).

1. INITIAL INSTRUMENT CALIBRATION

10. If the instrument does not read approximately 300 kC/m adjust the gain pot (R10) on the main board until it reads properly.

NOTE: The instrument threshold is now set at 100 = 10 mV

11. Turn the window ON (**WON**), and set it to 100 (**W100**).
12. Adjust the pulse amplitude control until it reads approximately 20 mV. The ratemeter reading should again indicate approximately 75% of the counts (**300 kC/m**).
13. Adjust the threshold setting to 200 (**T200**), 300 (**T300**), and 400 (**T400**) repeating the above procedure each time to verify that the threshold and window settings are linear.
14. Turn the window off (**WOFF**) and reset the threshold to 100 (**T100**).

High Voltage Calibration

15. Disconnect the instrument from the pulser and connect it to a high impedance voltmeter.
16. Set the high voltage to 1500 volts (**H1500**).
17. If the voltmeter does not read from 1498 - 1502 volts adjust the HV pot (**R52**) on the main board until it reads within tolerance.
18. Adjust the high voltage to 500 volts (**H500**). The voltmeter should read between 490 - 510 volts.
19. Adjust the high voltage to 2000 volts (**H2000**). The voltmeter should read between 1940 - 2060 volts.

Overload Calibration

21. Disconnect the instrument from the voltmeter, and connect it to the overload simulator resistor box.
22. Change to the Alarm Display (**SVD3**).
23. Turn the overload on (**OON**), and set it to 15.0 μA (**O150**).
24. Change to the Parameter Display (**SVD1**).
25. Set the high voltage to 1500 volts (**H1500**).
26. Change to the Main Display (**SVD0**). The ratemeter display at the top of the screen should be alternating between the ratemeter display and the word OVERLOAD at approximately 1 second intervals.
27. If this is not occuring adjust the OVERLOAD pot (**R7**) on the main board until the display alternates properly.
28. Adjust the high voltage to 1000 volts (**H1000**). The overload indicator should stop appearing.
29. Adjust the overlaod to 10.0 μA (**O100**). The OVERLAOD indicator should again begin to alternate with the ratemeter indicator.
30. Repeat steps 28 and 29 again with a voltage setting of 500 (**H500**) volts and an overload setting of 5 μA (**O50**).
31. When properly completed turn the overload alarm off (**OOFF**).

1. INITIAL INSTRUMENT CALIBRATION

1.2 Instrument Calibration (cont.)

Alarm Checkout

1. Connect the Model 2350-1 to the pulser.
2. Set the pulse frequency to 600k cpm.
3. Select the Alarm Display (**SVD3**).
4. Set the integrated dose alarm to 100k cpm (**P1E5**).

NOTE: If an alarm is indicated press the ACK/SCRL button to silence the audio.

5. Select the Main Display (**SVD0**) and zero the integrated dose (**SIZ**). The Integrated dose counter should start counting immediately and an alarm should be indicated when it reaches 100k cpm. After the alarm press the ACK/SCRL button to silence the audio.
6. Select the Alarm Display(**SVD3**) and set the scaler alarm to 60,000 counts (**K60000**).
7. Return to the Main Display (**SVD0**), set the scaler count time to 6 seconds (**F6**), and take a scaler count (**C**). When the scaler reaches 60,000 counts an alarm should again be indicated. Press the ACK/SCRL button again to silence the audio.
8. Adjust the pulse frequency of the pulser to less than 600k cpm.
9. Select the Alarm Display (**SVD3**) and set the ratemeter alarm to 600k cpm (**J6E5**).
10. Select the Main Display (**SVD0**) and readjust the pulse frequency to a setting of 600k cpm. The ratemeter alarm should be triggered. Press the ACK/SCRL button to silence the audio.
11. Verify that the ratemeter (**RAT**), scaler (**SCL**), and integrated dose (**DOS**) indicators are all alternating with the alarm (**ALM**) indicators at 1 second intervals.
12. Select the alarm display (**SVD3**)
13. Set all of the alarms to their default high settings (ratemeter, **J1E9**; scaler, **K1000000**; integrated dose, **P1E9**)
14. Select the Main Display (**SVD0**) and reset all of the alarm indicators (**X**).
15. Disconnect the instrument from the pulser and place it into the instrument can.

The electronics have now been calibrated and functionally checked. All remaining calibration procedures involve setting the programmable parameters of the instrument and are covered in the Model 2350-1 Data Logger Instruction Manual.

2. CALIBRATION ROUTINES

SOURCE PARAMETERS AND TYPICAL VALUES FOR MODEL 2350-1 CALIBRATIONS

To insure that the proper sized sources are used in calculating the calibration constant, and dead time of the Model 2350-1 and detectors the following calculation should be performed.

% Dead Time Loss = No. of source counts in 1 second X Dead Time (in seconds)

The following list provides some typical LO and HI cal points and dead times for various detectors:

TYPICAL DEAD TIME CALIBRATION, AND OVERLOAD POINTS

DETECTOR	LOW POINT	HIGH POINT	OVERLOAD POINT
44-2	500 µR/hr	15 mR/hr	100 mR/hr
44-6	20 mR/hr	400 mR/hr	1 R/hr
44-7	5 mR/hr	100 mR/hr	N/A
44-9	6 mR/hr	200 mR/hr	1 R/hr
44-38	20 mR/hr	400 mR/hr	1 R/hr
44-116	6 mR/hr	60 mR/hr	N/A

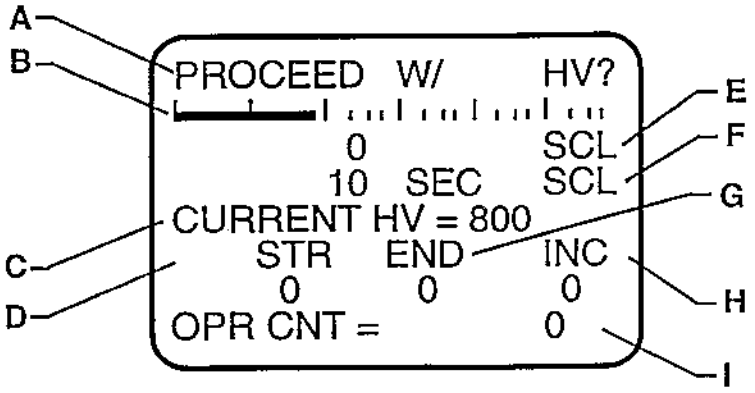
TYPICAL DEAD TIME AND CALIBRATION CONSTANT SETTINGS

DETECTOR	DEAD TIME	CALIBRATION CONSTANT
44-2	15 - 25 µsec.	$1.0e^{10}$ - $0.3e^{10}$
44-6	65 - 135 µsec.	$7.09e^{7}$ - $0.65e^{7}$
44-7	250 - 270 µsec.	$1.39e^{5}$ - $0.1e^{5}$
44-9	50 - 120 µsec.	$2.0e^{5}$ - $0.3e^{5}$
44-38	65 - 135 µsec.	$7.09e^{7}$ - $0.65e^{7}$
43-68 Alpha	15 - 25 µsec.	1
43-68 Beta	18 - 26 µsec.	1
43-37 Alpha	18 - 20 µsec.	1
43-37 Beta	19 - 25 µsec.	1

2. CALIBRATION ROUTINES

2.1 High Voltage Ramp Routine

The high voltage ramp routine is useful when a user needs to plateau a detector to determine the proper operating voltage of the detector. The following display will appear when performing the routine.



HIGH VOLTAGE RAMP ROUTINE DISPLAY

A. INFORMATION PROMPT: Prompts the user for the parameters required for the ramping routine. When the routine is first started the prompt will ask if the user wants to proceed with the current parameters. If answered YES the instrument will then prompt the user to begin the routine by executing the scaler count command. If answered NO then the following information prompts will appear immediately after the one before is answered.

Starting HV ?
Ending HV?
HV Increment?

The message DUMPING HEADER will then appear momentarily followed by the command "Ent C to start".

B. RATEMETER BARGRAPH DISPLAY: A logarithmic display of the ratemeter reading in cps.

C. HV IDENTIFIER: Identifies the current HV setting.

D. STR: Identifies the starting voltage of the HV ramping routine.

E. SCALER COUNT: Shows the scaler reading in progress.

F. SCALER TIMER: Shows the count time for the scaler. When a count is in progress the timer will show the time remaining in the count.

G. END: Identifies the ending HV setting for the ramping routine.

H. INC: Identifies the increment the voltage will be increased by in each step of the routine.

I. OPR CNT: Identifies the count at the beginning knee of the plateau or the recommended operating voltage.

2. CALIBRATION ROUTINES

The following example demonstrates how to run a plateau on a Model 44-2 Gamma Scintillator.

KEYSTROKES	RESPONSE
SHR(x) ENTER Where (x) = the number 0 or 1. 0 = Disables data dump to the serial port. 1 = Enables data dump to the serial port.	The Model 2350 display will show the detector display with the current set of detector parameters. There will be no prompt but you will need to select a set of parameters to use in the routine. If the current parameters are correct press "Y ENTER", otherwise select the set of detector parameters that you want to use and then press "Y ENTER". The instrument will proceed with the routine by displaying the screen shown on the opposite page.
N ENTER	This answers the prompt "PROCEED W/ HV" allowing the user to change the parameters of the routine.
500 ENTER	This set the beginning high voltage at 500 volts.
1000 ENTER	This sets the ending high voltage at 1000 volts.
25 ENTER	This sets the HV increment to 25 volts. (This increment is the amount that the high voltage setting will change between each step of the ramping routine.)
C ENTER	This activates the routine by starting the scaler counting.

The scaler count time is determined by the detector setup that was selected. If the user selects "SHR0" The instrument will run the plateau and determine the voltage setting that the detector should operate at. If the user selects "SHR1" at each step of the ramp the voltage setting and scaler count will be dumped to the RS-232 port.

When the routine is complete the following prompt will appear:

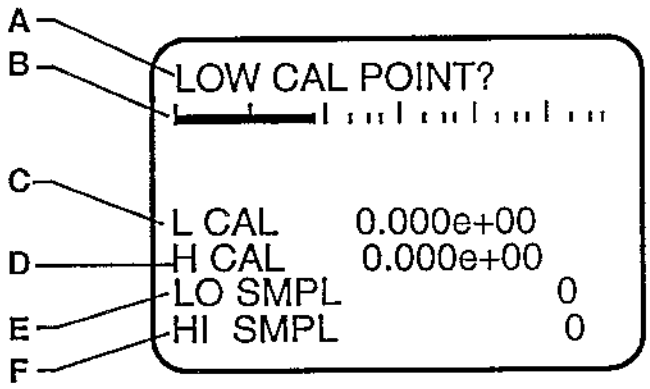
"SAVE? HV = XXX"

If you want to save that voltage as the operating voltage of the detector answer "Y ENTER" and the voltage will be saved and the instrument will return to the screen that was active before the routine was started. Otherwise answer "N ENTER" and the routine will stop and the display will return to the screen that was active before the routine was started without saving the voltage determined to memory.

2. CALIBRATION ROUTINES

2.2 Calibration Constant and Dead Time Calibration with Background Subtract

This routine will use a two point (low-hi) method to calculate the calibration constant and dead time of the detector. The following display will appear when performing the routine.



CALIBRATION CONSTANT/DEAD TIME ROUTINE DISPLAY

A. INFORMATION PROMPT: Prompts the user for the parameters required for the routine. When the routine is first started the prompt will prompt the user low calibration point. Once entered it will prompt for the following parameters in order.

HI CAL POINT
TAKE BACKGROUND
TAKE LOW SAMPLE
TAKE HI SAMPLE
SAVE NUMBERS?

B. RATEMETER BARGRAPH DISPLAY: A logarithmic display of the ratemeter reading in cps.

C. L CAL: Identifies the low calibration point that will be used in the routine.

D. H CAL: Identifies the high calibration point that will be used in the routine.

E. LO SMPL: Shows the reading obtained from the low sample source.

F. HI SMPL: Shows the reading obtained from the high sample source.

NOTE: Line 1 will indicate the ratemeter reading when a sample is being taken, and lines 3 and 4 will show the scaler taking a count. When the routine is complete Line 3 will display the calculated calibration constant, and line 4 will show the calculated dead time constant. These numbers will be saved into the active detector setup if the user answers yes to the prompt to save the numbers.

2. CALIBRATION ROUTINES

The following example will calculate the cal constant and dead time of a Model 44-2 Gamma Scintillator in R/hr.

KEYSTROKES	RESPONSE
SKB ENTER	The Model 2350-1 will show the calibration constant/dead time routine with background subtract control display with a prompt to set the low cal point.
5e-4 ENTER	This will set the lower calibration point at 500 μR/hr, then a prompt will appear for the hi cal point.
15e-3 ENTER	This will set the high calibration point at 15 mR/hr, then a prompt will appear to take a background sample.
C ENTER	This will initiate the scaler to take a background reading, then a prompt will appear to take the low sample count. Place a 1 μCi ^{137}Cs check source on the end of the detector.
C ENTER	This will initiate the scaler to take a count with the low sample source, then a prompt will appear for the hi sample count. Place a 5 μCi ^{137}Cs check source on the end of the detector.
C ENTER	This will initiate the scaler to take the hi sample reading.

NOTE: The SSK command initiates the same routine as stated above except that the background count is not taken or considered when determining the calibration constant and dead time of the system.

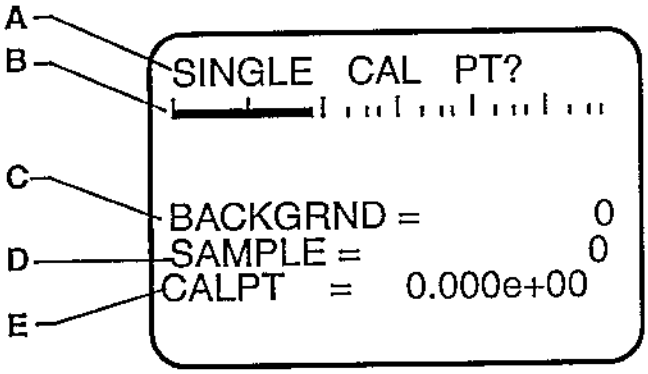
ADDITIONAL PARAMETERS

1. The background count should be less than 2% of the low sample count.
2. The low sample count should have at least 15,000 counts.
3. The high sample should be at least 100 times the low sample and produce between 30 - 60% dead time loss.

2. CALIBRATION ROUTINES

2.3 Single Point Calibration Constant Routine with Background Subtract

This routine will use a single point method to calculate the calibration constant of the detector. The following display will appear when performing the routine.



CALIBRATION CONSTANT/DEAD TIME ROUTINE DISPLAY

A. INFORMATION PROMPT: Prompts the user for the parameters required for the routine. When the routine is first started the prompt will prompt the user single calibration point. Once entered it will prompt for the following parameters in order.

TAKE BACKGROUND
TAKE SAMPLE
SAVE CAL CNST?

B. RATEMETER BARGRAPH DISPLAY: A logarithmic display of the ratemeter reading in cps.

C. BACKGRND: Identifies the background reading obtained during the routine.

D. SAMPLE: Identifies the sample count taken during the routine.

E. CALPT: Identifies the reference calibration point set for the routine.

NOTE: Line 1 will indicate the ratemeter reading when a sample is being taken, and lines 3 and 4 will show the scaler taking a count. When the routine is complete Line 8 will display the calculated calibration constant. This number will be saved into the active detector setup if the user answers YES to the prompt to save the number.

2. CALIBRATION ROUTINES

The following example will calculate the cal constant of a Model 44-2 Gamma Scintillator in R/hr.

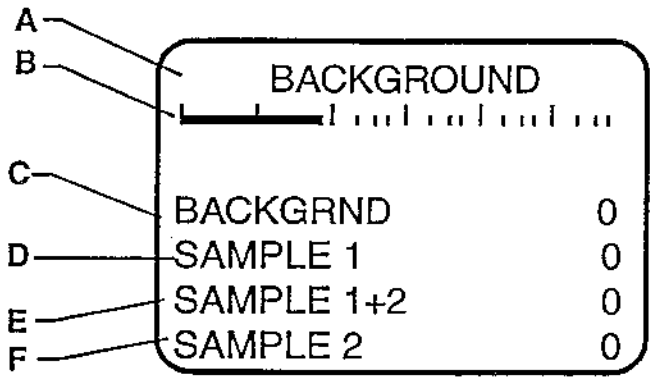
KEYSTROKES	RESPONSE
SSB ENTER	The Model 2350-1 will show the single point calibration constant routine with background subtract control display with a prompt to set the single cal point.
5e-4 ENTER	This will set the single calibration point at 500 μR/hr, then a prompt will appear to take a background reading.
C ENTER	This will initiate the scaler to take a background count, then a prompt will appear for the sample count. Place the detector in a 500 μR/hr field.
C ENTER	This will initiate the scaler to take the single sample reading.

NOTE: The SSS command initiates the same routine as stated above except that the background count is not taken or considered when determining the calibration constant.

2. CALIBRATION ROUTINES

2.4 Two Source Dead Time Calibration Routine with Background Subtract

This routine will use a single point method to calculate the calibration constant of the detector. The following display will appear when performing the routine.



CALIBRATION CONSTANT/DEAD TIME ROUTINE DISPLAY

A. INFORMATION PROMPT: Prompts the user for the parameters required for the routine. When the routine is first started the prompt will appear for the background count. Once entered it will prompt for the following parameters in order.

SAMPLE 1
SAMPLE 1+2
SAMPLE 2
SAVE DEAD TIME?

B. RATEMETER BARGRAPH DISPLAY: A logarithmic display of the ratemeter reading in cps.

C. BACKGRND: Identifies the background count taken during the routine.

D. SAMPLE 1: Identifies the sample count taken with source 1 during the routine.

E. SAMPLE 1 +2: Identifies the sample count taken with sources 1 & 2 during the routine.

F. SAMPLE 2: Identifies the sample count taken with source 2 during the routine.

NOTE: Lines 3 will show a timer and line 4 will show the word COUNTING when a count is in progress. When the routine is complete Line 3 will display the calculated dead time for the detector. This number will be saved into the active detector setup if the user answers YES to the prompt to save the number.

2. CALIBRATION ROUTINES

The following example will calculate the dead time of a Model 44-2 Gamma Scintillator in R/hr.

KEYSTROKES	RESPONSE
SSD ENTER	The Model 2350-1 will show the dead time calibration routine with background subtract control display with a prompt to take a background reading.
C ENTER	This will initiate a count to get a background sample, then a prompt will appear to take a reading from sample 1.
C ENTER	This will initiate count for sample 1, then a prompt will appear for a count with samples 1 & 2.
C ENTER	This will initiate a count of samples 1 & 2 together, then a prompt will appear for a count with sample 2 only.
C ENTER	This will initiate a count of sample 2 only.

ADDITIONAL PARAMETERS

1. The sources used for this test should be approximately the same size and each should provide a minimum of 25,000 cpm.
2. When combined the sources must provide a between 25 - 60% dead time loss.

3. THEORY OF OPERATION

3.1 AMPLIFIER/POWER SUPPLY BOARD #5371-002

3.1.1 INPUT

Negative going pulses are coupled from the detector through C9 to emitter follower Q1. CR6 is a voltage reference which provides a bias voltage of approximately +3.3 Vdc to Q1 via R45. R9 protects Q1 from input inadvertent shorts/ transients. R40 couples the detector to the high voltage supply (HV).

3.1.2 AMPLIFIER

U3 is a self-biased amplifier which provides gain in proportion to R12 divided by the series combination of R11 and R10. R10 is adjusted to provide a pulse height in proportion to a given threshold setting at comparator U4 (typically adjusted to trigger with a detector input pulse of 10 millivolts at a threshold setting of 100). Transistor (pins 4, 5, and 6 of U3) provide amplification and pulse polarity inversion. Transistor pins 10 through 15 are coupled as a constant current source to pin 6 of U3. The output self-biases to 2 Vbe — approximately 1.4 Vdc at pin 7 of U3. This provides just enough bias current through pin 6 to conduct all of the current from the constant current source. Positive pulses from pin 7 are coupled to the Window and Threshold comparators, U4.

3.1.3 WINDOW/THRESHOLD

Threshold (THR) comparator, pins 5, 6, and 7 of U4, provides the lower pulse height discrimination. Pulses are AC coupled from amplifier U3 via C23 to pin 6 of U4. THR reference voltage data from the microprocessor board (µP) is processed by digital to analog convertor (DAC) U6 and coupled to pin 5 of U4 via opamp U5. R54 and C13 provide additional filtering of the reference voltage. THR reference Vdc is approx. +122 millivolts (mV) with the THR set at 100 on display — 1.222 Vdc at a THR setting of 1000. As the pulse height at pin 6 of U4 increases above the reference voltage at pin 5, pin 7 — normally high (approx. +5 Vdc) goes low for the pulse duration.

Window (WIN) comparator, pins 1, 2, and 3 of U4 provide the upper pulse height discrimination. Pulses are coupled from amplifier U3 to pin 2 of U4. WIN reference voltage data from the µP is processed by DAC U6 and coupled to pin 3 of U4. Q2 applies approx. +5 Vdc to the WIN reference to disable the WIN comparator when the WIN OFF signal is applied to the base of Q2. The WIN reference voltage rides on top of the THR reference — i.e., with a THR and WIN setting of 100, the WIN reference at pin 3 of U4 will equal approx. +122 mV referenced above the THR at pin 5 or approx. +244 mV referenced to chassis ground. If the THR is increased to 200 and the WIN still remains at 100 the WIN reference will still equal approx. +122 mV referenced to the threshold but will increase to approx. +366 mV when referenced to ground (THR = 244 mV + 122 mV WIN = 366 mV). As the pulse amplitude increases above the WIN reference voltage, pin 1 of U4 goes low for the pulse duration.

3.1.4 WINDOW/THRESHOLD LOGIC CIRCUIT

Negative pulses from the THR comparator are coupled to univibrator U9. Negative, pulses (approx. 5 volt) are present at univibrator output pin 7 of U9 (PULSE') as long as pins 13 and 3 remain high. When a WIN pulse is present at pins 13 and 3 the Reset function is enabled which disables the PULSE' output locking pin 7 high. Pulses are connected from pin 7 to the µP on the Central Processor Board for count processing. Pin 7 is tied back to pin 13 via CR1 to provide a time delay (approx. 8 to 10 µs) for the µP clock cycle to complete before the next pulse can be recognized by the micro-processor.

3. THEORY OF OPERATION

3.1.5 DIGITAL TO ANALOG CONVERTORS

U6 and U7 are digital to analog convertors (DAC) which convert the digital data from the µP to analog signals to control the THR, WIN, High Voltage Reference (HV REF), and Overload Reference (OVR REF) variables. Data via BUS0-BUS3 and A0-A2 is loaded into the DAC latches for U6 and U7 by strobing CE3' and CE4' (Chip Select). CE5' (Up Date) is then strobed to transfer the data stored in the latches to the DAC outputs.

3.1.6 HIGH VOLTAGE SUPPLY AND DETECTOR OVERLOAD

Detector High Voltage (HV) is developed by blocking oscillator Q3, T1, C29 and rectified by voltage multiplier CR3-CR5, CR14, CR15, C5, C32, C37, and C38. Q4, CR13, and R41 provide a regulated voltage of approx. 4.4 Vdc (battery voltage must be +4.4 Vdc) to the emitter of Q3. HV increases as current through Q5 increases with maximum output voltage with Q5 saturated.

HV is coupled back through R5, through voltage follower U1, to pin 6 of U2 to complete the regulation loop. Resistors R52 and R6 complete the HV divider network to ground. HV regulation is produced by opamp comparator pins 5, 6, and 7 of U2. During stable operation the voltage at pin 6 will equal pin 5. If HV REF is increased, pin 7 of U2 will increase increasing conduction of Q5 until the voltage at pin 6 equals pin 5 of U2 via HV divider network, R5, R52, and R6. R52 is adjusted to calibrate the HV output to the HV REF signal supplied to pin 5 of U5 by the DAC — HV REF is set at approx. 1500 mV by entering the "H1500" command into the Model 2350-1, the HV CAL is adjusted for 1500 Vdc at the detector connector. C1-C3, C8-C7, C19, and C27 provide additional filtering of the HV output.

Detector Overload is achieved by measuring the voltage differential across R4. As current is increased into the detector, a voltage drop is produced across R4. The HV on either side of R4 is converted to a low voltage by resistor divider networks R5, R52, R6, and R44, R7, and R43. The voltage differential is coupled to differential opamp, pins 12-14 of U1, via opamp buffers. The differential output is coupled to opamp comparator, pins 8- 10 of U1. OVR REF is provided by the µP via the DAC — OVERLOAD' is coupled back to the µP. R7, CURRENT CAL, calibrates the detector current drain to the OVR REF input — i.e., a 10µA load is connected to the detector output; the overload is set to "100" by entering the "O100" command (approx. 610mV at OVR REF), R7, CURRENT CAL, is then adjusted until pin 8 or U1 just starts to trigger low.

3.1.7 LOW VOLTAGE SUPPLY

Supply voltages of +5 and -10 Vdc are supplied by U8, T2, and supporting components. U8 is a switching regulator with an on-board comparator providing regulation. An internal voltage reference of 1.0 Vdc maintains the inverting and non-inverting comparators at 1.0V via the feedback loop. Oscillator frequency, set by C36, is approx. 100 kHz at pin 5 of U5. CR11 and C26 provide rectification and filtering for the +5V output. CR12 and C25 provide rectification and filtering for the -10V output.

U11 is a -2.5 Vdc voltage reference for the DAC's — U6 and U7. C8 located on the Backplane board maintains the battery voltage charge during inadvertent battery disconnection (mechanical shock).

3.1.8 LCD VIEWING ANGLE SUPPLY

U2 is configured as a differential opamp which controls the backplane voltage to adjust the viewing angle for the LCD graphics display. Output voltage, pin 1 of U2 is adjustable from 0 to -10 Vdc by varying R50 (VIEWING ANGLE). LCD backplane variance due to temperature is compensated by CR10.

3. THEORY OF OPERATION

3.2 CENTRAL PROCESSOR BOARD #5371-068

3.2.1 MICROPROCESSOR (µP)

U124, Intel 80C51FA, is the Model 2350-1 central processor. The µP clock frequency is crystal controlled by Y159 and related components at 6.144 MHZ. C172 resets the µP at power-up to initiate the start of the program routine. The main program routine is stored in EPROM, U122. User parameters and logged data is stored in the 8k X 8 RAM, U123. (replaced with 64k X 8 RAM located on the Memory Expander board)

Address and data information are multiplexed by latch U121 from the µP to the two memory chips. The low address bits A0-A7 are multiplexed with the data bus, BUS0-BUS7, out of the µP. U121 latches the address data AO-A7 on lines BUS0-BUS7 during the first part of the external memory cycle when the ALE input is strobed.

The HD175 ACCESS shunt configures the µP parameter access mode and password. When pins 1 and 2 are shunted (default) the access parameters is determined by the settings preset in the EPROM and the password entered in RAM. If shunt is placed between pins 2 and 3 the password is set to "0" and the access level is set to "3".

The ACKNOWLEDGE' input is pulled low when the front panel ACKNLDGE pushbutton switch is depressed silencing the audible alarm(s). The OVERLOAD' signal from the AMP/PS board instructs the µP to initiate an OVERLOAD condition. WIN OFF' is an output signal from the µP to the AMP/PS board which disables the Window feature.

The TONE' input comes from the I/O processor which toggles the TONE'/ALARM line low when the external bar code wand registers bar code information. The TONE' and ALARM' (µP output signal from pin 5 of U124) signals initiate an independent audible tone by changing the CV (control voltage) input on the ICM7556 timer, U118.

The READY, CLEAR SEND, RECEIVE, and XMIT data lines communicate the RS-232 and bar code reader wand information from/to the I/O processor to/from the central processor. The RESET output at pin 13 of U124 is coupled to the I/O board to reset the I/O processor. Q174 inverts the RESET signal (RESET') providing a reset line for the LCD graphics display. The PULSE' input supplies the pulses from the AMP/PS board to be counted and converted into data by the µP.

3.2.2 BATTERY VOLTAGE VFC

Un-switched (connected directly to batteries) battery voltage — +BATUNS — is divided by resistor divider network R148 and R149 and connected to voltage to frequency convertor (VFC), U125. VFC OUT is connected to a counter inside the µP which counts the frequency for a preset time converting to a number displayed on the LCD representing the battery voltage. R130, BAT CAL, adjusts the VFC frequency output to calibrate the LCD BAT reading to the actual battery voltage.

NOTE: Disregard sections 3.2.3 and 3.2.4 for the Model 2350-1

3.2.3 RECORDER DRIVE CIRCUIT

The RCDR output from the µP is coupled to MOSFET transistor Q126. The µP uses pulse-width modulation for the recorder signal. The pulse-modulated signal is integrated by R144 and C100. Pins 5, 6, and 7 of U126 "buffers" the integrated voltage from R131. R131 provides calibration of the recorder output voltage. Pins 1, 2, and 3 of U126 are configured as an opamp voltage follower providing recorder drive.

3.2.4 ADDRESS DECODER/VOLTAGE BACKUP

U120 is address decoder which generates the chip enable signals — CEO-CE7 — by monitoring address lines A13-A15. U120 also provides battery backup, +5VBACK, to the Clock chip U119 and the RAM U123. This enables the user to change the instrument batteries without losing RAM memory. +BATUNSR supplies battery voltage to CR112 voltage reference to limit the voltage at 5.1 Vdc. The 5.1 Vdc is coupled to a 0.1

3. THEORY OF OPERATION

farad capacitor through CR113. CR113 prevents C129 from discharging through the +BATUNSR line when the batteries are removed.

3.2.5 CLOCK CHIP

U119 provides the time and date information used in conjunction with the logged data. U119 is crystal controlled by Y158 and supporting components C102 and C103 at 32.786 kHz. The 10 Hz output at pin 13 of U119, provides the timing frequency to the µP.

3.2.6 AUDIO CIRCUIT

Pulses are coupled from the AMP/PS board to U128 — RDD 104 decade divider chip. AUDIO DIVIDE (front panel) by "1" switch position jumpers the PULSE' input directly to the CLICK' input to the timers. Divide by "10" and "100" switch positions connect the DIV OUT of U128 to the CLICK' input using U128 for pulse division. U118, a dual package 7555 timer, provides audio oscillation. Pulses (CLICK') are coupled to the first timer, pins 1-6 of U118, via C97. This timer is configured as a monostable multivibrator (one-shot) producing a fixed pulse-width for each input pulse at pin 6 of U118. Pulse-width is set by R161 and C95. CR114 limits pulse input to pin 6 of U118 to 5.6 volts; R134 is a pull-up resistor for the AC coupled pulse. The second half of U118 is configured as a astable (free-running) multivibrator which produces the audible tone — frequency is set by R133 and C96.

T157 provides amplification of the audio signal driving the unimorph speaker. Audio volume is varied by adjusting the voltage on top of the primary winding of T157 via the front panel volume control. When an ALARM' is initiated maximum voltage applied by saturating Q154.

3.3 I/O INTERFACE BOARD #5371-063

3.3.1 MICROPROCESSOR (µP)

U15, Intel 80C51FA, communicates and processes information bi-directionally from/to the RS-232 interface (U13) to/from the central processor via the serial interface lines XMIT, READY, RECEIVE, and CLEAR SEND. U15 also decodes information from the bar code reader (WAND) and sends information to central processor. The µP clock frequency is crystal controlled by Y159 and related components at 6.144 MHZ.

U14, EPROM, stores the program for the I/O µP. U14 incorporates on-board latches to separate the multiplexed address and data buss lines.

CR26-CR28 provide "clipping" of transients which may be produced at the SERIAL I/O port.

3.3.2 RS-232 INTERFACE

U13, MAX232, is a +5 Vdc powered RS-232 driver/ receiver used to interface the Model 2350-1 to a computer or keypad terminal. U13 incorporates on-board voltage multipliers which generate the +10 and -10 volts required for RS-232 communication.

3.3.3 BACKLIGHT DRIVE

The LCD backlight is illuminated by appling power to +EL POWER when front panel BACKLIGHT switch is ON. With battery voltage applied to +EL POWER, blocking oscillator — Q23, T1 and supporting components begin oscillating. The signal is amplified by T1 to provide a 70VAC signal to drive the LCD backlight. R30, a 10 ohm resistor, limits the power-up surge to the oscillator circuit.

3. THEORY OF OPERATION

3.4 64k MEMORY EXPANDER BOARD #5371-054

NOTE: When the MEMORY EXPANSION board is added, U120 (DS1211) and U123 (CDM6264) on the CENTRAL PROCESSOR board must be removed. The red entries in the CENTRAL PROCESSOR theory of operation should be removed/or inserted for the M2350-1.

U119 is a 128k RAM (only 64k is used) used to store user parameters and logged data. U119 is selected by the central µP by applying a logic "high" to the RAM input, Pin 30 of U119. The Recorder circuit is disabled on the Central Processor board and the RCDR output on the central µP is used to enable the Memory Expansion board RAM.

U117 is address decoder which generates the chip enable signals — CE1-CE7, E1 — for the DAC's on the AMP/PS board and the Clock chip on the Central µP board by monitoring address lines A12-A14 from the central µP.

U115 provides battery backup, +5VBACK, to the Clock chip (U119) on the Central µP board and the RAM. This enables the user to change the instrument batteries without losing the RAM memory. U115 also provides a RESET signal which goes low when the +5V supply to pin 2 of U115 drops below a preset threshold (4.5-4.75 volts). This opens U116 analog switches disabling the RAM and CLOCK' signals from the data bus to save the parameter and logging memory.

4. PARTS LIST, COMPONENT LAYOUTS, AND SCHEMATICS

AMPLIFIER / POWER SUPPLY BOARD

Ref. No.	Description	Part No.
CAPACITORS		
C1-C3	0.0056µF, 3kV	04-5522
C4	0.1 µF	04-5521
C5	0.0015 µF, 3kV	04-5518
C6-C8	0.0056 µF, 3kV	04-5522
C9	100 pF, 3kV	04-5532
C10	10 µF	04-5592
C11-C12	100 pF	04-5527
C13	0.01 µF	04-5523
C14	47 pF	04-5533
C15	100 µF	04-5576
C16	10 pF	04-5573
C17	100 pF	04-5527
C18-C19	0.0056 µF, 3kV	04-5522
C20-C21	33 pF	04-5616
C22	0.01 µF	04-5523
C23	0.1 µF	04-5521
C24	0.0056 µF, 3kV	04-5522
C25	22 µF	04-5579
C26	220 µF	04-5639
C27	0.0056 µF, 3kV	04-5522
C28	100 pF, 3kV	04-5532
C29	0.01 µF	04-5523
C30	100 µF	04-5576
C31	100 pF	04-5527
C32	0.0015 µF, 3kV	04-5518
C33	33 pF	04-5616
C34	1 µF	04-5575
C35-C36	0.001 µF	04-5519
C37-C38	0.0015 µF, 3Kv	04-5518
C39	10 µF	04-5592
C40	0.1 µF	04-5521
C41	33 pF	04-5616
C42	0.01 µF	04-5523
DIODES		
CR1-CR2	1N4148	07-6272
CR3-CR5	MR250-2	07-6266
CR6	1N5226	07-6260
CR7	1N5819	07-6306
CR8-CR10	1N4148	07-6272
CR11-CR12	1N5819	07-6306
CR13	1N4148	07-6272

4. PARTS LIST, COMPONENT LAYOUTS, AND SCHEMATICS

Ref. No.	Description	Part No.
DIODES		
CR14-CR15	MR250-2	07-6266
CR16-CR18	1N4148	07-6272
TRANSISTORS		
Q1	2N3904	05-5755
Q2	MPS6534	05-5763
Q3	MPS-U51	05-5765
Q4	MPS-U01	05-5778
Q5	2N3904	05-5755
RESISTORS		
R1	10kohm, 333MW	12-7748
R2	47 ohm, 333MW	12-7756
R3	56 kohm, 333MW	12-7789
R4	4.7 Mohm	10-7030
R5	1 Gohm	12-7686
R6	470 kohm, 333MW	12-7757
R7	1 Mohm, pot	09-6828
R8	100 kohm, 333MW	12-7747
R9	10 kohm, 333MW	12-7748
R10	100 kohm, pot	09-6823
R11	1 kohm, 333MW	12-7750
R12	470 kohm, 333MW	12-7757
R13-R14	10 kohm, 333MW	12-7748
R15	1 kohm, 333MW	12-7750
R16	4.7 kohm, 333MW	12-7755
R17-R19	10 kohm, 333MW	12-7748
R21	0.1 ohm, 3W	12-7647
R22	80.6 kohm, 333MW	12-7762
R23	1 Mohm, 333MW	12-7763
R24	10 Mohm, 333MW	12-7749
R25	10 kohm, 333MW	12-7748
R26	80.6 kohm, 333MW	12-7762
R27	62 kohm, 333MW	12-7790
R28	1 Mohm, 333MW	12-7763
R29	33.2 kohm, 333MW	12-7793
R30	47 kohm, 333MW	12-7758
R31	100 ohm, 333MW	12-7746
R32	221 kohm, 333MW	12-7792
R33-R36	10 kohm, 333MW	12-7748
R37	820 ohm, 333MW	12-7791
R38	10 kohm, 333MW	12-7764

4. PARTS LIST, COMPONENT LAYOUTS, AND SCHEMATICS

Ref. No.	Description	Part No.
RESISTORS		
R39-R40	1 Mohm	10-7028
R41	100 kohm, 333MW	12-7747
R42	3 kohm, 333MW	12-7768
R43	470 kohm, 333MW	12-7757
R44	1 Gohm	12-7686
R45	100 kohm, 333MW	12-7747
R46	10 kohm, 333MW	12-7748
R47	33.2 kohm, 333MW	12-7793
R48	1 Mohm, 333MW	12-7763
R49	12 kohm, 333MW	12-7787
R50	1 kohm, pot	09-6831
R51	330 ohm, 333MW	12-7788
R52	1 Mohm, pot	09-6828
R53	22 kohm, 333MW	12-7754
R54	10 kohm, 333MW	12-7748
R55	1 kohm, 333MW	12-7750
R56	1 Mohm, 333MW	12-7763
R57	80.6 kohm, 333MW	12-7762
R58	1 Mohm, 333MW	12-7751
R59	10 kohm, 333MW	12-7748
RESISTOR NETWORK		
RN1	5.6 kohm	12-7696
RN20	220 kohm	12-7578
TRANSFORMERS		
T1	M2350-1 HVPS	4275-037
T2	M2350-1 LVPS	4275-089
INTEGRATED CIRCUITS		
U1	LT1079	06-6252
U2	LT1078	06-6251
U3	CA3096	06-6023
U4	TLC372	06-6265
U5	LT1078	06-6251
U6-U7	AD7549	06-6253
U8	LM2578	06-6223
U9	CD4098	06-6066
U10	LT1078	06-6251
U11	LM385Z	05-5791

4. PARTS LIST, COMPONENT LAYOUTS, AND SCHEMATICS

CENTRAL PROCESSOR BOARD

Ref. No.	Description	Part No.
CAPACITORS		
C95	0.047 μF	04-5565
C96	0.001 μF	14-5519
C97	47 pF	04-5533
C98	0.01 μF	04-5523
C99-C100	0.1 μF	04-5521
C101	27 pF	04-5614
C102-C103	22 pF	04-5552
C104	27 pF	04-5614
C109	10 μF	04-5592
C110	100 μF	04-5576
C111	1 μF	04-5575
C129	0.1 F	04-5633
C172	10 μF	04-5592
C177	0.1 μF 100V	04-5521
DIODES		
CR112	1N5231	07-6261
CR113-CR115	1N4148	07-6272
CR162	1N4148	07-6272
HEADER		
HD175	3 PIN SIP	n/a
TRANSISTORS		
Q153	2N3904	05-5755
Q154	MPS6534	05-5763
Q155	2N3904	05-5755
Q168,Q174	2N7000	05-5820
RESISTORS		
R130	10 kohm, pot	09-6822
R131	100 kohm, pot	09-6823
R132	2.2 kohm	10-7012
R133	470 kohm	10-7026
R134	220 kohm	10-7066
R135	5.6 kohm	10-7042
R137-R138	10 kohm	10-7016
R139	33 kohm	10-7019
R140	10 kohm	12-7540
R141-R142	100 kohm	12-7557
R143	7.15 kohm	12-7620

4. PARTS LIST, COMPONENT LAYOUTS, AND SCHEMATICS

Ref. No.	Description	Part No.
RESISTORS		
R144	1 Mohm	10-7028
R148	35.7 kohm	12-7640
R149	8.66 kohm	12-7623
R160	220 kohm	10-7066
R161	150 kohm	10-7024
R164	1 Mohm	10-7028
R166-R167	10 kohm	12-7540
R170	1 Mohm	10-7028
R176	220 kohm	10-7066
RESISTOR NETWORKS		
RN151	22 kohm	12-7566
TRANSFORMERS		
T157	M2221, 300-9	4275-074
INTEGRATED CIRCUITS		
U118	ICM7556	06-6244
U119	MM58274	06-6254
U120	DS1211	06-6255
U121	CD74HC573	06-6093
U122	27C512	06-6264
U123	CDM6264	06-6098
U124	80C51FA	06-6236
U125	LM331	06-6156
U126	TLC27M71P	06-6248
U128	RDD104	06-6060
CRYSTALS		
Y158	32 kHz XTAL	01-5219
Y159	6.144 MHz XTAL	01-5212

4. PARTS LIST, COMPONENT LAYOUTS, AND SCHEMATICS

64k MEMORY EXPANDER BOARD

Ref. No.	Description	Part No.
RESISTORS		
R001	22.1 kohm	12-7843
R114	221 kohm	12-7845
INTEGRATED CIRCUITS		
U115	MAX703ESA	06-6381
U116	CD74HC4066M	06-6323
U117	CD74HC138M	06-6339
U119	CXK581000M	06-6385

4. PARTS LIST, COMPONENT LAYOUTS, AND SCHEMATICS

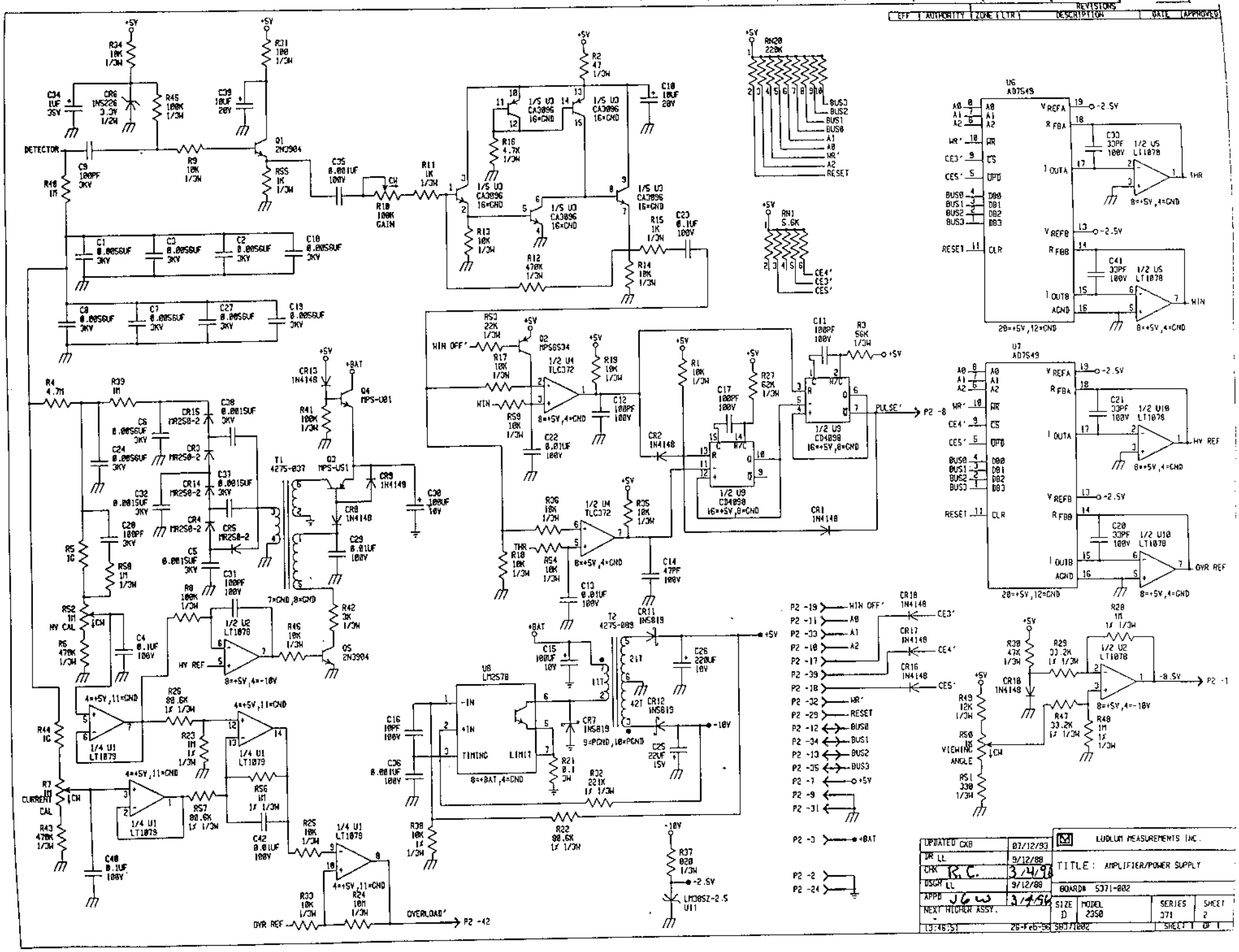
I/O INTERFACE BOARD

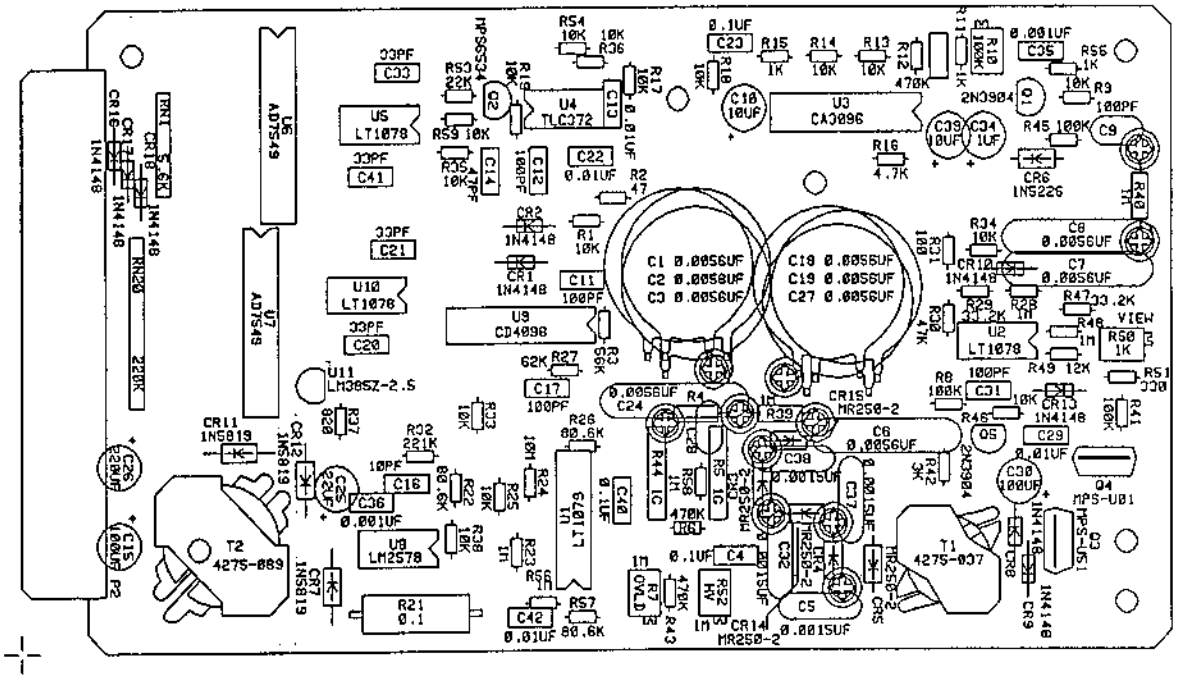
Ref. No.	Description	Part No.
CAPACITORS		
C3-C4	27 pF	04-5614
C5	0.047 µF	04-5565
C6	100 µF	04-5576
C8-C11	10 µF	04-5592
C12	4.7 µF	04-5578
C37-C39	220 µF	04-5639
RESISTORS		
R16	33 ohm	10-7001
R19	8.2 kohm	10-7015
R20-R21	3.3 kohm	10-7013
R30	10 ohm	10-7046
R40	4.7 ohm	10-7095
RESISTOR NETWORKS		
RN33	10 kohm	12-7777
DIODES		
CR26-CR28	1N5231	07-6261
TRANSISTORS		
Q23	2N3904	05-5755
TRANSFORMERS		
T1	M2350-1 EL	4275-090
INTEGRATED CIRCUITS		
U13	MAX232	06-6188
U36	87C51FA	06-6405
CRYSTALS		
Y25	6.144 MHz MICRO XTAL	01-5212

4. PARTS LIST, COMPONENT LAYOUTS, AND SCHEMATICS

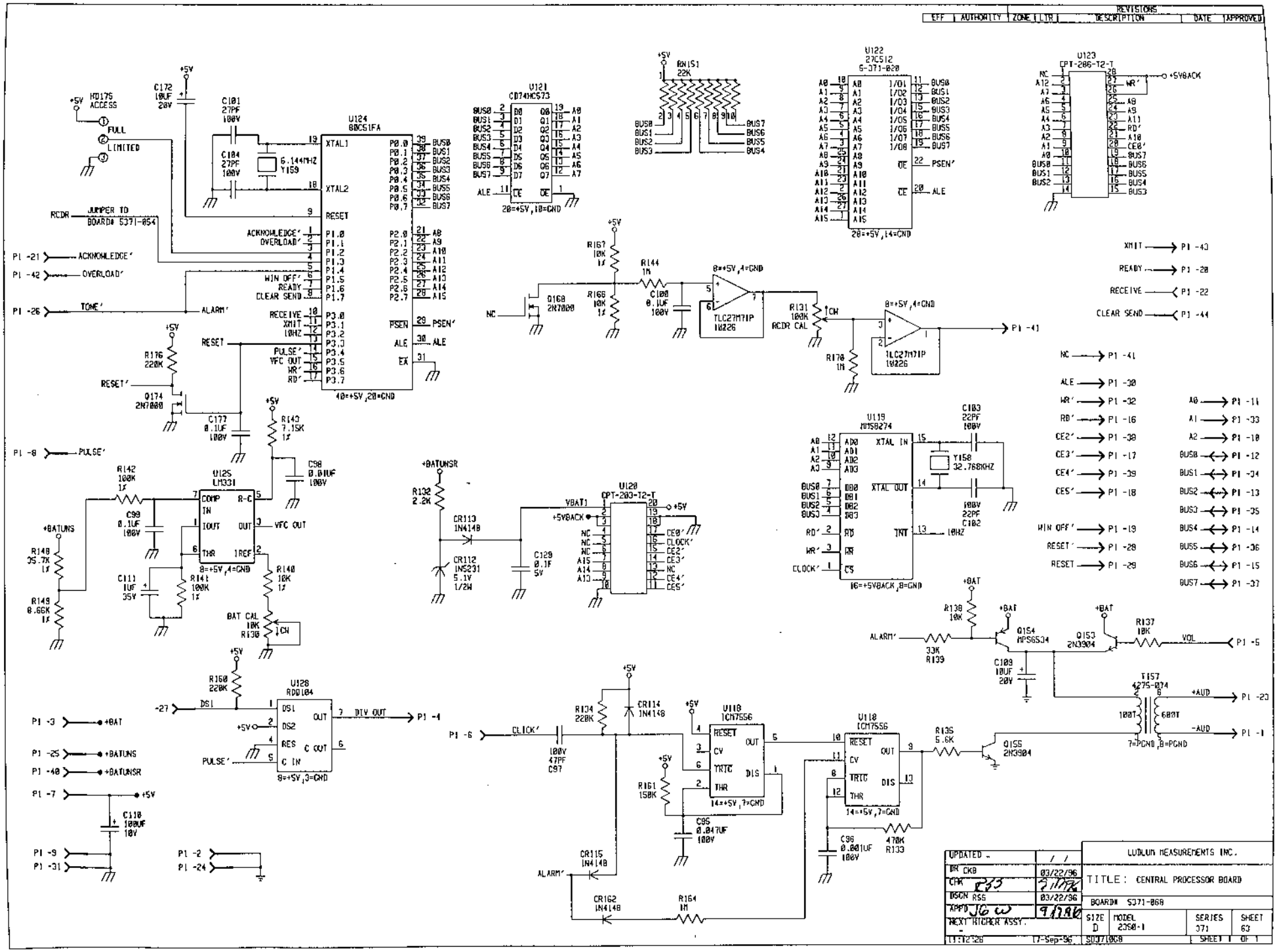
BACKPLANE BOARD

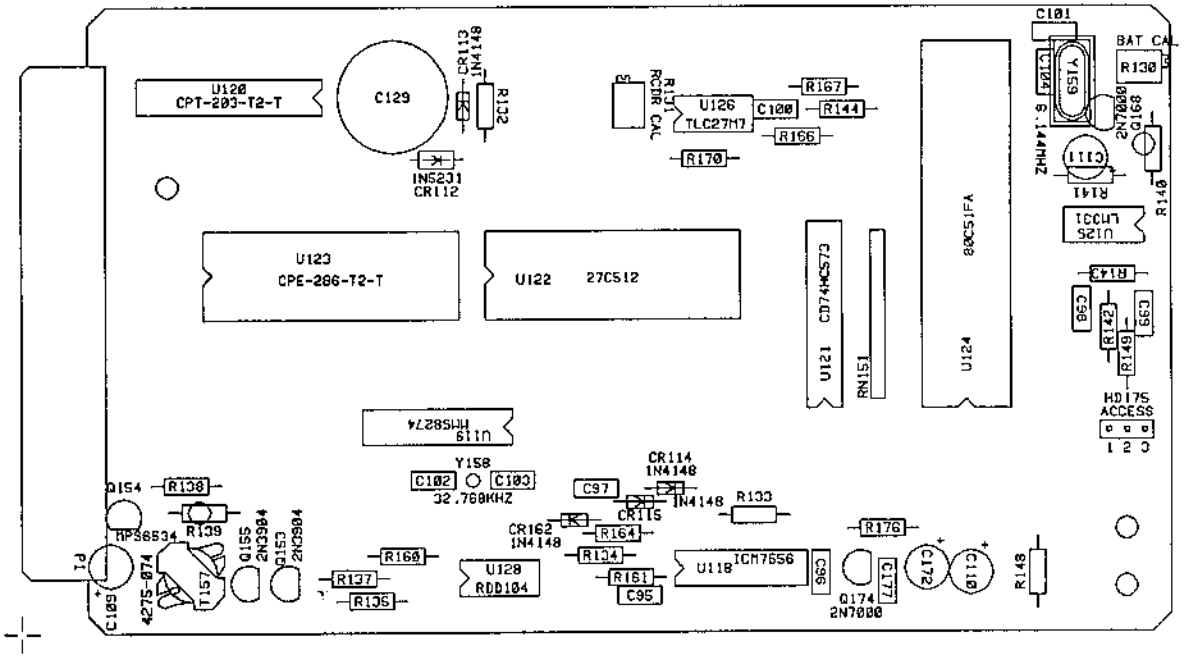
Ref. No.	Description	Part No.
RESISTORS		
R6	1 kohm	10-7009
DIODES		
CR5	1N4148	07-6272
CR7	1N5819	07-6306
CONNECTORS		
J1-J2	125X44-CBNEARS EZA22DRSN	13-8181


REVISIONS
EFF | AUTHORITY | ZONE | LTR | DESCRIPTION | DATE | APPROVED
DETECTOR
R34 10K 1/3W
R31 100 1/3W
C34 1UF 35V
CR6 1N5226 3.3V 1/2W
R45 100K 1/3W
C39 10UF 20V
Q1 2N3904
R55 1K 1/3W
R40 1M
C9 100PF 3KV
R9 10K 1/3W
C35 0.001UF 100V
R10 100K GAIN
R11 1K 1/3W
R2 47 1/3W
C10 10UF 20V
1/5 U3 CA3096 16=GND
R16 4.7K 1/3W
R13 10K 1/3W
R12 470K 1/3W
R15 1K 1/3W
C23 0.1UF 100V
R14 10K 1/3W
RN20 220K
BUS0
BUS1
BUS2
BUS3
A1
A0
WR'
A2
RESET
RN1 5.6K
CE4'
CE3'
CE5'
U6 AD7549
U7 AD7549
C33 33PF 100V
1/2 U5 LT1078
C41 33PF 100V
1/2 U5 LT1078
1HR
1HIN
8=+5V,4=GND
20=+5V,12=GND
-2.5V
C21 33PF 100V
1/2 U10 LT1078
C20 33PF 100V
1/2 U10 LT1078
HV REF
OVR REF
C1 0.005UF 3KV
C3 0.005UF 3KV
C2 0.005UF 3KV
C10 0.005UF 3KV
C8 0.005UF 3KV
C7 0.005UF 3KV
C27 0.005UF 3KV
C19 0.005UF 3KV
R4 4.7M
R39 1M
C6 0.005UF 3KV
C24 0.005UF 3KV
CR15 MR250-2
CR3 MR250-2
C38 0.001UF 3KV
C37 0.001UF 3KV
CR14 MR250-2
CR4 MR250-2
CR5 MR250-2
C32 0.001UF 3KV
C20 100PF 3KV
C5 0.001UF 3KV
C31 100PF 100V
R5 1G
R58 1M 1/3W
R52 1M HV CAL
R6 470K 1/3W
C4 0.1UF 100V
R8 100K 1/3W
1/2 U2 LT1078
HV REF
8=+5V,4=-10V
7=GND,8=GND
R46 10K 1/3W
Q5 2N3904
T1 4275-037
CR13 1N4148
Q4 MPS-U01
R41 100K 1/3W
Q3 MPS-U51
CR9 1N4148
CR8 1N4148
C29 0.01UF 100V
C30 100UF 10V
R42 3K 1/3W
4=+5V,11=GND
1/4 U1 LT1079
R26 80.6K 1/3W
R23 1M 1/3W
R44 1G
R7 1M CURRENT CAL
R43 470K 1/3W
C40 0.1UF 100V
R57 80.6K 1/3W
R56 1M 1/3W
C42 0.01UF 100V
R25 10K 1/3W
R24 10K 1/3W
R30 10K 1/3W
OVR REF
OVERLOAD'
P2 -42
WIN OFF'
R53 22K 1/3W
Q2 MPS6534
R17 10K 1/3W
WIN
R59 10K 1/3W
1/2 U4 TLC372
8=+5V,4=GND
R19 10K 1/3W
C12 100PF 100V
C22 0.01UF 100V
R1 10K 1/3W
C17 100PF 100V
R27 62K 1/3W
CR2 1N4148
1/2 U9 CD4098 16=+5V,8=GND
C11 100PF 100V
R3 56K 1/3W
PULSE'
P2 -8
R56 10K 1/3W
R35 10K 1/3W
THR
R18 10K 1/3W
R54 10K 1/3W
C13 0.01UF 100V
C14 47PF 100V
CR1 1N4148
T2 4275-089
CR11 1N5819
C15 100UF 10V
C26 220UF 10V
U8 LM2578
TIMING
LIMIT
CR7 1N5819
9=PGND,10=PGND
R21 0.1 3W
C25 22UF 15V
C16 100PF 100V
C36 0.001UF 100V
R38 10K 1/3W
R32 221K 1/3W
R22 80.6K 1/3W
R37 820 1/3W
-2.5V
LM385Z-2.5 U11
P2 -19 WIN OFF'
P2 -11 A0
P2 -33 A1
P2 -10 A2
P2 -17
P2 -39
P2 -18
P2 -32 WR'
P2 -29 RESET
P2 -12 BUS0
P2 -34 BUS1
P2 -13 BUS2
P2 -35 BUS3
P2 -7 +5V
P2 -9
P2 -31
P2 -3 +BAT
P2 -2
P2 -24
CR18 1N4148 CE3'
CR17 1N4148 CE4'
CR16 1N4148 CE5'
R28 1M 1% 1/3W
R30 47K 1/3W
R29 33.2K 1% 1/3W
1/2 U2 LT1078
-8.5V
P2 -1
CR19 1N4148
R47 33.2K 1% 1/3W
R48 1M 1% 1/3W
R49 12K 1/3W
R50 1K VIEWING ANGLE
R51 330 1/3W
LUDLUM MEASUREMENTS INC.
TITLE: AMPLIFIER/POWER SUPPLY
UPDATED CKB 07/12/93
DR LL 9/12/88
CHK R.C. 3/4/96
DSGN LL 9/12/88
APPD J.C.W. 3/4/96
NEXT HIGHER ASSY.
BOARD# 5371-002
SIZE D
MODEL 2350
SERIES 371
SHEET 2
SHEET 1 OF 1
26-Feb-96 5371002



LUDLUM MEASUREMENTS INC. SHEETWATER, TX.					
DR	CKB	06/23/92	TITLE: AMPLIFIER/POWER SUPPLY BOARD		
CHK R.C.		3/4/96	BOARD# 5071-002		0S071002
DSGN LL		10/11/88	MODEL 2350	SERIES 071	SHEET 24
APP JGW		3/4/96			
08:54:39		21-Feb-96	COMP SIDE ☐	SLDR SIDE ☐	OUTLINE ☒
COMP PASTE ☐	COMP MASK ☐		SLDR PASTE ☐	SLDR MASK ☐	


REVISIONS
EFF | AUTHORITY | ZONE | LTR | DESCRIPTION | DATE | APPROVED
U124 80C51FA
U121 CD74HC573
U122 27C512 5-371-820
U123 CPT-286-T2-T
U125 LM331
U120 CPT-203-T2-T
U119 MM58274
U128 RD0104
U118 ICM7556
U118 ICM7556
T157 4275-074
Q154 MPS6534
Q153 2N3904
Q155 2N3904
Q168 2N7000
Q174 2N7000
Y159 6.144MHZ
Y158 32.768KHZ
RCDR CAL
JUMPER TO BOARD# 5371-854
HD175 ACCESS
FULL
LIMITED
ACKNOWLEDGE'
OVERLOAD'
TONE'
ALARM'
PULSE'
RESET
RESET'
CLICK'
DIV OUT
VFC OUT
+BAT
+BATUNS
+BATUNSR
+5V
+5V8ACK
XMIT
READY
RECEIVE
CLEAR SEND
VOL
+AUD
-AUD
7=PGND,8=PGND
LUDLUM MEASUREMENTS INC.
TITLE: CENTRAL PROCESSOR BOARD
BOARD# 5371-868
SIZE D
MODEL 2350-1
SERIES 371
SHEET 63
UPDATED
DR CKB
03/22/96
CHK
DSGN RSG
03/22/96
APPD
NEXT HIGHER ASSY.
17-Sep-96
SHEET 1 OF 1

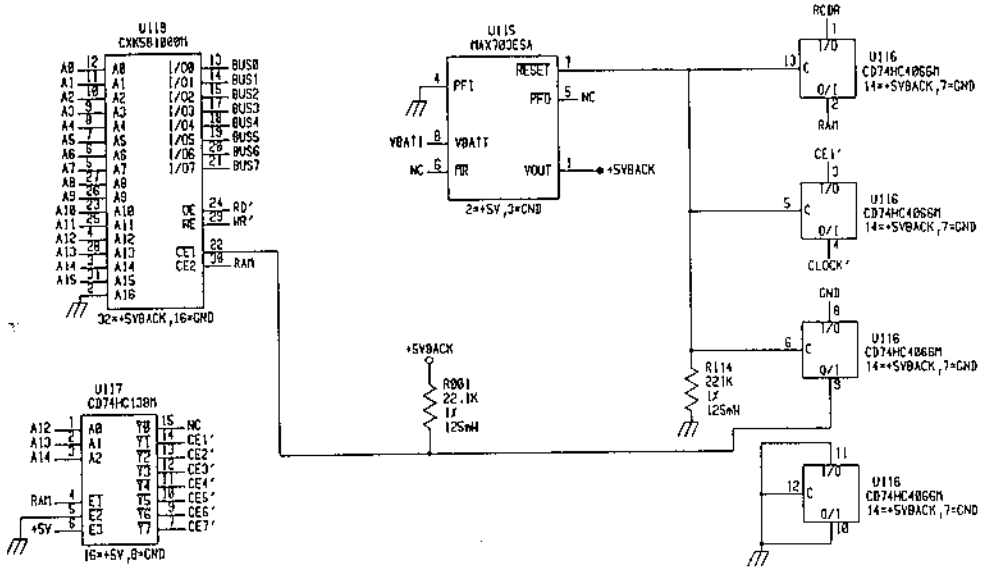


LUDLUM MEASUREMENTS INC. SWEETWATER, TX.				
DR CKD	09/17/96	TITLE: CENTRAL PROCESSOR BOARD		
CHK RSS	9/17/96	BOARD# 5371-068		BS371068
DSGN RSS	09/17/96	MODEL 2350-1	SERIES 371	SHEET 64
APP	9-17-96	COMP ARTWORK ☐		SLDR ARTWORK ☐
11:19:52	17-Sep-96	COMP OUTLINE ☒		SLDR OUTLINE ☐
COMP PASTE ☐	COMP MASK ☐	SLDR PASTE ☐		SLDR MASK ☐

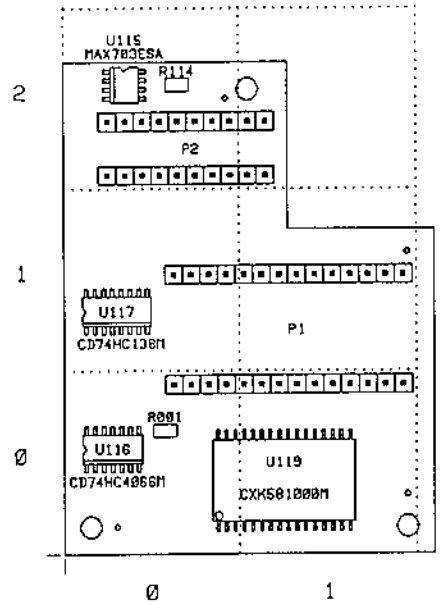
REVISIONS						
EFF	AUTHORITY	ZONE	LTR	DESCRIPTION	DATE	APPROVED

P1 -1	NC	P1 -28	NC
P1 -2	A12	P1 -27	MR'
P1 -3	A7	P1 -26	NC
P1 -4	A6	P1 -25	A8
P1 -5	A5	P1 -24	A9
P1 -6	A4	P1 -23	A11
P1 -7	A3	P1 -22	RD'
P1 -8	A2	P1 -21	A10
P1 -9	A1	P1 -20	NC
P1 -10	A0	P1 -19	BUS7
P1 -11	BUS0	P1 -18	BUS6
P1 -12	BUS1	P1 -17	BUS5
P1 -13	BUS2	P1 -16	BUS4
P1 -14	NC	P1 -15	BUS3

P2 -1	VBAT1	P2 -20	+5V
P2 -2	+5VBACK	P2 -19	NC
P2 -3	NC	P2 -18	NC
P2 -4	NC	P2 -17	CE8'
P2 -5	NC	P2 -16	CLOCK'
P2 -6	NC	P2 -15	CE2'
P2 -7	A15	P2 -14	CE3'
P2 -8	A14	P2 -13	NC
P2 -9	A13	P2 -12	CE4'
P2 -10	GND	P2 -11	CE5'

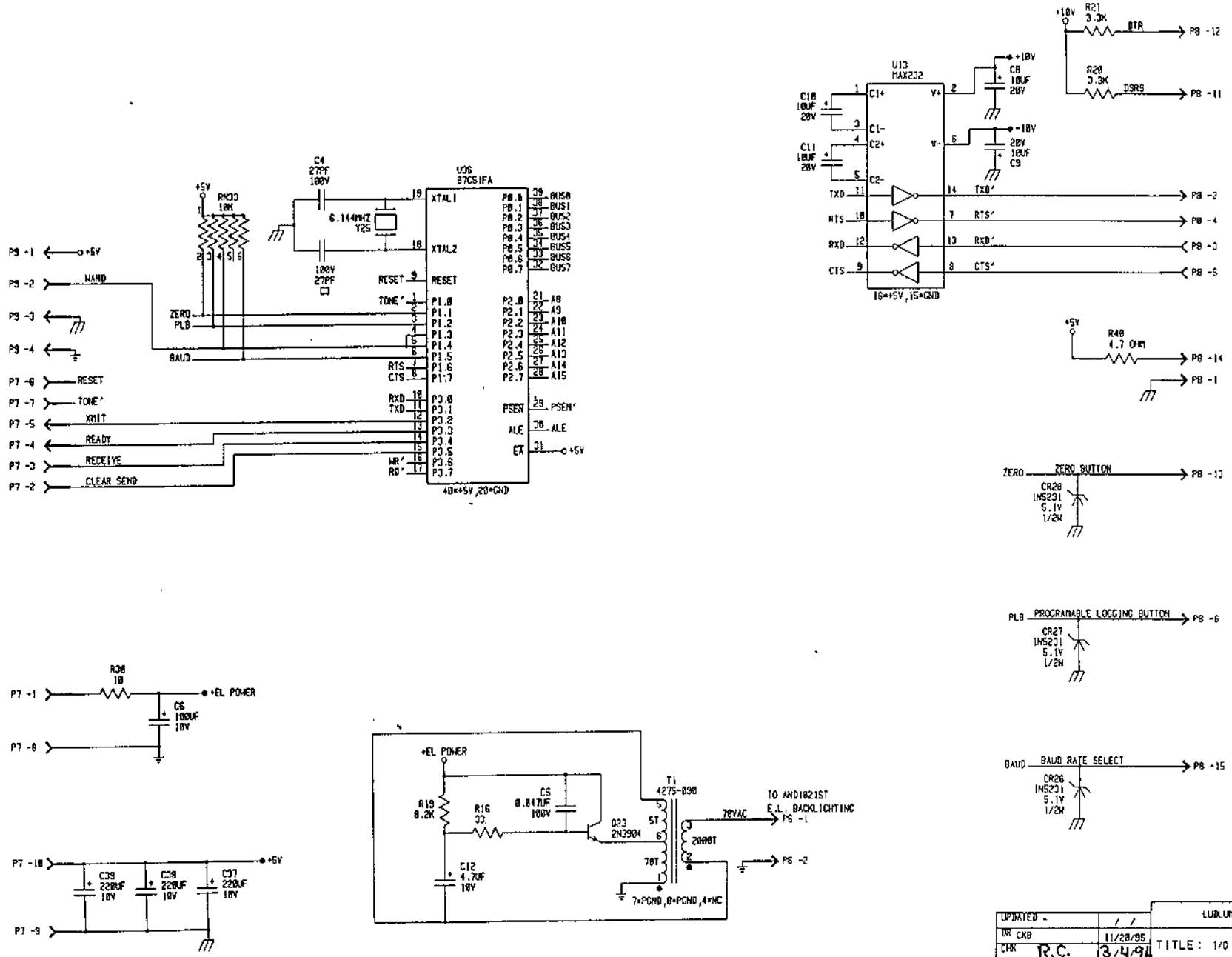


UPDATED -	/ /	LUDLUM MEASUREMENTS INC	
DR CKB	08/14/95	TITLE: 64K MEMORY EXPANDER BOARD	
CHK R.C.	3/4/96		
DSGN LL	05/12/95	BOARD# 5371-054	
APPD JGW	3/4/96	SIZE D / MODEL 2350-1 / SERIES 371 / SHEET 50	
NEXT HIGHER ASSY. -			
14:06:58	26-Feb-96	50371054	SHEET OF

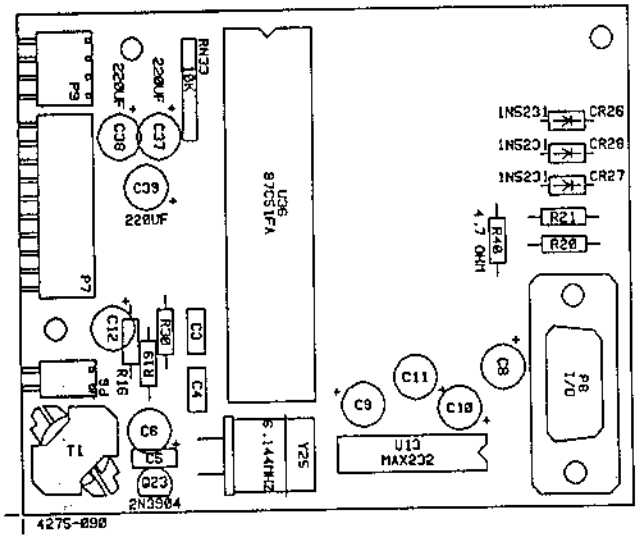


LUDLUM MEASUREMENTS INC. SWEETWATER, TX.					
DR	CKB	08/14/95	TITLE: 128K MEMORY EXPANDER BRD		
CHK	R.C.	3/4/96	BOARD# 5371-054		8S371054
DSGN	LL	05/12/95	MODEL 2350-1	SERIES 371	SHEET S1
APP	JGW	3/4/96	COMP ARTWORK ☐		SLDR ARTWORK ☐
08:38:42		21-Feb-96	COMP OUTLINE ☒		SLDR OUTLINE ☐
COMP PASTE ☐		COMP MASK ☐	SLDR PASTE ☐		SLDR MASK ☐

REVISIONS						
EFF	AUTHORITY	ZONE	LTR	DESCRIPTION	DATE	APPROVED

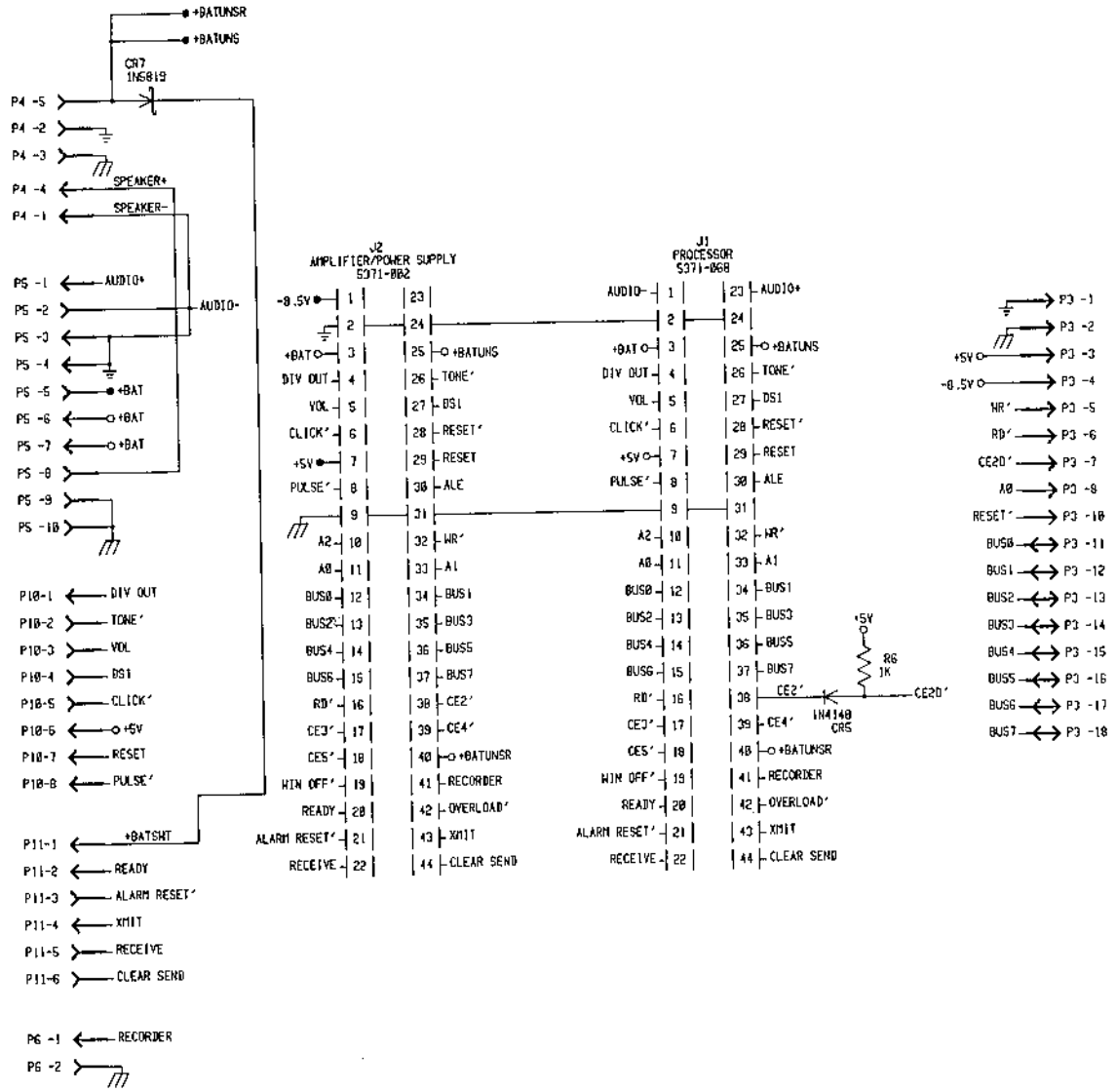


UPDATED -	/ /	LUDLUM MEASUREMENTS INC.	
DR CKB	11/20/95	TITLE: I/O INTERFACE	
CHK R.C.	3/4/96		
DSGN RSS	11/20/95	BOARD# 5371-063	
APPD JGW	3/4/96		
NEXT HIGHER ASSY. -		SIZE D / MODEL 2050-I / SERIES 371 / SHEET 58	
16:29:49	29-Feb-96	5837106J	SHEET 1 OF 1

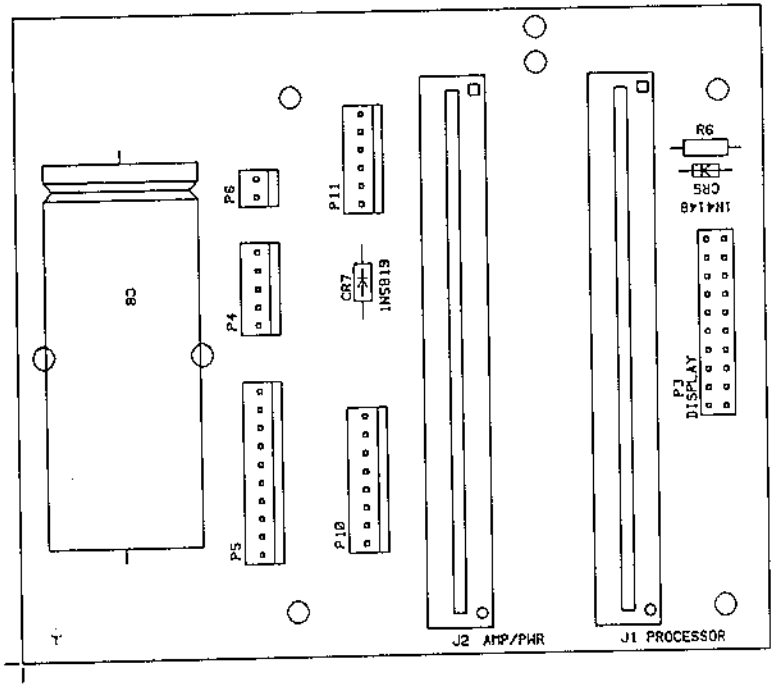


LUDLUM MEASUREMENTS INC. SWEETWATER, TX.					
DR CKB	11/20/95	TITLE: I/O INTERFACE BOARD			
CHK R.C.	3/4/96	BOARD# 5371-063		85371063	
DSGN RSS	11/20/95	MODEL 2350-1	SERIES 371	SHEET 59	
APP JGW	3/4/96	COMP ARTWORK ☒		SLDR ARTWORK ☐	
16:30:15	29-Feb-96	COMP OUTLINE ☒		SLDR OUTLINE ☐	
COMP PASTE ☐	COMP MASK ☐	SLDR PASTE ☐	SLDR MASK ☐		

REVISIONS						
EFF	AUTHORITY	ZONE	LTR	DESCRIPTION	DATE	APPROVED

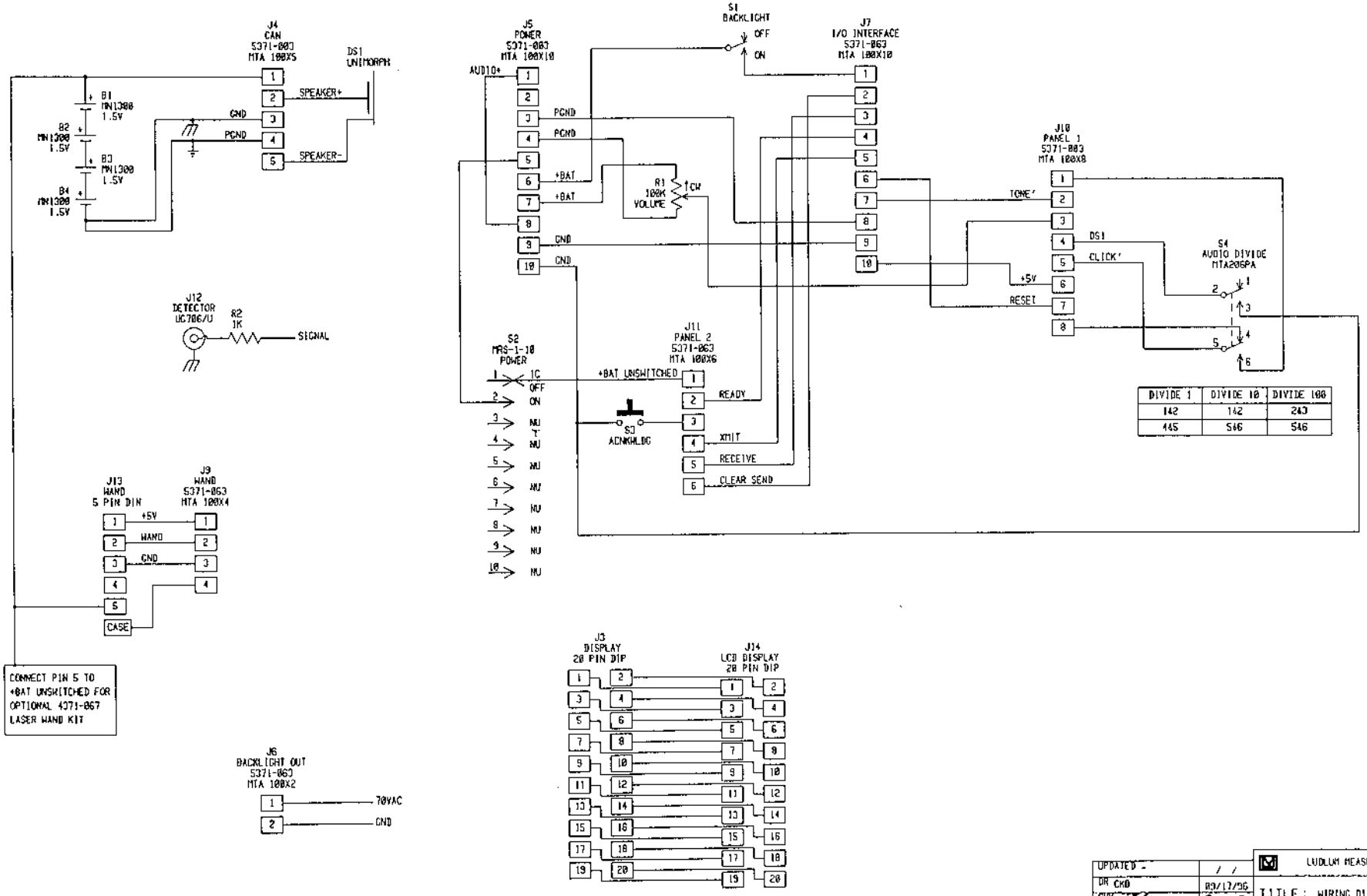


UPDATED	/ /	LUDLUM MEASUREMENTS INC.
DR LL	9/27/88	TITLE: BACKPLANE
CHK	9/27/88	BOARD# 5371-003
DSGN LL	9/27/88	
APPD JBW	9/27/88	SIZE D · MODEL 2350-1 · SERIES 371 · SHEET 3
NEXT HIGHER ASSY.		
08:55:18	17-Sep-96	SD371003 · SHEET 1 OF 1



LUDLUM MEASUREMENTS INC. SHEETWATER, TX.					
DR LL	12/17/90	TITLE: BACKPLANE			
CHK R.C.	3/4/96	BOARD# 5071-003		05071003	
DSGN LL	10/20/88	MODEL 2350	SERIES 071	SHEET 29	
APP JGW	3/4/96	COMP ARTWORK ☐		SLDR ARTWORK ☐	
08:55:02	21-Feb-96	COMP OUTLINE ☒		SLDR OUTLINE ☐	
COMP PASTE ☐	COMP MASK ☐	SLDR PASTE ☐		SLDR MASK ☐	

REVISIONS						
EFF	AUTHORITY	ZONE	LTR	DESCRIPTION	DATE	APPROVED



DIVIDE 1	DIVIDE 10	DIVIDE 100
142	142	243
145	546	546

UPDATED	/ /	LUDLUM MEASUREMENTS INC.
DR CKD	09/17/96	TITLE: WIRING DIAGRAM
CHK	9.17.96	
DSGN RSS	09/17/96	BOARD# 371-071
APPD JG	9.17.96	SIZE D · MODEL 2350-1 · SERIES 371 · SHEET 72
NEXT HIGHER ASSY.		
08:53:10	17-Sep-96	W371071 · SHEET 1 OF 1

STATEMENT OF WARRANTY

Ludlum Measurements, Inc. warrants the products covered in this manual to be free of defects due to workmanship, material and design for a period of twelve months from the date of delivery. The calibration of a product is warranted to be within its specified accuracy limits at the time of shipment. In the event of instrument failure, notify Ludlum Measurements to determine if repair, recalibration, or replacement is required.

This warranty excludes the replacement of photomultiplier tubes, G-M and proportional tubes, and scintillation crystals which are broken due to excessive physical abuse or used for purposes other than intended.

There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face there of. If the product does not perform as warranted herein, purchasers sole remedy shall be repair or replacement, at the option of Ludlum Measurements. In no event will Ludlum Measurements be liable for damages, lost revenue, lost wages, or any other incidental or consequential damages, arising from the purchase, use, or inability to use product.

Shaw Radiological Soil Screening Activity Hazard Analysis

Activity Hazard Analysis

Client name: US NAVY	Project Name and Number: Treasure Island Site 12	Location: San Francisco, California
General description for scope of work of this activity: **Shallow Excavation, Remediation, Removal Action for Potential Radioactive Material**		

	Task Breakdown	Potential Hazards	Critical Safety Practices
☒	**Mobilize to Project Site**	• Collision with other vehicle, object or pedestrian; falling objects	• Wear seat belt • Keep safe distance from other vehicle(s); use 2 second rule • Obey speed limit/traffic rules • Avoid distractions, e.g. cell phones, eating/drinking, reading map – stop/pull over to perform activities that may distract • Have proper directions to site; take route free of known road hazards, e.g. construction, pot holes; congested traffic flow • Maintain vehicle safety equipment, e.g. mirrors, alarms, horns, wipers, lights • Maintain vehicle, e.g. tire pressure, fluid levels • Keep head lights on for maximum visibility • Perform 360 degree walk-around of vehicle to look for potential hazards/obstructions before pulling-out of parking spaces (back-in parking space if possible) • Use a spotter if backing in/out of hazardous area, e.g. blind spot.
☒	**General Sampling Precautions**	• Heavy objects, e.g. manhole covers, Strains and Sprains	• Use proper tools to lift heavy objects • Use proper lifting techniques • Avoid manually lifting more than 60 lbs.; use mechanical lifting equipment • Get assistance from someone else if mechanical lifting is not feasible
☒		• Sharp objects	• Wear leather gloves when handling or exposed to sharp objects • Keep guards in place on all equipment/hand tools
☒		• Confined/restricted spaces	• Do not enter confined/restricted spaces until all hazards have been identified and assessed by trained/qualified personnel
☒		• Struck by/against process equipment	• Identify objects/hazards in work areas • Maintain lighting to be able to see hazards; use high powered flashlight • Wear hard hat, safety glasses, high visibility vest, safety shoes
☒		• Slips, Trips, and Falls	• Clear walkways, work areas of equipment, tools and vegetation • Mark, identify and/or barricade other obstructions or open wholes, excavations, pits, etc. • Maintain 3 point contact when ascending/descending ladders
☒		• Insects and Animals (rodents, large mammals, birds, snakes)	• Be observant for insect hiding places such as dark or unused recesses • Wear long sleeve shirt and pants if exposed to insects • Use insect repellant containing “DEET” e.g. “Deepwoods Off”, especially if ticks, chiggers, or mosquitos may be (or are)present • Check body for ticks • Report all bites and seek medical attention • Maintain cognizance of animal hazards • Know emergency numbers and route to hospital

	Task Breakdown	Potential Hazards	Critical Safety Practices
☒	**General Sampling Precautions (Continued)**	• Improper Waste Minimization	• Care must be taken to minimize the potentially contaminated waste generated while sampling, while properly collectingsamples that are not cross-contaminated
☐		• Lead paint	• Review lead containing paint disclosure • Avoid dust generating activities involving painted surfaces or paint chips • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through painted surfaces • Brush paint chips from boots before leaving building
☐		• Cr	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affected zones)
☐		• As	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affected zones)
☒		• Pb	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affected zones)
☐		• Hg	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affected zones)

	Task Breakdown	Potential Hazards	Critical Safety Practices
☐	**General Sampling Precautions (Continued)**	• Pesticides	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affected zones)
☒		• PCB	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affect zones)
☒		• Dioxin	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated material • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affected zones)
☒		• PolyNuclear Aromatic Hydrocarbons	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated material • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affected zones)
☐		• Diesel Range Organics (DRO)	• Review HASP disclosure(s) and project documents • Follow precautions as stated in plan
☐		• Gasoline Range Organics (GRO)	• Review HASP disclosure(s) and project documents • Follow precautions as stated in plan
☐		• Volatile Organics (VOCs)	• Review HASP disclosure(s) and project documents • Follow precautions as stated in plan
☐		• Semi-Volatile Organics (SVOCs)	• Review HASP disclosure(s) and project documents

	Task Breakdown	Potential Hazards	Critical Safety Practices
☐	**General Sampling Precautions (Continued)**	• Unexploded Ordnance (UXO)	• Review HASP disclosure(s) and project documents
☐		• Other	• Review HASP disclosure(s) and project documents • Avoid dust generating activities involving contaminated or treated surfaces • Wash hands after completing work and before eating or smoking • Utilize respirator while drilling through contaminated • Brush debris from boots before leaving building (or wear booties and collect potentially contaminated booties on exiting affected zones)
☐		• Asbestos	• Review asbestos presence disclosure • Avoid areas with damaged insulation, pipe wrapping, or wall board (transite) • Do not sample in areas with damaged insulation • Take care to avoid unnecessary disturbance of dusty surfaces
☒	**Mobilize to Site and Establish Onsite Sampling Station**	• Electrical Hazards	• Inspect general condition of electrical service outlets local to or used for sampling operations • Inspect electrical cords on instruments and equipment • Use grounded outlet for all three-prong plugs • Avoid use of extension cords if possible, if used inspect the extension cord and use one of sufficient gauge for all potential loads
☒		• Personnel Traffic	• Limit personnel access to sample handling area
☒	**Radiological Sampling Precautions**	• Responsibilities	• Radiological Safety shall be managed by the following personnel: • Project Manager – Peter Bourgeois • Regional Site Safety Professional – Fred Mlakar, CIH • Radiation Safety Officer – Dennis Brown, CHP • Radiation Safety Manager – Dave Hillyer
☒		• Identification of Controlling Agencies and Documents	• Base Commander, • Army Regulation EM 385-1-1 06.E • Regulatory Guide 1.86 (guidance and screening) • North Carolina-promulgated regulations under the NRC State Agreement Program • 10 CFR 20 Appendix E for soil screening at projected 25 mrem TEDE

	Task Breakdown	Potential Hazards	Critical Safety Practices
☒	**Radiological Sampling Precautions (Continued)**	• Identification of ***SITE-SPECIFIC*** Radiological Hazards	• Potential for Sr-90, Cs-137 in soil and sub-surface debris up to mCi/Kg quantities but more likely µCi/Kg quantities • Potential for self-powered illuminating deck markers and similar devices up to 15 µCi each with Ra-226, Sr-90, or Cs-137
☒		• Evaluation of Potential Exposure to Workers	• Not a potential hazard unless detected at levels greater than (Reg Guide 1.86): • See entries below and site-specific hazards and concentrations noted above:
☒		• **Check all that apply**	• Uranium • 5,000 dpm α/100cm2 average • 15,000 dpm α/100cm2 maximum • 1,000 dpm α/100cm2 removable
☒			• Transuranic waste or Transuranic spp. contamination also: Ra-226, Th-230 (uranium series radionuclides in mill tailings, UMTRCA, FUSRAP, etc.) • 100 dpm α/100cm2 average • 300 dpm α/100cm2 maximum • 20 dpm α/100cm2 removable
☒			• Sr-90 • 1,000 dpm β/100cm2 average • 3,000 dpm β/100cm2 maximum • 200 dpm β/100cm2 removable
☒			• Beta emitters, except Sr-90 • 5,000 dpm β/100cm2 average • 15,000 dpm β/100cm2 maximum • 1,000 dpm β/100cm2 removable
☒		• Evaluation of Public Dose	• No risk of creating contamination that could leave the site and expose public • Access to facility controlled during sampling event
☒		• Training Program Development	• Workers will review this AHA, including the radiological controls • Work will be performed under the guidance of knowledgeable Shaw radiation protection professionals
☒		• Declare Pregnant Woman	• Any women performing sampling activities will be advised of radiation risk to embryo/fetus and placed in touch with a Shaw Certified Health Physicist for discussion • If woman states she is pregnant, work will be performed to limit dose to this individual consistent with Regulatory Guides 8.13 and 8.29.

	Task Breakdown	Potential Hazards	Critical Safety Practices
☒	**Radiological Sampling Precautions (Continued)**	• ALARA Program	• Activities will be performed such that radiation exposures are kept as low as possible • Any contamination levels in excess of Reg. Guide 1.86 will be sampled using additional radiological controls to minimize exposure. A knowledgeable Shaw radiological professional will define the additional controls.
☒		• External Exposure Control	• The allowed contamination levels will not result in external exposure requiring any additional controls
☒		• Internal Exposure Control	• The allowed contamination levels and care to not disturb potential contamination will not result in airborne contamination requiring any additional controls to prevent internal exposure
☒		• Monitoring and Measuring External Exposure	• No external personnel dosimeter is required because external exposure is not expected to exceed 10 mrem in one year. However, NWT employees are badged
☒		• Monitoring and Measuring Internal Exposure	• No internal personnel dosimetry program is required because internal exposure is not expected to exceed 10 mrem in one year. However, NWT employees will be in areas that have stationary air monitoring
☒		• Surveys and Monitoring	• Each sampling site will be monitored with a combined alpha – beta/gamma instrument prior to sampling to assure contamination levels do not exceed Reg. Guide 1.86 levels • Walk over and comprehensive area surveys will be performed
☒		• Contamination Control	• Care will be taken to minimize disturbance of potentially contaminated surfaces (dusty) surfaces while sampling • Samples will be packaged to prevent contamination of sampling equipment, personnel, and to prevent cross contamination
☒ ☒ ☒ ☒ ☒ ☒ ☒		• Instrumentation	• Ludlum Model 2360 with either 43-68, 43-89, or43-93, 43-93-2 probe for alpha – beta/gamma surface measurements • Ludlum Model 2929 for alpha and beta/gamma smear counting • Ludlum Model 19 for exposure rate assessment gamma field measurements • Ludlum Model 44-9 with a Ludlum Model 3 ratemeter for alpha/beta/gamma surface measurements • Ludlum Model 44-10 with a Ludlum Model 2241 ratemeter/scaler for gamma field measurements • All instruments calibrated using ANSI standard techniques • All instruments performance checked daily to assure response within industry-standard parameters

	Task Breakdown	Potential Hazards	Critical Safety Practices
☒	**Radiological Sampling Precautions (Continued)**	• Radiological Areas and Posting	• No posting will be required, other than drums and drum storage areas for presence of Radioactive Material, label on exempt check sources, and a gamma spectroscopy source and source handling area in the Gamma Spec. Lab. • Sampling personnel will control access in proximity of sampling activities to keep non-essential personnel away
☒		• Control of Radiological Work	• Work will be performed following the safety practices defined in this AHA and good industry practice
☒		• Procurement, Receipt, and Inventory	• Radioactive check sources will be controlled to prevent unauthorized use and loss • Check sources will be locked up when not in use • No other radioactive material will be procured for this sampling project
☒		• Shipping and Transportation of Radioactive Materials	• Samples will be monitored with calibrated radiological instrumentation to characterize levels prior to shipping • Samples will be shipped according to DOT shipping regulations • Sample characterization information will be forwarded to the analytical laboratory before receipt for sample handling purposes
☒		• Control of Radioactive Waste	• Investigation-derived waste (IDW) will be handled in compliance with Section 5, Waste Management of the Sampling Plan for this project, addressing: • Waste minimization • Potential waste streams • IDW • Sanitary waste • Low-level radioactive waste (none is anticipated)
☒		• Radiation Protection Records	• Radiological survey records will be maintained and filed kept with the project records • Analytical results will be maintained with the project records
☒		• Reports and Notifications	• No reports or notifications are necessary for this sampling activity
☒		• Licenses	• NWT has a Type A Broad Scope License
☒		• Review and Approval	• This AHA shall be approved by: • Project Manager—Peter Bourgeois, 415-277-6983; 415-760-5321 (cell) • Site Safety Professional, Fred Mlakar, 949-660-5413; 949-981-1450 (cell) • Radiation Safety Officer, Dennis Brown 3030-7441-7507; 720-272-9915 (cell); NWT-Doc Dennis 916-919-6977 • Radiation Safety Manager or designee Dave Hillyer, 617-589-1115; 217-521-4721 (cell)
☐		• Planned Special Exposures	• Planned Special Exposure will not be considered for use on this sampling, surveying, and excavation project

	Task Breakdown	Potential Hazards	Critical Safety Practices
☐	**Radiological Sampling Precautions (Continued)**	• Self-Assessment, Reviews, and Corrective Actions	• Following completion of this project, a discussion including all involved Shaw radiation protection personnel will be held to identify improvement opportunities • This discussion will be documented in the project records • No periodic reviews will be necessary on this short-term project.
☐	**Sampling at Elevated Heights Precautions**	• Fall from Height	• Catwalks must have OSHA compliant railings before unprotected travel is allowed • Fall protection must be used if railings are non-compliant or missing • Long-handled tools must be used to sample outside an arm's reach • Do not lean over railings
☐		• Unsafe lift operation	• Lift operator must be trained in equipment operation • Lift basket must have appropriate tie-off points for fall protection • Personnel riding in lift must use OSHA-compliant fall protection harness and lanyard • Do not climb on basket railings • Do not lean out over edge of basket • Use long-handled tools to sample beyond an arm's reach
☐		• Dropping from height	• Do not sample when personnel are located below • Secure tools to prevent dropping from heights
☒	**Perform Surface Contamina-tion Sampling**	• Skin contamination	• Gloves (latex or nitrile) shall be worn when sampling
☒		• Finger laceration	• Work gloves shall be worn in addition when performing swipe sampling
☒	**Perform Residue Sampling**	• hand injury while sampling	• Wear work gloves while performing residue and soil sampling
☐	**Perform Sampling on Roof**	• Falling from roof	• Use fall protection of approaching within 6 feet of roof edge
		• Falling through roof	• Discuss roof condition with knowledgeable personnel before going on roof • Be aware of roof condition while walking on roof • Avoid roof penetrations until condition has been determined
☐	**Perform Concrete Sampling**	• Electrical Hazards	• Follow electrical hazard safety practices identified above • Assure extension cord is appropriate for electrically operated tool • Inspect tool for electrical hazards before use
☐		• Power Tool Hazard	• Wear work gloves when working with power tools • Wear hard-toed safety shoes when working with power tools
☐		• Airborne dust	• Respirator with air-purifying cartridges must be worn by power tool operator • Other personnel must not be in the area during dust generating activities
☒	**Sample Preparation and Shipping**	• Hazardous contamination	• Sample containers must be wiped off and smeared for radiological contamination • Sample containers must be adequately closed and packed to prevent sample release within the shipping packaging

	Task Breakdown	Potential Hazards	Critical Safety Practices
☒	**Sampling Demobiliz-ation**	• Improper Waste Disposal	• Generated waste must be categorized and separated for proper deposal • Waste characterization records (process knowledge, measurements, etc.) must be maintained • Waste must be disposed of properly
	REVIEWED BY: NAME	EMPLOYER	DATE

Job Safety Analysis

Attachments:

Lead & Asbestos disclosure
Hospital map
Occupational Health Clinic Map
JSA form
Names & approvals list

Appendix D
Site 12 Waste Management Plan

FINAL

WASTE MANAGEMENT PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number N68711-01-D-6011
Contract Task Order 0010

Document Control Number NAV010-002-H
Revision 0

February 26, 2007

Submitted to:

U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
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Submitted by:

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Concord, California 94520-1120

FINAL

WASTE MANAGEMENT PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

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Document Control Number NAV010-002-H
Revision 0

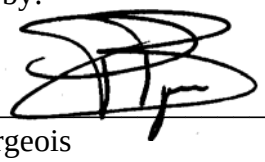
February 26, 2007

Prepared by:

_____ Date: February 26, 2007

Mark Vennemeyer
Transportation and Disposal Coordinator

Approved by:



_____ Date: February 26, 2007

Peter Bourgeois
Project Manager

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Table 2 Waste Accumulation Methods and Times
Table 3 Waste Sample Types and Analysis
Table 4 Preliminary Characterization and Classification
Table 5 Waste Manifest Packages for Potential Waste Disposal Facilities

List of Attachments

Attachment 1 Waste Inventory Log
Attachment 2 Waste Storage Area Inspection Checklist

Acronyms and Abbreviations

DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
NAVSTA	Naval Station
TI	Treasure Island
T&D	transportation and disposal
TPH	total petroleum hydrocarbons
WMP	Waste Management Plan

1.0 Introduction

This Waste Management Plan (WMP) describes the project management and engineering controls that Shaw Environmental, Inc. (herein referred to as Shaw) will use to accumulate, transport, and dispose of wastes generated at the site in a cost-effective, timely, and compliant manner. This WMP outlines the specific transportation and disposal (T&D) activities in a chronological sequence under Contract Task Order 0010 of the Naval Facilities Engineering Command Environmental Multiple Award Contract. The WMP also provides specific waste information and the T&D Coordinator's associated responsibilities for each T&D activity. This document is submitted as part of the remediation Work Plan.

2.0 Transportation and Disposal Coordination, Staff Organization, and Responsibilities

Shaw will assign a T&D Coordinator to coordinate all T&D-related activities at the Naval Station (NAVSTA) Treasure Island (TI) project site. The Site Superintendent will perform the on-site T&D activities and the T&D Coordinator will perform the off-site T&D activities. Table 1 outlines both the Site Superintendent's and the T&D Coordinator's responsibilities for each of the project's T&D-related activities.

Table 1

Synopsis of T&D Activities and Staff Responsibilities

Step No.	T&D Activity	Site Superintendent Responsibilities	T&D Coordinator Responsibilities
1	Waste accumulation and storage	Mark and label waste containers, if present. Prepare and maintain Waste Inventory Log. Inspect storage areas; prepare and maintain Waste Storage Area Inspection Checklist weekly. Ensure waste accumulation times do not exceed regulatory thresholds.	Provide marking and labeling requirements. Monitor Waste Inventory Logs. Monitor Waste Storage Area Inspection Checklists.
2	Waste analysis	Assist Project Chemist in retrieving samples. Ship samples to laboratory and disposal facilities in accordance with DOT and IATA requirements. Provide analytical data to T&D Coordinator.	Determine waste characterization and disposal facility analyses requirements. Provide waste characterization and disposal facility analysis requirements to Project Chemist. Determine if samples are regulated by DOT and IATA, and provide DOT and IATA requirements to Project Chemist.
3	Waste EPA/DTSC characterization and DOT classification	Provide site history and waste generation sources to T&D Coordinator. Verify accuracy of waste labels.	Characterize and classify each waste stream.
4	Selection of T&D subcontractors	Provide T&D Coordinator with project schedule.	Determine T&D options. Prepare purchase order requisition package. Evaluate bidding vendors. Recommend subcontractors.
5	Waste manifest package preparation	Obtain generator approval and signatures. Submit to disposal facility and track approval time.	Prepare disposal facility waste profiles, land disposal restriction forms, and template manifests. Obtain disposal facility letters of commitment.

Table 1 (Continued)

Synopsis of T&D Activities and Staff Responsibilities

Step No.	T&D Activity	Site Superintendent Responsibilities	T&D Coordinator Responsibilities
6	Waste shipment and tracking	Schedule shipment. Inspect transportation containers, vehicles, and drivers. Obtain generator and transporter signatures on each manifest and land disposal restriction form.	Prepare manifests and land disposal restriction forms. Distribute copies of executed manifests. Track shipment to disposal facility. Obtain disposal facility signed manifests.
7	Waste treatment and disposal	No action required.	Obtain certificates of disposal/treatment, and weight tickets.

DOT denotes U.S. Department of Transportation

No. denotes number

DTSC denotes Department of Toxic Substances Control

EPA denotes U.S. Environmental Protection Agency l

IATA denotes International Air Transport Association

T&D denotes transportation and disposal

3.0 Transportation and Disposal Activities

This section describes the specific T&D activities in a chronological sequence at NAVSTA TI project site.

3.1 Waste Accumulation and Storage

The majority of excavated soil and construction debris generated during this remedial action will be loaded directly (i.e., "direct loaded") onto bulk transport vehicles. Waste will be characterized / classified using pre-construction waste samples. Loaded vehicle(s) will transport the wastes to an appropriate treatment, storage and disposal facility based on the pre-construction sampling & classification. It is anticipated that waste materials and debris from the solid-waste disposal area 1207/1209 will be staged at a nearby stockpile area (Site 6).

Shaw will segregate and accumulate wastes into the categories outlined in Table 2. The Site Superintendent will ensure wastes from different sources are additionally segregated by each individual source. The T&D Coordinator will then review available information and determine whether the wastes from different sources can be commingled for both cost and handling efficiency.

Table 2
Waste Accumulation Methods and Times

Waste	Accumulation Method	Maximum Accumulation Times
Soil Class 1 (Hazardous) contaminated with TPH, PCB, PAH, dioxins and/or heavy metals)	Temporary waste pile; roll-off container.	90 days maximum for hazardous according to 22 CCR Section 66262.34
Soil, Class 2 (Non-hazardous, no regulated contaminants)	Temporary waste pile; roll-off container.	Not applicable for nonhazardous; 90 days maximum for hazardous according to 22 CCR Section 66262.34
Personal protective equipment and Visqueen®	Roll-off container; plastic bag.	Not applicable for nonhazardous; 90 days maximum for hazardous according to 22 CCR Section 66262.34
Construction debris (metal, wood, plastic, paper, etc.)	Temporary waste pile; roll-off container.	Not applicable for nonhazardous; 90 days maximum for hazardous according to 22 CCR Section 66262.34
Concrete chunks (from demo of sidewalks, patios, gutters, etc.)	Temporary waste pile; roll-off container.	Not applicable for nonhazardous; 90 days maximum for hazardous according to 22 CCR Section 66262.34

Table 2 (Continued)
Waste Accumulation Methods and Times

Waste	Accumulation Method	Maximum Accumulation Times
Asphalt chunks (from demo of roadway)	Temporary waste pile; roll-off container.	Not applicable for nonhazardous; 90 days maximum for hazardous according to 22 CCR Section 66262.34
Waste water (from equipment decon activities and/or dewatering of excavations)	Temporary storage tank	Not applicable for nonhazardous; 90 days maximum for hazardous according to 22 CCR Section 66262.34

CCR denotes California Code of Regulations
PAH denotes polycyclic aromatic hydrocarbons
PCB denotes polychlorinated biphenyl
TPH denotes total petroleum hydrocarbons

Attachment 1 provides the Waste Inventory Log that the Site Superintendent will use to track project wastes. Attachment 2 provides the Waste Storage Area Inspection Checklist that the Site Superintendent will use to inspect each waste storage area on a weekly basis.

3.2 Waste Analysis

The T&D Coordinator will instruct the Project Chemist to retrieve representative samples for waste characterization, and may request him/her to retrieve additional grab samples for comparison to applicable U.S. Environmental Protection Agency (EPA)/Department of Toxic and Substance Control land disposal restrictions. The majority of soil sampling will be performed prior to any excavation activities. Any waste water samples will be taken when accumulation of liquids is completed.

Table 3 outlines the required sample types and analytical methods necessary for proper waste characterization and waste disposal acceptance (at a minimum).

Table 3
Waste Sample Types and Analyses

Waste	Sample Type	Analytical Methods
Soil Class 1 (Hazardous) contaminated with TPH, PCB, PAH, dioxins and/or heavy metals)	Representative; approximately 1 4 point composite per 500 cubic yards	Total petroleum hydrocarbons (TPH) as diesel fuel, gasoline, and motor oil Total Title 22 metals PCBs SVOCs Dioxin
Soils (Class 2, non-hazardous, no regulated contaminants)	Representative; approximately 1 4 point composite per 500 cubic yards	Same as above
Personal protective equipment and Visqueen®	Not necessary since will infer from analytical data representing the soils	Will infer from analytical data representing the soils
Construction debris (metal, wood, plastic, paper, etc.)	Paint chip (if needed)	Lead (if needed)
Concrete chunks (from demo of sidewalks, patios, gutters, etc.)	Representative	Will infer from appearance of waste (i.e., staining) and potential contamination from soils
Asphalt chunks (from demo of roadway)	Representative	Will infer from appearance of waste (i.e., staining) and potential contamination from soils
Waste water (from equipment decon activities and/or dewatering of excavations	Representative	TPH as diesel fuel, gasoline, and motor oil Total Title 22 metals PCBs SVOC Total suspended solids, Chemical Oxygen Demand, pH

PAH denotes polycyclic aromatic hydrocarbons
PCB denotes polychlorinated biphenyl
TPH denotes total petroleum hydrocarbons
SVOCs denotes semivolatile organic compounds

3.3 Waste EPA Characterization and DOT Classification

Shaw's preliminary characterization and classification of the wastes generated at the site is outlined in Table 4. Additional waste characterization will be performed as needed using pre-construction sampling to determine exact disposal volumes and requirements. See the project Sampling and Analysis Plan for additional information regarding sampling and analysis.

Table 4
Preliminary Characterization and Classification

Waste Stream	EPA/DTSC Characterization	DOT Classification
Soil Class 1 (Hazardous) contaminated with TPH, PCB, PAH, dioxins and/or heavy metals)	Hazardous	Class 9 or Not regulated
Soil (Class 2, Non-hazardous with no regulated contaminants)	Nonhazardous	Not applicable
Personal protective equipment and Visqueen®	Nonhazardous	Not applicable
Construction debris	Nonhazardous	Not applicable
Concrete chunks	Nonhazardous	Not applicable
Asphalt Chunks	Nonhazardous	Not applicable
Waste water	Nonhazardous	Not applicable

DOT denotes U.S. Department of Transportation
DTSC denotes Department of Toxic Substances Control
EPA denotes U.S. Environmental Protection Agency
PAH denotes polycyclic aromatic hydrocarbons
PCB denotes polychlorinated biphenyl
TPH denotes total petroleum hydrocarbons

3.4 Waste Manifest Package Preparation, Shipping, Tracking, and Disposal

The T&D Coordinator will prepare one manifest package for each waste stream. Each manifest package will be signed by a Navy representative. Table 5 outlines the manifest package contents for each waste stream's potential disposal facility.

The remaining steps necessary for the shipment, tracking, and disposal of the wastes generated at the site will be in accordance with procedures outlined in Table 1.

Table 5
Waste Manifest Packages for Potential Waste Disposal Facilities

Waste Streams	EPA/DTSC Characterization	Potential Disposal Methods and Facilities	Manifest Package Contents
Soil Class 1 (Hazardous) contaminated with TPH, PCB, PAH, dioxins and/or heavy metals)	Hazardous	Direct landfill at Chemical Waste Management, Kettleman Hills, CA or Clean Harbors-Lokern in Buttonwillow, CA	Uniform Hazardous waste manifest Land Disposal Restriction Notification / Certification TSDF Generator Waste Profile form
		Stabilization followed by landfill at Chemical Waste Management, Kettleman Hills, CA or Clean Harbors-Lokern in Buttonwillow, CA	Uniform Hazardous waste manifest Land Disposal Restriction Notification / Certification TSDF Generator Waste Profile form
Soils Class 2 (Non-hazardous) no regulated contamination	Nonhazardous	Direct Landfill at Waste Management-Altamont Landfill, Livermore, CA or Allied Waste-Forward Landfill, Manteca, CA or Allied Waste-Keller Canyon Landfill, Pittsburg, CA	Nonhazardous waste manifest TSDF Generator Waste Profile form
Personal protective equipment and Visqueen7	Nonhazardous	Direct Landfill at Waste Management-Altamont Landfill, Livermore, CA or Allied Waste-Forward Landfill, Manteca, CA or Allied Waste-Keller Canyon Landfill, Pittsburg, CA	Nonhazardous waste manifest TSDF Generator Waste Profile form
Construction Debris (metal, wood, plastic, paper, etc.)	Nonhazardous	Direct Landfill at Waste Management-Altamont Landfill, Livermore, CA or Allied Waste-Forward Landfill, Manteca, CA or Allied Waste-Keller Canyon Landfill, Pittsburg, CA	Nonhazardous waste manifest TSDF Generator Waste Profile form
Concrete chunks	Nonhazardous	Direct Landfill at Waste Management-Altamont Landfill, Livermore, CA or Allied Waste-Forward Landfill, Manteca, CA or Allied Waste-Keller Canyon Landfill, Pittsburg, CA	Nonhazardous waste manifest TSDF Generator Waste Profile form
		Recycle at Specialty Crushing, Oakland, CA or Davis Street Recycling Center, Oakland, CA	Nonhazardous waste manifest

Attachment 1
Waste Inventory Log

WASTE INVENTORY LOG

Shaw Environmental
EMAC – CTO-0010
Former Naval Station Treasure Island
San Francisco, California

Date of Inventory Inspection: _____ Inspected by: _____

Container Number	Container Type	Container Volume	Generation Date	Waste Description	Date Removed from site

Attachment 2
Waste Storage Area Inspection Checklist

Waste Storage Area
Inspection Checklist

Inspected by: _____ Date: _____ Time: _____

	Yes	No	Corrective Action		Date Corrected
Area posted with appropriate hazard and cautionary signs	☐	☐	_____		_____
Area free of spills?	☐	☐	_____		_____
All liquids stored in proper secondary containment?	☐	☐	_____		_____
Secondary containment basins free of liquids, snow and debris?	☐	☐	_____		_____
Containers compatible with waste being stored?	☐	☐	_____		_____
Containers properly sealed (lids on, rings in place, bins covered, etc.)?	☐	☐	_____		_____
All containers properly labeled?	☐	☐	_____		_____
Labels easily visible for inspection?	☐	☐	_____		_____
Accumulation start dates present on labels?	☐	☐	_____		_____
Accumulation start dates with storage time limit (e.g., 90 days)?	☐	☐	_____		_____
Information on all labels legible not faded and all required information is present?	☐	☐	_____		_____
Adequate aisle space for drums (minimum 22 inches)?	☐	☐	_____		_____
Aisles and doorways free of obstructions?	☐	☐	_____		_____
Containers free of leaks, dents or deterioration including structural defects and rusting?	☐	☐	_____		_____
Adequate separation of incompatible materials?	☐	☐	_____		_____
Tops of containers free of standing water?	☐	☐	_____		_____

Notes: _____

_____

Appendix E
Site 12 Site Health and Safety Plan

FINAL

SITE HEALTH AND SAFETY PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number N68711-01-D-6011
Contract Task Order 0010

Document Control Number NAV010-002-H
Revision 0

February 26, 2007

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FINAL

SITE HEALTH AND SAFETY PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number N68711-01-D-6011
Contract Task Order 0010

Document Control Number NAV010-002-H
Revision 0

February 26, 2007

Prepared by:_____ Date: February 26, 2007
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Acronyms and Abbreviations

AHA	activity hazard analysis
ANSI	American National Standards Institute
APR	air-purifying respirator
BAAQMD	Bay Area Air Quality Management District
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
dBA	decibels, A-scale
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
EZ	exclusion zone
MSDS	material safety data sheet
Navy	U.S. Department of the Navy
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PDR	personal data-logging real-time aerosol monitor
PEL	permissible exposure limit
PM	Project Manager
PPE	personal protective equipment
PS	Project Superintendent
PS/SHSS	Project Superintendent/Site Health and Safety Specialist
SHSP	Site Health and Safety Plan
SHSS	Site Health and Safety Specialist
SWDA	solid-waste disposal area
SZ	support zone

Policy Statement

Shaw Environmental, Inc. (herein referred to as Shaw) maintains a policy of providing a safe and healthful work environment for all employees and subcontractors. No phase of operations or administration is afforded greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts, and all reasonable precautions will be taken to reduce the possibility of injuries, illnesses, or accidents.

This Site Health and Safety Plan, (SHSP) describes the procedures that Shaw will follow during project operations. Operational changes that could affect the health or safety of personnel, the community, or the environment will not be made without the prior approval of Shaw's program certified industrial hygienist. The provisions of this SHSP are mandatory for all Shaw personnel, Project Managers, and subcontractor personnel working on this project.

Objective

The objective of this Site Health and Safety Plan (SHSP) is to provide on-site health and safety guidelines for the subject Contract Task Order 0010 which has been issued by the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command, Southwest, at the solid-waste disposal areas that are located in the Site 12 residential housing area at the former Naval Station on Treasure Island, San Francisco, California, under Environmental Multiple Award Contract N68711-01-D-6011. The procedures and guidelines presented herein are based on the best information available at the time of plan preparation. This SHSP describes the specific health and safety requirements and procedures that Shaw Infrastructure, Inc. will use while conducting fieldwork.

In combination with the Shaw Environmental, Inc. *Health and Safety Policies and Procedures Manual* (Shaw, 2006), and the *Program Health and Safety Plan Revision 1*, (Shaw, 2003), this SHSP serves as the *Code of Safe Work Practices*. All of these documents are required to be on site and available for immediate reference. Collectively, these documents present the essential elements of the health and safety program for each project site. Section 1.0 of this SHSP describes the project site and the scope of work.

Changes to the SHSP must be approved by the Site Health and Safety Specialist, the Project Certified Industrial Hygienist, and the Project Manager or Project Superintendent and documented on the Health and Safety Plan Amendment Documentation form (Attachment 1). The Navy Technical Representative may acknowledge the change but is not required to sign the form.

Site Health and Safety Plan Acknowledgment _____

I understand and agree to abide by the provisions detailed in this Site Health and Safety Plan for the activities described in the project work plans. I understand that failure to comply with these provisions could lead to disciplinary action, which could include dismissal from the work site, termination of employment, or termination of subcontractors' contracts.

Printed Name	Company	Signature	Date

1.0 Site History Description and Scope of Work

This Site Health and Safety Plan (SHSP) has been prepared by Shaw Environmental, Inc. (herein referred to as Shaw) for the U.S. Department of Navy (Navy), Naval Facilities Engineering Command Southwest, under Environmental Multiple Award Contract, Contract N68711-01-D-6011, Contract Task Order 0010, and presents the policies and procedures established to protect workers and the public from potential hazards posed by site work. Shaw considers safety the highest priority during work at a site containing potentially hazardous conditions and has established a policy of minimizing exposure that must be upheld on all projects. Although the SHSP focuses on the planned work activities, it must remain flexible because of the nature of the work. Changes to the SHSP must be approved by the Site Health and Safety Specialist (SHSS), Certified Industrial Hygienist (CIH), Project Manager, or Project Superintendent (PS) and must be recorded on the Health and Safety Plan Amendment Documentation form provided as Attachment 1, "Health and Safety Plan Amendment Documentation."

1.1 Site Description

Site 12 is located on the northwest portion of Treasure Island (TI) on a relatively flat 93-acre area. The site consists of multiplex housing units with private backyards and common area front yards, side yards and surrounding greenbelts. The area was originally used as a parking lot during the 1939-40 Golden Gate International Exposition. After Navy occupation of the island in 1940, the area was developed as bunker storage of munitions and other materials, vehicle equipment and storage, recreational playing fields and disposal and burning of solid waste. Beginning in the 1960s, areas of Site 12 were incrementally developed into housing for Navy personnel and their dependents.

Site 12 contains four housing areas that include the 1100 housing area, the 1200 housing area, the 1300 housing area, and the 1400 housing area. Collectively there are 149 residential buildings in Site 12. Each building has between four and eight residential units. The majority of buildings within the solid-waste disposal areas (SWDA) are unoccupied pending Navy environmental restoration activities.

1.2 Scope of Work

This SHSP addresses the proposed Non-Time Critical Removal Action activities for three solid waste disposal areas located in the Site 12 residential housing area at the former Naval Station on TI. The removal action includes excavation of chemical- and solid-waste contaminated soil within known SWDAs as well as the preemptive excavation of soil within residential backyards which may be impacted by historical grading and mixing of material from the SWDAs. Contaminants of potential concern within the Site 12 SWDAs include polycyclic

aromatichydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dioxin, and lead. Methane and 1,1,2,2-tetrachloroethane are present within localized areas of SWDA A&B. The excavated soils will also be screened for radiological contamination for disposal purposes. The anticipated duration of field work is approximately 8 months.

2.0 Responsibilities

Project personnel are responsible for completing tasks in a safe manner and reporting any unsafe acts or conditions to their supervisor and the PS. All persons on site are responsible for continuous adherence to health and safety procedures during the performance of any project work. In no case may work be performed in a manner that conflicts with the intent of, or the inherent safety precautions expressed in this SHSP. Persons who violate procedures or work rules after due warning will be dismissed from the site, terminated, or have their contract revoked. Blatant disregard or repeated infractions of health and safety policies are grounds for disciplinary action up to, and including, dismissal and/or removal from the project.

All employees have the right and duty to stop work when conditions are unsafe, or when established safety procedures are being disregarded. Whenever an employee determines that workplace conditions present an immediate uncontrolled risk of injury or illness, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the employee is authorized and required to issue a Stop Work Order in accordance with Shaw Procedure No. HS040, "Stop Work Authority" (2006). The specific activity or operation in question shall be discontinued until the issue is resolved.

All Shaw and subcontractor personnel are required to read and acknowledge their understanding of this SHSP. All project personnel are expected to abide by the requirements of this SHSP and to cooperate with project management and safety representatives to ensure a safe and healthful work site. Site personnel are required to immediately report any of the following to the PS:

- Accidents and injuries, regardless of severity
- Expected or uncontrolled release of chemical substances
- Any sign or symptoms of chemical exposure
- Any unsafe or malfunctioning equipment

Any changes in site conditions that could affect the health and safety of project personnel

Key project personnel are identified in Attachment 2, "Emergency Phone Numbers," of this SHSP.

The Project Manager (PM), PS, SHSS, and Project CIH share responsibilities for formulating and enforcing health and safety requirements, and implementing the SHSP. This section outlines the responsibilities of each of these key personnel, Shaw Employees, and Subcontractors.

2.1 Project Manager

The PM has the overall responsibility for the project and to assure that the requirements of the contract are attained in a manner consistent with the SHSP requirements. The PM will coordinate with the PS and the SHSS to assure that the work is completed in a manner consistent with the SHSP.

2.2 Site Supervisor

The PS is responsible for field implementation of the SHSP and Site Emergency Response and Contingency Plan. The PS is responsible for field implementation of the SHSP and will act as the SHSS in his/her absence.

2.3 Site Health and Safety Specialist

The SHSS is authorized to administer the SHSP. The SHSS's primary operational responsibilities include personal and environmental monitoring, coordination of job safety analyses, selection and care of personal protective equipment (PPE), assignment of protection levels, review of work permits and observation of work activities. The SHSS is authorized to stop work when an imminent health or safety risk exists. The SHSS will review the essential safety requirements with all on-site personnel and will facilitate the daily safety meetings. The SHSS reports to the Project CIH.

The SHSS responsibilities include:

- Monitoring workers for signs of stress, such as cold exposure, heat stress, and fatigue.
- Reevaluating site conditions on an on-going basis. Coordinating protective measures including engineering controls, work practices and personal protective equipment.
- Assisting the PS in the preparation, presentation, and documentation of daily safety meetings.
- Conducting and preparing reports of daily safety inspections of work processes, site conditions, equipment conditions, and submitting to PS. Discussing any necessary corrective actions with the PS and reviewing new procedures.
- Initiating revisions of the SHSP as necessary for new tasks or modifications of existing operations and submitting to the Project CIH for approval.
- Performing air monitoring as required by the SHSP.
- Assisting the PM and PS in incident investigations.
- Preparing permits for special operations, *e.g.*, hot work, confined spaces, line breaking, *etc.*

- Maintaining site safety records.
- Conducting weekly inspections of all fire extinguishers, supplied air respirators, first-aid kits and eye washes/emergency showers.
- Ensuring that project management/purchasing has pre-qualified sub contractors during the bidding stage. Informing subcontractors of the elements of the SHSP/contractor pre-job safety checklist.
- Coordinating the preparation of Job Safety Analyses with the PS, team leader, and work crew

2.4 Project Certified Industrial Hygienist

The Project CIH is responsible for reviewing the SHSP and ensuring that the SHSP is complete and accurate. The Project CIH provides technical and administrative support and will be available for consultation when required. If necessary, the CIH will direct modifications to specific aspects of the SHSP to adjust for on-site changes that affect safety. The SHSS will coordinate with the CIH on necessary modifications to the SHSP. The CIH may make periodic site visits to determine compliance.

2.5 Employee Safety Responsibilities

The employee will use all equipment provided in a safe and responsible manner as directed by the PS. Site personnel concerned with any aspect of health and safety shall bring it to the attention of the Project Superintendent/Site Health and Safety Specialist (PS/SHSS). All project personnel have the authority to stop work if in their judgment serious injury could result from continued activity. The PS and the SHSS shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions.

Specific requirements include:

- Providing or assisting with the preparation of activity hazard analyses associated with onsite subcontractor activities.
- Reading the SHSP and any amendments prior to the start of on-site work.
- Providing documentation of medical surveillance and training to the PS/SHSS prior to the start of work
- Attending the pre-entry briefing prior to beginning on-site work as well as other scheduled safety meetings.
- Bringing forth any questions or concerns regarding the content of the SHSP to the PS/SHSS prior to the start of work.

- Reporting all potentially dangerous situations, incidents, injuries, and illnesses, regardless of their severity, to the PS/SHSS.
- Complying with the requirements of this SHSP and the requests of the PS/SHSS.

2.6 Subcontractor Health and Safety

This section of the SHSP outlines general requirements for subcontractors including adoption of the Shaw SHSP, correction of safety violations, and other general requirements.

2.6.1 Correction of Safety Violations

Every employer on the project site has an obligation to prevent or correct hazards and to protect all employees from exposure to such conditions if they exist. To assure these obligations are being met, subcontractors will be subject to periodic inspection by Shaw. The subcontractor will be notified in writing if a safety violation is observed. The subcontractor shall have these violations corrected within the time frame noted and shall sign and enter the date on which the item was corrected and return the signed inspection reports so items can be rechecked. Failure to correct the violations and to return the signed inspection reports may result in termination of contract.

2.6.2 General Safety Requirements

Additionally, the subcontractor is responsible for assuring the following:

- Designating a safety representative to work with the Shaw SHSS.
- Ensuring, via daily inspections, that all work conditions, practices and equipment are free of hazards
- Providing SHSS with copies of material safety data sheets (MSDS) for all hazardous materials brought on-site.
- Providing all the required personal protective equipment for their employees.
- Participating in the daily safety meeting.

Reporting all safety incidents, including near misses, first aid, medical, equipment, vehicle, property and environmental to the Shaw SHSS, immediately.

3.0 Project Hazard Analysis

This section summarizes hazards associated with site activities.

The activity hazard analysis (AHA) identifies potential safety, health, and environmental hazards and identifies measures to protect personnel, the community, and the environment. The AHA describes the sequence of work, specific hazards anticipated, and control measures that will be used to minimize or eliminate each hazard. Attachment 3, "Activity Hazard Analyses," contains an AHA for each major field activity described in the Remedial Action Plan. Attachment 3 is supplemented by the information contained in the following sections and contains AHAs for the following activities:

- Site preparation (utility clearing, construct access road install temporary fencing, survey and staking, erosion control)
- Clearing and grubbing
- Excavation of waste and waste-impacted soil
- Waste segregation and stockpile management
- Soil monitoring and sampling
- Vehicle operations (transportation and disposal)
- Backfilling and compaction
- Site restoration (removal of temporary facilities)

3.1 Chemical Contaminants of Concern

Site 12 soil data was evaluated with respect to its potential for causing airborne exposures to site remediation workers. The following are the contaminants of concern which were evaluated:

- Lead
- PCBs
- PAHs
- Dioxin
- Methane
- 1,1,2,2-tetrachloroethane

Calculations and experience indicate that standard dust controls including water spray and careful soil handling will prevent hazardous airborne concentrations of these constituents to site workers and the general public. Dust concentrations near site workers' breathing zones and at the jobsite perimeter will be monitored both visually and with direct reading aerosol monitoring

instrumentation. The properties and hazards of these chemicals are presented on Table 1, "Chemical Contaminants of Concern." Air monitoring procedures are presented in Section 7.0.

3.2 Biological Hazards

Spiders

Spiders are primarily nocturnal and retreat to dark areas. Some spiders are venomous; however, they rarely bite humans. Even so, those that may bite can cause a painful injury, and in rare cases, hospitalization or death. Two types of spiders that are poisonous and can pose a risk to humans are black widows and brown recluse.

The most effective way to prevent bites from spiders is to avoid them. Avoid placing hands or feet under rocks or reaching into dark confined places. Visual inspection of work areas should be performed prior to activities taking place.

3.3 Material Safety Data Sheets

MSDS are provided in Attachment 4 for materials that are expected to be used during the course of the project.

3.4 Heat Stress

Shaw's Health and Safety Standard Operating Procedure for Heat Stress (HS400) can be found in Attachment 8.

3.5 Noise

Exposure to excessive noise leads to hearing loss. Hearing protection will be used by workers exposed to noise levels that could exceed an eight-hour time-weighted average of 85 decibels (A-scale), and they will be enrolled in a hearing conservation program that includes audiometric testing and training. Noise levels will be measured if deemed necessary by the SHSS in consultation with the project CIH.

3.6 Mobile Equipment

All heavy equipment will be equipped with audible backup alarms and all onsite vehicles will have manually operated horns capable of being heard 200 feet away. The operators of all vehicles will not leave the controls of their vehicles while moving under their own engine power. All site workers will wear high visibility vests and will be trained to establish eye contact between equipment operators and foot traffic before approaching same.

3.7 Confined Spaces

Confined space entry is not anticipated.

3.8 Unanticipated Hazards

Previously unanticipated hazards due to changed conditions or new information will be addressed prior to starting or continuing work that could expose workers to those hazards. A new or revised AHA will be prepared using the U.S. Army Corps of Engineers (USACE) Health and Safety Requirements Manual EM 385-1-1 (USACE, 2003 and Shaw E & I Procedure No. HS045 (2006) as guidelines).

4.0 Personal Protective Equipment

The initial level of PPE required for project tasks will be either Level D or Modified Level D as specified in the AHAs presented in Attachment 3. These levels are also defined below.

Level D PPE shall consist of the following, at a minimum:

- Standard work clothing
- American National Standards Institute (ANSI)-approved steel-toed work boots
- ANSI-approved safety glasses with side shields
- Hearing protection (if necessary) providing 25 decibels, A-scale (dBA) or greater protection
- ANSI-approved hard-hat
- Abrasion resistant gloves, if necessary

Level D-modified PPE shall consist of the following, at a minimum:

- ANSI-approved steel-toed work boots
- Tyvek®-type coveralls (may be constructed of other materials as appropriate)
- Abrasion resistant gloves, if necessary
- Hearing protection (if necessary) providing 25 dBA or greater protection
- ANSI-approved hard-hat
- ANSI-approved safety glasses with side shields

Level C protective equipment shall consist of the following, at a minimum:

- Half-face or full-face air-purifying respirator (APR) with high-efficiency particular air (filter) cartridges
- ANSI approved steel-toed boots
- Tyvek® coveralls with hoods and elastic wrists and ankles
- Abrasion resistant gloves, if necessary
- Hearing protection (if necessary) 25 dBA or greater protection
- ANSI-approved hard-hat

- ANSI-approved safety glasses with side shields, if full-face APR is not worn

4.1 Personal Protective Equipment Upgrade/Downgrade

As site activities progress, levels of PPE are subject to change or modification. PPE may be upgraded when action levels are exceeded or whenever the need arises to protect the health of site personnel. PPE level upgrades or downgrades are customarily communicated between the Program CIH and the SHSS and are based on the results of air sampling data. Levels of PPE will not be downgraded without prior approval from the Program CIH.

4.2 Respirator Cartridge Replacement Schedule

If the use of APRs becomes necessary, a respirator cartridge replacement schedule will be determined based on air monitoring data, chemicals of concern, and the cartridge service life program supplied by the cartridge manufacturer. At minimum, respirator cartridges will be changed at the end of each shift or when a contaminant-warning property, such as odor or irritation is detected, or when breathing becomes more difficult than when the respirator was donned

5.0 Site Control

This section describes access control mechanisms, briefing requirements, and tracking mechanisms that will be instituted to maintain site control. This section also addresses engineering controls and restrictions which may impact area residents during completion of the Non-Time Critical Removal Action.

5.1 Work Zones

To prevent off-site migration of contamination caused by personnel or equipment, work areas and PPE will be clearly specified prior to beginning operations. Each site will be established separately taking into consideration the working space, type of contamination, and activities to be performed. Caution tape and barricades will be used to define the zones. Only authorized personnel with appropriate training and PPE will be allowed to enter the exclusion zones (EZs), which are areas where inhalation, oral contact, or dermal contact with contaminants could occur. All personnel entering the Exclusion Reduction will be logged in and out on a daily basis.

5.2 Exclusion Zone

The EZ is the area suspected of contamination and presents the greatest potential for worker exposure. Personnel entering the EZ must wear the mandated level of protection for that area.

5.3 Contamination - Reduction Zone

If Level C protection becomes necessary, the contamination reduction zone (CRZ) or transition zone will be established between the EZ and support zone (SZ). In this area, personnel will begin the sequential decontamination process required to exit the EZ. To prevent off-site migration of contamination and to control access to the EZ, all personnel will enter and exit the EZ through the CRZ. The CRZ for this project will be the access/egress routes to/from the EZ and the personnel and equipment decontamination stations.

5.3.1 Support Zone

The SZ will consist of the area outside of the EZ and CRZ where the support equipment and sanitation facilities (*i.e.*, toilets and drinking/washing water) are staged. Eating, drinking, and smoking will be allowed only in the SZ.

5.4 Hazard Briefing

No person will be allowed on the site during site operations without first being given a site hazard briefing. In general, the briefing will consist of a review of the SHSP and the tailgate safety meeting. All persons on the site, including visitors, must sign the SHSP acknowledgment

sheet and tailgate safety meeting form. Tailgate safety meetings will be held daily before site activities begin.

5.5 Access Controls

The SHSS and PS will establish the physical boundaries of each zone and instruct all workers and visitors on the limits of the restricted areas. No one will be allowed to enter the restricted area without the required protective equipment for that area. The PS will ensure compliance with all restricted area entry and exit procedures.

The PS will also designate a decontamination point for personnel to exit the contaminated area and to enter the clean area where personnel may rest and drink.

All site personnel and/or visitors entering and exiting the EZ or the CRZ will be required sign a logbook that will be maintained at the entrance.

5.6 Visitor Access

The following steps should be taken with respect to site visitors.

5.6.1 Approach

If unannounced visitors arrive on site, Shaw employees should approach them, introduce him or her self, and respectfully ask the visitors to identify themselves and state their business. An effort should be made to distinguish between Shaw workers and subcontractors and those for whom Shaw is not responsible for enforcing health and safety rules on job sites, such as client representatives, agency representatives, and other visitors authorized by the client. For example, hard hats and safety glasses may be a requirement in the SZ or anywhere on the site, but to enforce the same on all visitors may not be necessary. A respectful explanation of what areas to avoid may be all that is necessary.

5.6.2 Unauthorized Visitors

If visitors are unauthorized, Shaw employees should explain to the visitors that entry to the site is restricted because the site contains hazards. The site boundaries and any other relevant restrictions should be pointed out to the visitors.

5.6.3 Visitors Authorized to View the Site from the Support Zone

If visitors are authorized by the client, Shaw employees should do the following:

- Review the tailgate safety meeting form with them and ask them to sign it
- Provide the visitors with hard hats, safety glasses, and orange vests, if applicable
- Prohibit entry to the EZ

5.6.4 Visitors Authorized to Enter the Exclusion Zone While Work is Ongoing

If the visitors must enter the EZ, Shaw employees should do the following:

- Verify that they have current hazardous waste operations and emergency response training (HAZWOPER) training
- Verify that they have a current physical exam authorizing work on hazardous waste sites
- Review the SHSP and the tailgate safety meeting form, and have the visitors sign the acknowledgement forms of all documents
- Provide the protective equipment required for the site
- Escort the visitor while in the EZ

5.6.5 Refusal

If visitors refuse to comply with any one of the five requirements listed above, and the **client authorizes** the visitor to enter the EZ anyway, Shaw will **shut down** any potentially hazardous equipment and take all practicable steps to eliminate other hazards and exposures. The event will be thoroughly documented.

Visitors who refuse to comply and are not authorized by the client should be asked to leave. Contact the San Francisco Police if problems occur with visitors who refuse to leave.

5.7 Engineering Controls on Dwellings and Area Resident Impacts

Shaw has scheduled work activities to minimize inconvenience to Site 12 residents. However, to ensure residents are not exposed to hazards typically associated with excavation work, such as airborn dust and heavy equipment hazards, Shaw will institute engineering controls on area buildings as needed. Shaw will also restrict parking and street access in specified locations. Residents in buildings where both the front and backyards are scheduled for excavation will be temporarily displaced. Specific controls and resident impacts are detailed below.

5.7.1 Westside Drive Residents (SWDA A&B)

The impact to all the units of Building 1325 will be the tarping of doors and windows for roughly 1 month, from roughly early March to mid April 2007. Residents will only have access to their units through the backyards. Westside drive will be blocked off near the building and access to their driveways will be unavailable for roughly 2 months to allow for the field efforts and restoration efforts to occur. Westside Drive, within the excavation footprint, will remain a gravel road after restoration efforts. Replacement of asphalt is not planned.

5.7.2 Bayside Drive Residents (SWDA 1207/1209)

Due to the potential hazards inherent to the construction activities to be completed in front and behind Buildings 1211 and 1213, residents of both buildings will need to be temporarily displaced during the excavation/backfill and site restoration work around the buildings for approximately 5.5 months, beginning in roughly early March 2007. Potential hazards are associated with the use of large excavation equipment and other vehicles in the area which will restrict safe access to the buildings. Additionally work activities will not allow for the maintenance of Emergency egress routes from the buildings. All the front and back doors and windows will be tarped during excavation work to prevent intrusion of dust.

The fronts of Building 1205 Units D, E, and F will have doors and windows tarped for 3 weeks beginning in roughly early March 2007 during Shaw's excavation and backfill work. Completion of the remaining area excavation/backfill and site restoration will take approx. 5 months beyond the 3 weeks of excavation/backfill in front of the units. Parking spaces for these units will not be available for 5 months.

Due to the excavation of soils beneath Bayside Drive road, doors and windows at the front of all of Building 1224's units will be tarped for 1.5 months beginning in roughly early March 2007. Site restoration will take approx. 4 months beyond the 1.5 months of excavation/backfill in front of the units. The parking spaces for the building will not be available for 5.5 months

Additionally, to allow for excavation work within the SWDA, the entire Bayside Drive will be off limits to street side parking for approximately 5.5 months beginning in early March 2007. With the exceptions stated above, the residents will be able to use their parking spaces, but no parking will be available on the sides of the entire street. Bayside Drive will be closed to traffic from Building 1205 to the corner of Building 1213; residents will have one-way access to the street from the two street entrances only.

5.7.3 North Point Drive Residents (SWDA 1231/1233)

The impact to all the units of Building 1237 will be the tarping of doors and windows of the entire back of the building during the excavation work in the building's backyards (roughly 2.5 months beginning in early March 2007). Residents will only have access to their units through the front. Site restoration will take another month beyond the 2.5 months of excavation and backfill. No parking restrictions are planned for this building.

At Building 1235 doors and windows of the entire back of the building will be tarped, as will doors and windows on the front of Building Units A, B, and C. Shaw will excavate behind the building for roughly 2.5 months, beginning in roughly March 2007. Excavation in front of Units A and B will take 3 weeks during the 2.5 months. Residents of Units D and E will only have access to their units through the front. Site restoration will take another month beyond the 2.5

months of excavation and backfill. The Navy is requesting Units A, B, C, and F remain vacant for approximately 4 months. Additionally, parking will not be allowed in these spaces dedicated to Units A, B, and C for 4 months to facilitate the excavation efforts.

Parking will not be allowed in spaces dedicated to Bldg. 1233 Units D, E, and F for approximately 4 months, beginning in early March 2007, to facilitate the excavation efforts.

6.0 Decontamination

This section describes decontamination procedures for project personnel and equipment.

6.1 Personnel Hygiene and Decontamination Facilities and Procedures

Portable toilets, hand washing facilities, and other standard personnel hygiene facilities will be provided at the project site. Site employees will observe strict personal hygiene standards to include thorough washing of the hands, face, arms upon leaving the work zone and prior to eating, drinking, smoking or performing any other hand to mouth function.

6.2 Equipment Decontamination Facilities and Procedures

It will be assumed that any item or vehicle taken into an EZ is contaminated and must be carefully inspected and/or decontaminated prior to leaving that particular EZ. A visual inspection of the frame and tires of all vehicles and equipment leaving an EZ will be completed. In order for a vehicle or equipment to pass inspection, it must be in a broom-clean condition and free of loose dirt or sludge material on tailgates, axles, wheels, buckets, *etc.* An equipment decontamination area will be established.

7.0 Site Monitoring

This section describes the monitoring requirements for airborne contaminants and physical hazards.

7.1 Air Monitoring

Airborne dust will be visually monitored on a continual basis. Water spray and careful soil handling will be used to prevent airborne dust from reaching workers' breathing zones and to prevent dust from escaping the perimeter of the EZ. In addition, air monitoring instrumentation will be used to document that all field personnel are adequately protected from airborne contaminants. The monitoring types, frequencies, and project-specific action levels specified in Table 2, "Action Levels," are based on permissible exposure limits (PELs) enforced by the California Division of Occupational Safety and Health. The instrument and action levels to be used for this project are described in the following subsections.

7.1.1 Real-Time Aerosol Monitor

The personal data-logging real-time aerosol monitor (PDR) is a high sensitivity photometric monitor whose light scattering sensing configuration has been optimized for the measurement of the respirable fraction of airborne dust, smoke, fumes, and mists. It will be used for real-time monitoring of airborne dust concentrations. These measurements will be used to evaluate the proper level of personal protection and to determine the response action in emergency situations. Upwind and downwind dust monitoring stations will be established to monitor particulate emissions during excavation and grading activities and during stockpiling of excavated materials.

Real-time monitoring for dust will be performed in the work areas where the potential for the highest concentrations of dust are expected during activities that may have the potential for creating a dust hazard, such as clearing, excavation, loading and unloading trucks, and stockpiling. A PDR will be used to monitor for dust in each work area and on the downwind boundary of each SWDA. In addition, PDRs will be used to measure airborn dust within the Site 6 soil stockpile area and at selected residences.

7.1.1.1 Action Levels

The site-specific action levels for airborne dust are listed in Table 2. These action levels are based on the lead concentrations in the soil because lead has the highest soil concentration to PEL ratio, thereby introducing an extra margin of safety for the other constituents. The maximum lead concentration in the soil was then used to calculate the concentration of total airborne dust that must be attained to reach the PEL of lead, and then reducing that number by a safety factor of 18.5 for worker exposures, and by another factor of 2 for the perimeter dust limit.

These action levels represent airborne particulate concentrations generated by project activities only. Background particulate levels should be subtracted from the particulate measurements. The action levels do not represent a fine line between safe and hazardous conditions. Rather, they are airborne particulate levels that trigger additional attention to dust control.

The highest arsenic concentration detected in Site 12 soil was 29.6 milligrams per kilogram which equates to 0.00296 percent. The California Occupational Safety and Health Administration (Cal/OSHA) arsenic standard (Title 8 CCR section 5214) excludes any substance of a total inorganic arsenic content of 0.02 percent or less, by weight. Therefore, the concentrations of arsenic to in Site 12 soil are too low to present a significant hazard to site workers, and the Cal/OSHA arsenic standard does not apply.

PCBs, methane, 1,1,2,2-tetrachloroethane, and other metals were also detected in very low concentrations. Poly aromatic hydrocarbons, and dioxin concentrations were detected in even lower concentrations and no occupational exposure limits have been established for them. These substances do not present a significant risk to site workers. Nevertheless, exposures to soil dust will be minimized by:

- Application of water and careful handling of soil,
- Use of disposable coveralls and booties,
- Washing hands before eating or drinking,
- Communicating these precautions and the relative hazards of the contaminated soil to all affected workers in tailgate safety meetings
- Airborne dust monitoring using direct-reading instruments and using the site specific action levels presented on Table 2, which contain large margins of safety and which will trigger additional engineering and work practice dust control measures if exceeded:

7.1.1.2 Calibration Methods/Frequencies

The PDR is calibrated by the Shaw Electronics Group in Findlay, Ohio. There is no practical procedure for field calibration of the PDR. It will be checked, zeroed, and operated according to the manufacturer's recommendations. It will be zeroed prior to the start of each day's activities. During a zero check, the sampled air passes through the purge air filter and dryer to effect a self-cleaning of the optical chamber.

7.1.1.3 Preventative Maintenance

The Shaw Electronics Group in Findley, Ohio, maintains the PDRs, including replacement of filters and desiccant; battery replacement; and cleaning of optical detection assemblies.

7.1.1.4 Notification of Monitoring Results

Air monitoring results from the previous day will be reviewed at the daily tailgate safety meetings. In addition, PDR readings occur in real time and are readily available to all site workers, who will be provided data upon request.

7.1.2 Integrated Air Sampling

Integrated breathing zone air sampling may be conducted at the discretion of the project management team in consultation with the project CIH. All time-integrated air samples will be submitted to an American Industrial Hygiene Association-accredited laboratory for analysis using OSHA, or National Institute for Occupational Safety and Health validated analytical methods. All air samples will be collected within the breathing zone using personal sampling pumps and 8 µm cellulose ester membrane filters mounted in 37 mm cassettes. Pumps will be calibrated to a mean flow rate of approximately 2.0 liters per minute. Flow rates will be calibrated with a precision flow meter that is traceable to a primary standard. The analytical results will be evaluated by the project CIH.

7.1.3 Perimeter Air Monitoring

High-volume perimeter air monitoring will be performed during excavation activities to provide data to verify effective dust control and corresponding non-exposure of Site 12 residents to PAHs, PCBs, and lead. In addition, airborne particulate concentrations will be monitored at multiple locations within each SWDA and at select locations adjacent to occupied and potentially impacted residences

Four high-volume air sampling stations will be operated by Shaw during the excavation work. One air sampling station will be located on the upwind side of Site 12 to collect “background” samples. Three additional air sampling stations will be established downwind of the three excavations, one station at each excavation. Based on our experience, we expect the upwind sample station to be positioned west of SWDA A&B. We expect the downwind samplers to be positioned on the southeast sides of their respective excavation area. However, Shaw will monitor wind direction on a daily basis and may reposition air sampling stations during the project to account for varying conditions and to maintain and/or optimize their downwind positions.

Individual samples for PCBs and PAHs will be collected in accordance with Environmental Protection Agency (EPA) Methods TO-4A and TO-13, respectively using separate GMW PS-1 PUF samplers. Lead samples will be collected at each station using a third high-volume sampler identified as a GMW TSP sampler. Lead samples will be collected in accordance with EPA Method IO-2.1.

The sample schedule at each of the four stations will be as follows:

- Daily samples will be collected for PCBs, PAHs, and lead for three days before excavation work begins. Data from these samples will be used as background measurements.
- Daily samples for PCBs, PAHs, and lead will also be collected during each of the first four days (*i.e.* first full work week) of excavation.
- Following the first week of excavation, Shaw will collect daily high volume samples for lead only at the four Site 12 locations. Samples for PAHs and PCBs will not be collected during the remainder of the excavation work unless lead data and/or air quality monitoring (discussed below) suggest airborne contaminant concentrations are of concern. Shaw will collect daily lead samples from the upwind sample station throughout the duration of excavation work. High-volume lead samples will be collected at SWDA excavation-downwind locations for the full duration of excavation work at their respective SWDA.
- Shaw will collect daily high volume samples for lead, PAHs, and PCBs on each of three days following site restoration to confirm the effectiveness of the removal action.

In addition to high-volume sampling for specific analytes, Shaw will operate air quality monitoring equipment at locations upwind and downwind of each excavation and at residences to assess dust concentrations. Air quality monitoring equipment will consist of PDRs which will record total respirable dust concentrations. Two PDRs will be used at each excavation: one will be stationed outside and downwind of the excavation and a second PDR will be carried by a worker or within construction equipment (at locations considered to be most likely to be exposed to lead-impacted dust). PDRs will also be operated at appropriate locations upwind and adjacent to occupied residences within the excavation area. Buildings scheduled for air quality monitoring include Building 1325, 1205 and 1224, 1235 and 1237. PDR monitoring results will be checked frequently during each day and Shaw will revise the construction/engineering controls to limit further emissions, if airborne dust concentrations:

- Exceed 2.5 milligrams per cubic meter (mg/m^3) for a sustained interval (5 readings sustained for one minute or more above the action level during a 15 minute time span) within the exclusion zone or
- Exceed 1.0 mg/m^3 at or beyond the exclusion zone perimeter.

These limits are based on a thorough review of site data for lead by a Shaw CIH. These conservative site-specific action levels are protective of worker and resident health and ensure compliance with Bay Area Air Quality Management District (BAAQMD) Regulation 11, Rule 1 which limits ground level lead emissions and BAAQMD Regulation 6-305 for particulate matter and visible emissions.

In addition, periodic air monitoring of methane using lower explosive limit (LEL) concentrations will be performed during excavation of soils within SWDA A&B using a combustible gas meter. The measurements will be collected to ensure worker and resident safety. If LEL concentrations exceed 10 percent at any time during excavation within the methane affected part of SWDA A&B, the excavation equipment will be shut down and all other sources of ignition will be eliminated until natural ventilation reduces concentrations below 10 percent LEL.

The LEL meter calibration will be checked daily before use against a calibration gas of known concentration, and in accordance with manufacturer's instructions.

Lastly, a meteorological (MET) station will be operated by Shaw during the project. The MET station will provide summaries of weather conditions (such as wind direction, fog, humidity) which may affect air monitoring results.

8.0 Employee Training

This section describes training requirements for personnel who will be performing fieldwork or other on-site activities.

8.1 Tailgate Safety Meetings

Prior to the start of the project, all personnel will participate in an initial tailgate safety meeting. During the initial tailgate safety meeting, this SHSP will be discussed. The PS will ensure that expected site hazards are summarized and explained to all personnel and that they are aware of the precautions they must take to minimize potential exposure to the hazards. Tailgate safety meetings will be held at the start of each work shift. All new employees will be required to attend a site health and safety orientation. Attendance records and meeting notes will be maintained with the project files.

8.2 Hazardous Waste Training

All personnel entering the EZ or CRZ will have completed at least 40 hours of HAZWOPER training, with annual refreshers. Supervisors will have received an additional 8-hour supervisory training as required by Title 8, California Code of Regulations, Section 5192(e). Additional job- or function-specific training requirements are specified in the AHAs (Attachment 3).

8.3 Hazard Communication

All personnel performing field activities will receive basic hazard communication training. The training will involve a review of the written hazard communication program (Shaw Procedure No. HS060) (2006), the MSDS for each chemical used on site, container labeling, and chemical health hazards. An MSDS will be obtained for each material purchased or brought on site and will be kept on site with this SHSP.

8.4 Site Specific Training

For site specific training, the SHSS will present an initial review of the SHSP and daily tailgate safety meetings. Attendance for such training will be tracked by obtaining signatures of all attendees and will be documented in the project files.

8.5 First Aid and Cardiopulmonary Resuscitation

At least two employees with current certificates in first aid and cardiopulmonary resuscitation (CPR) will be assigned to the project, and will be on the site whenever field activities are being conducted. If multiple work groups are dispersed throughout a project site, more than two employees will have current certification in first aid and CPR. The extent of coverage will be determined relative to the number of employee groups. Personnel trained in first aid will also be

trained in bloodborne pathogen hazards. The SHSS will be current and certified in first-aid and CPR training.

9.0 Medical Surveillance Program

All Shaw personnel and subcontractors working on the site within the CRZ or EZ are required to have completed an occupational medical examination within the last 12 months, as specified by Title 8 California Code of Regulations Section 5192(f) and Shaw Procedure No. HS100 (2006). Field personnel are also required to have written clearance in their records to work on hazardous waste sites and to wear a respirator if required by the job.

Shaw's medical surveillance program is performed under the direct supervision of a physician who is board certified in occupational medicine.

10.0 Emergency Response Plan

10.1 Pre-Emergency Planning

Prior to engaging in construction/remediation activities at the site, the PS will plan for possible emergency situations and have available adequate supplies and manpower to respond. In addition, site personnel will receive training during the site orientation concerning proper emergency response procedures.

The following situations would warrant implementation of the emergency plan:

Fire/Explosion	• The potential for human injury exists • Toxic fumes or vapors are released • The fire could spread on site or off site and possibly ignite other flammable materials or cause heat-induced explosions • The use of water and/or chemical fire suppressants could result in contaminated run-off • An imminent danger of explosion exists
Spill or Release of Hazardous Materials	• The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard • The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health
Natural Disaster	• A rain storm exceeds the flash flood level • The facility is in a projected tornado path or a tornado has damaged facility property • Severe wind gusts are forecasted or have occurred and have caused damage to the facility
Medical Emergency	• Overexposure to hazardous materials • Trauma injuries (broken bones, severe lacerations/ bleeding, burns) • Eye/skin contact with hazardous materials • Loss of consciousness • Heat stress (Heat stroke) • Cold stress (Hypothermia) • Heart attack • Respiratory failure • Allergic reaction

The site route map to the nearest medical facility that is approved by Health Resources, Shaw's consulting occupational medical group, is presented as Attachment 5, "Route Maps to Medical Facilities."

The following measures will be taken to assure the availability of adequate equipment and manpower resources:

- Sufficient equipment and materials will be kept on site and dedicated for emergencies only. The inventory will be replenished after each use.
- On-site emergency responders will be current in regards to training and medical surveillance programs. Copies of all applicable certificates will be kept on file for on-site personnel.
- It will be the responsibility of the emergency coordinator to brief the on-site response team on anticipated hazards at the site. The emergency coordinator shall also be responsible for anticipating and requesting equipment that will be needed for response activities.

Communications will be established prior to commencement of any activities at the remediation site. Communication will be established so that all responders on site have availability to all pertinent information to allow them to conduct their activities in a safe and healthful manner. The primary communication will be by voice and personal contact. Primary communication with local responders in the event of an emergency will be accomplished using commercial telephone lines.

10.2 Emergency Recognition and Prevention

Because unrecognized hazards may result in emergency incidents, it will be the responsibility of the PS and SHSS, through daily site inspections and employee feedback (daily safety meetings, and job safety analyses) to recognize and identify all hazards that are found at the site.

Once a hazard has been recognized, the PS and/or the SHSS will take immediate action to prevent the hazard from becoming an emergency. This may be accomplished by the following:

- Daily safety meeting
- Site-specific training prior to commencement of activity
- Lock-out/tag-out
- Personal Protective Equipment selection/use
- Written and approved permits for hot work, confined space
- Trenching/shoring procedure
- Air monitoring
- Following all Shaw/Shaw standard operating procedures
- Practice drills for fire, medical emergency, and hazardous substances spills

10.3 Personnel Roles, Lines of Authority, and Communications

This section describes the various roles, responsibilities, and communication procedures that will be followed by personnel involved in emergency responses.

The primary emergency coordinator for this site is the SHSS. In the event an emergency occurs and the emergency coordinator is not on site, the PS will serve as the emergency coordinator until he arrives. The emergency coordinator will determine the nature of the emergency and take appropriate action as defined in this section.

Immediately after being notified of an emergency incident, the emergency coordinator or his designee will evaluate the situation to determine the appropriate action.

10.3.1 Responsibilities and Duties

This section describes the responsibilities and duties assigned to the emergency coordinator.

It is recognized that the structure of the "Incident Command System" will change as additional response organizations are added. Personnel will follow procedures as directed by the fire department, State and Federal Agencies as required. The SHSS, in coordination with the local Fire Department chief will assume the role of Incident Commander. Additional on-site personnel may be added to the Site Emergency Response Team as required to respond effectively.

10.3.2 On-Site Emergency Coordinator Duties

The on-site emergency coordinator is responsible for implementing and directing the emergency procedures. All emergency personnel and their communications will be coordinated through the emergency coordinator. Specific duties are as follows:

- Identify the source and character of the incident, type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.
- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the site. While operations are dormant, monitor for leaks, pressure build-up, gas generation, or ruptures in valves, pipes, or other equipment, where appropriate.
- Notify the Client Representative and local Emergency Response Teams if their help is necessary to control the incident. Attachment 2 provides telephone numbers for emergency assistance.
- Direct on-site personnel to control the incident until, if necessary, outside help arrives. Specifically:

- Ensure that the building or area where the incident occurred and the surrounding area are evacuated and shut off possible ignition sources, if appropriate. The Emergency Response Team is responsible for directing site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.
- If fire or explosion is involved, notify local Fire Department.
- Have protected personnel, in appropriate PPE, on standby for rescue.

If the incident may threaten human health or the environment outside of the site, the emergency coordinator should immediately determine whether evacuation of area outside of the site may be necessary and, if so, notify the Police Department and the Office of Emergency Management.

When required, notify the National Response Center. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of facility
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside of the facility.

The emergency telephone number for the National Response Center is 800-424-8802.

If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.
- Notify the EPA Regional Administrator that cleanup procedures have been completed and that all emergency equipment is fit for its intended use before resuming operations in the affected area of the facility. The EPA Regional Administrator's telephone number is included in the Emergency Contacts.

- Record date, time, details of the incident, and submit a written report to the EPA Regional Administrator. The report is due to the EPA within 15 days of the incident.

10.4 Safe Distances and Places of Refuge

The emergency coordinator for all activities will be the SHSS. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies, which could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident-specific criteria. However, if an emergency occurs at the project site workers should initially evacuate to the assigned meeting place and if necessary or directed, leave the site. Also the following measures are established to serve as general guidelines even though these events are very unlikely to occur.

In the event of minor hazardous materials releases (small spills of low toxicity), workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards, the emergency coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The emergency coordinator or his designee will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in Attachment 2.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release
- Fire/explosion
- Power loss
- Medical emergency
- Hazardous weather

In general, evacuation will be made off site, unless the emergency coordinator determines otherwise. It is the responsibility of the emergency coordinator to determine when it is necessary to evacuate personnel to off-site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the emergency coordinator.

10.5 Evacuation Routes and Procedures

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations, the emergency coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The emergency coordinator is responsible for determining which situations require site evacuation.

The initial evacuation assembly points and EZs are shown on the map in Attachment 6, "Muster Point Location and Exclusion Zone Evacuation Route Map." These areas are usually located upwind of project areas. As work progresses, the SHSS could alter these assembly areas depending on site and weather conditions. A wind direction indicator will be placed on site. The site specific evacuation procedures will be discussed in detail at the daily safety tailgate meeting.

The authority to order personnel to evacuate the work area rests with the PS and the SHSS. If site evacuation is required, a continuous, uninterrupted air horn or vehicle horn (backup) will be sounded for approximately 10 seconds. Personnel working in the EZ will immediately make their way to the assembly point for a head count.

The EZ, evacuation route, and emergency equipment locations are included on the map presented in Attachment 6. This map will be posted at each entrance to the EZ. During an emergency, the evacuation routes noted on the map are to be followed. If conditions such as wind direction or physical hazards do not allow access to the prescribed evacuation routes, personnel are to evacuate by the safest route available.

10.5.1 Evacuation Signals and Routes

Voice and personal contact will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. Total site evacuation will be initiated only by the emergency coordinator, however, in his absence, decision to preserve the health and safety of employees will take precedence. Evacuation routes will be posted in each outside work area. Signs inside trailers will be posted on walls or other structural element of a trailer. Periodic drills will be conducted to familiarize each employee with the proper routes and procedures.

10.5.2 Evacuation Procedures

In the event evacuation is necessary, the following actions will be taken:

- The emergency signal will be activated.

- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery if safe to do so.
- ALL on-site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a head count and await further instruction from the emergency coordinator.
- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders (*e.g.*, foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the emergency coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.
- A final tally of persons will be made by the emergency coordinator or designee. No attempt to find persons not accounted for will involve endangering lives of Shaw or other employees by re-entry into emergency areas.
- In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the Site Supervisor.
- Personnel will be assigned by the emergency coordinator to be available at the main gate to direct and brief emergency responders.
- Re-entry into the site will be made only after clearance is given by the emergency coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.

10.5.3 Emergency Response Equipment

The following equipment will be staged in the support zone and throughout the site, as needed, to provide for safety and first aid during emergency responses.

- ABC-type fire extinguisher
- First-aid kit, industrial size

- Eyewash unit capable of providing 1.5 liters per minute (0.4 gallons per minute) of flushing solution to both eyes for at least 15 minutes.

In addition to the equipment listed above, Shaw maintains direct reading instrumentation that may be used in emergency situations to assess the degree of environmental hazard. This equipment will only be used by the SHSS or other specially trained personnel. This equipment will be stored, charged and ready for use in evaluating hazardous chemical concentrations.

10.5.4 Personal Protective Equipment

Disposable coveralls (Tyvek® or equivalent) and air purifying respirators with cartridges approved for protection against toxic dusts will be available onsite.

10.5.5 Emergency Spill Response Clean-Up Materials and Equipment

Emergency spill response clean-up material and equipment will be maintained on site as necessary.

*Note: All contaminated soils, absorbent materials, solvents and other materials resulting from the clean-up of spilled or discharged substances shall be properly stored, labeled, and disposed of off-site.

10.6 Medical Emergencies

The procedures listed below will be used to respond to medical emergencies. The route map to the nearest medical facility approved by Health Resources is presented as Attachment 5.

10.6.1 Response

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately contact the on-site site safety officer coordinator to alert him of a medical emergency situation. The supervisor will advise the following information:

- Location of the victim at the work site
- Nature of the emergency
- Whether the victim is conscious
- Specific conditions contributing to the emergency, if known

The following actions will then be taken depending on the severity of the incident:

- *Life-Threatening Incident* – If an apparent life-threatening condition exists, the crew supervisor will inform the site safety officer and the local

Emergency Medical Services (EMS) will be immediately called. An on-site person will be appointed who will meet the EMS and have him/her quickly taken to the victim. Any injury within the EZ will be evacuated by Shaw personnel to a clean area for treatment by EMS personnel.

- *Non Life-Threatening Incident* – If it is determined that no threat to life is present, the SHSS will direct the injured person through decontamination procedures (see below) appropriate to the nature of the illness or accident. Appropriate first aid or medical attention will then be administered.

*Note: The area surrounding an accident site must not be disturbed until the scene has been cleared by the SHSS.

Any personnel requiring emergency medical attention will be evacuated from exclusion and contamination reduction zones if doing so would not endanger the life of the injured person or otherwise aggravate the injury. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life-saving first aid. For others, decontamination may aggravate the injury or delay life-saving first aid. Decontamination will be performed if it does not interfere with essential treatment.

If decontamination can be performed, observe the following procedures:

- Wash external clothing and cut it away.

If decontamination cannot be performed, observe the following procedures:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-site medical personnel to potential contamination, instruct them about specific decontamination procedures.
- Send site personnel familiar with the incident and chemical safety information, *e.g.*, MSDS, with the affected person.

All injuries, no matter how small, will be reported to the SHSS or the PS. An accident/injury/illness report will be completely and properly filled out and submitted to the Project CIH (Shaw only).

A list of emergency telephone numbers is given in Attachment 2.

10.6.2 Notification

The following personnel/agencies will be notified in the event of a medical emergency:

- Local Fire Department or EMS
- Workers in the affected areas
- Client Representative

10.7 Fire Emergencies

Because flammable/combustible materials are present at this site, fire is an ever-present hazard. Shaw personnel and subcontractors are not trained professional firefighters. Therefore, if there is any doubt that a fire can be quickly contained and extinguished, personnel will notify the emergency coordinator by radio and vacate the structure or area. The emergency coordinator will immediately notify the local Fire Department.

The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- The air will be monitored for flammability before and during hot work and periodically where flammable materials are present. Hot work permits will be required for all such work.
- "No smoking" signs will be conspicuously posted in areas where flammable materials are present.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area the foreman will give instruction on egress procedures and assembly points. Egress routes will be posted in work areas and exit points clearly marked.

10.7.1 Response

The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify the SHSS, who will activate the emergency notifications and contact the local Fire Department.
- When the emergency notification is made, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Workers will assemble at a predetermined rally point for a head count.
- When a small fire has been extinguished by a worker, the emergency coordinator will be notified.

10.8 Hazardous Weather

Operations will not be started or continued when the following hazardous weather conditions are present:

- Lightning
- Heavy Rains
- High Winds

10.8.1 Response

- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge, initially crew trailers. The emergency coordinator will determine when it is necessary to evacuate personnel to off-site locations and will coordinate efforts with fire, police and other agencies.

10.8.2 Notification

The emergency coordinator will be responsible for assessing hazardous weather conditions and notifying personnel of specific contingency measures:

10.9 Emergency Spill Response Procedures and Equipment

In the event of an emergency involving a hazardous material spill or release, the following general procedures will be used for rapid and safe response and control of the situation. Emergency contacts found in Attachment 2 provide a quick reference guide to follow in the event of a major spill.

10.9.1 Notification Procedures

If an employee discovers a chemical spill or process upset resulting in a vapor or material release, he or she will immediately notify the on-site emergency coordinator.

On-site Emergency Coordinator will obtain information pertaining to the following:

- The material spilled or released.
- Location of the release or spillage of hazardous material.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill, vapor or smoke release is heading.
- Any injuries involved.
- Fire and/or explosion or possibility of these events.
- The area and materials involved and the intensity of the fire or explosion.

This information will help the on-site emergency coordinator to assess the magnitude and potential seriousness of the spill or release.

10.9.2 Procedure for Containing/Collecting Spills

The initial response to any spill or discharge will be to protect human health and safety, and then the environment. Identification, containment, treatment, and disposal assessment will be the secondary response.

If for some reason a chemical spill is not contained within a dike or sump area, an area of isolation will be established around the spill. The size of the area will generally depend on the size of the spill and the materials involved. Small spills (less than or equal to 55 gallons) or leaks from a tank or pipe will require evacuation of at least 50 feet in all directions to allow cleanup and repair and to prevent exposure. When any spill occurs, only those persons involved in overseeing or performing emergency operations will be allowed within the designated hazard area. If possible the area will be roped or otherwise blocked off.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and possibly evacuated from the area. The on-site emergency coordinator will inform the proper agencies in the event this is necessary. (Attachment 2)

Clean up personnel will take the following measures:

- Make sure all unnecessary persons are removed from the hazard area.
- Put on protective clothing and equipment.
- If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.
- Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.
- If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, *etc*. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.
- Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal site.
- Spray the spill area with foam, if available, if volatile emissions may occur.

Apply appropriate spill control media (*e.g.*, clay, sand, lime, *etc.*) to absorb discharged liquids.

10.9.3 Response

Any person observing a spill or release will act to remove and/or protect injured/contaminated persons from any life-threatening situation. First aid and/or decontamination procedures will be implemented as appropriate.

First aid will be administered to injured/contaminated personnel. Unsuspecting persons/vehicles will be warned of the hazard. All personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons. Attempt to stop the spill at the source, if possible. Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as uprighting a drum, closing a valve or temporarily sealing a hole with a plug.

Utilizing voice communications, the SHSS will be notified of the spill/release, including information on material spilled, quantity, personnel injuries and immediate life threatening hazards. Air monitoring will be implemented by the SHSS to determine the potential impact on the surrounding community. Notification procedures will be followed to inform on-site personnel and off-site agencies. The SHSS will make a rapid assessment of the spill/release and direct confinement, containment and control measures.

Depending upon the nature of the spill, measures may include:

- Construction of a temporary containment berm
- Digging a sump, installing a polyethylene liner and
- Diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground
- Transferring the material from its original container to another container

The emergency coordinator will notify the Client Representative of the spill and steps taken to institute clean-up. Emergency response personnel will clean-up all spills following the spill clean-up plan developed by the emergency coordinator. Supplies necessary to clean up a spill will be immediately available on-site. Such items may include, but are not limited to:

- Shovel, rake
- Polyethylene liner
- Personal safety equipment
- Steel drums
- Pumps and miscellaneous hand tools

The major supply of material and equipment will be located in the SZ. Smaller supplies will kept at active work locations. The emergency coordinator will inspect the spill site to determine that the spill has been cleaned up to the satisfaction of the Client Representative. If necessary, soil, water or air samples may be taken and analyzed to demonstrate the effectiveness of the spill clean-up effort. The SHSS will determine the cause of the spill and determine remedial steps to

ensure that recurrence is prevented. The SHSS will review the cause with the Client Representative and obtain his concurrence with the remedial action plan.

10.10 Incident Investigation and Review

All occupational emergencies, incidents, injuries or illnesses must be reported, investigated and reviewed in accordance with the Injury, Illness and Incident Telephone Notification Guide and with Shaw Procedure No. HS020, which are presented in Attachment 7.

11.0 References

California Code of Regulations, Title 8, Section 5214

California Code of Regulations, Title 8, Section 5192(e)

California Code of Regulations, Title 8, Section 5192(f)

Shaw Environmental Inc., 2003, *Program Health and Safety Plan, Revision 1*, April.

Shaw Environmental & Infrastructure, Inc., 2006, *Health and Safety Policies and Procedures Manual.*

U.S. Army Corps of Engineers, 2003, *Health and Safety Requirements Manual EM 385-1-1*, November.

Tables

Table 1
Chemical Contaminants of Concern

Compound	Maximum Concentration	PEL	Routes of Exposure	Symptoms
Lead dust	2600 mg/kg	0.05 mg/m^3	Inhalation Ingestion	Weakness, insomnia, facial pallor, anorexia, weight loss, malnutrition, constipation, colic, anemia, gingival lead line, paralysis of wrist or ankles, encephalopathy, kidney disease, irritation eyes; and hypotension. Causes cancer in laboratory animals.
Arsenic	29.6 mg/kg	0.01 mg/m^3	Inhalation Ingestion	Ulceration of nasal septum dermatitis, gastro intestinal disturbances, peripheral neuritis respiratory irritation lung and lymphatic cancer
Polychlorinated biphenyls	5.5 mg/kg	0.5 mg/m^3	Inhalation Ingestion, Skin	Eye and throat irritation chloracne, liver damage, reproductive effects, causes cancer in laboratory animals
Polyaromatic Hydrocarbons	4.7 mg/kg	NE	Inhalation Ingestion, Skin	Eye and throat irritation, dermatitis, some PAHs a known carcinogens
Dioxins	191 ng/kg	NE	Inhalation Ingestion, Skin	Chloracne human carcinogen, reproductive effects,
Chromium	452 mg/kg	0.5 mg/m^3	Inhalation Ingestion, Skin	Eye and skin irritation, lung fibrosis
Copper	4170 mg/kg	1.0 mg/m^3	Inhalation Ingestion, Skin	Eye, nose and throat irritation, perforation of nasal septum, metallic taste, dermatitis
Nickel	1620 mg/kg	1.0 mg/m^3	Inhalation Ingestion, Skin	Sensitization dermatitis, allergic asthma, pneumonia,
Methane	Unknown	10% LEL	Inhalation	Methane is a colorless, odorless and a highly flammable gas. It is a simple asphyxiate (displaces oxygen) but has no other acute or chronic health effects.
1,1,2,2-tetrachloroethane	Unknown	5.0 mg/m^3	Inhalation	Nausea, vomiting, abdominal pain

% denotes percent

LEL denotes lower explosive limit
mg/m^3 denotes milligrams per cubic meter of air.
mg/kg denotes milligrams per kilogram of soil
ng/kg denotes nanograms per kilogram of soil .
NE denotes not established

Table 2
Action Levels

Method	Monitoring Location	Monitoring Frequency [a]	Action Level [b]	Action
Visual dust observation	All areas	Ongoing	Any visible airborne dust	Apply water or other suppression method
PID/FID/Combustible Gas meter	Methane and 1,1,2,2-tetrachloroethane affected area within SWDA A&B	As needed	>10% of LEL >5 ppm of total VOCs	Stop work until natural ventilation reduces concentrations
PDR	Near workers' breathing zones	Continuously	<2.5 mg/m^3 >2.5 mg/m^3	Use Modified Level D Increase dust control and/or upgrade to Level C until concentrations are reduced
	Exclusion zone Perimeter	Continuously	<1.0 mg/m^3 >1.0 mg/m^3	Continue work Stop work until levels decrease

[a]Frequency of air monitoring may be adjusted by the project CIH after sufficient characterization of site contaminants has been completed, tasks have been modified, or site controls have proven effective.

[b]Five readings exceeding the action level in any 15-minute period or a sustained reading exceeding the action level for 5 minutes will trigger a response. Action levels represent airborne particulate concentrations in excess of background particulate concentrations.

% denotes percent

mg/m^3 denotes milligrams per cubic meter.

PDR denotes personal data-logging real-time aerosol monitor.

FID denotes flame ionization detector

LEL denotes lower explosive limit

PID denotes photo ionization detector

ppm denotes parts per million

VOC denoted volatile organic compund

> denotes greater than.

< denotes less than.

No one is permitted to downgrade levels of PPE without authorization from the Project Superintendent/Site Health and Safety Specialist.

Attachment 1
Site Health and Safety Plan
Amendment Documentation

Site-Specific Health & Safety Plan Amendment Documentation

Project Name: _____ **Project No:** _____

Amendment No: _____ **Date:** _____

Amendment Revisions: Page: _____ **Section:** _____

Task(s) Amendment Affects[a]: _____

_____

[a]*Attach new/revised job safety analyses.*

Reason For Amendment:

_____

_____

_____

_____

Amendment:
(Attach separate sheets as necessary)

_____

_____

_____

_____

_____

_____

_____

_____

Completed by:_____ **Approved by:** _____

Attachment 2
Emergency Phone Numbers

Emergency Phone Numbers

Emergency Phone Numbers

Contact	Phone Number
Emergency Medical Services	911
Non-Emergency	(415) 206-8000
Fire Department	911
Non-Emergency	(415) 558-3248
Police Department	911
Non-Emergency	(415) 553-0123
Hospital: San Francisco General 1001 Potrero Ave San Francisco, CA 94110	(415) 206-8000
Alternate Hospital: Alta Bates Summit Medical Center 350 Hawthorne Ave Oakland, CA 94609	(510) 655-4000
National Poison Referral Service	1-800-222-1222
Key Project and Shaw Personnel	
Shaw Program Manager: John Baur	(925) 288-2019 office (925) 382-3051 mobile
Program CIH: Fred Mlakar	(949) 660 5413 office (949) 981-1450 mobile
Project Manager: Peter Bourgeois	(925) 277-6983 office (415) 760-5321 mobile
Site Superintendent: Ed Hueston.	(415) 398-6887 office (415) 760-5319 mobile
Occupational Physician: Dr.Jerry H. Berke, M.D.	(800) 350-4511
Medical Incident Reporting: Health Resources Virginia Gutierrez	 (800) 350-4511 (508) 647-0923
Shaw Help Desk	(866) 299-3445
Navy Contact ROICC: Shirley Ng	(510) 755-5878

Attachment 3
Activity Hazard Analyses

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION

SECTION 1

Location:	Contract No.:	Project Title:
Site 12, Treasure Island	N68711-01-D-6011 Contract Task Order 0010	Site 12 Final Remedy Removal Action
Activity:	**Prime Contractor:**	**Subcontractors:**
Utility clearing, install temporary fencing,	Shaw Environmental, Inc.	None

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Utility clearances	Contact with underground or overhead utilities	• Identify all mark utilities around the site before work commences • Cease work immediately if unknown utility markers are uncovered • Re-route selected utilities if necessary • Use manual excavation within 3 feet of known utilities • Strict adherence to Shaw Health and Safety Procedure HS-308, "Underground/Overhead Utility Contact Prevention," will be observed prior to intrusive activities. • Maintain required overhead clearances from power lines: Nominal System Voltage — Minimum Required Clearance 0.6 - 50 kV — 10 feet over 50 - 75 kV — 11 feet over 75 - 125 kV — 13 feet over 125 - 175 kV — 15 feet over 175 - 250 kV — 17 feet over 250 - 370 kV — 21 feet over 370 - 550 kV — 27 feet over 550 - 1000 kV — 42 feet

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Using Manlift to Install Covering on Second Story Windows	• Malfunctioning Manlift • Personnel falling from Manlift • Manlift tips over/or personnel thrown form basket • Pinch points/crushing injuries from operating close to the building	• All Manlift equipment will be inspected and maintained as per manufacturer's requirements • Only trained and authorized personnel will be allowed to operate Manlift • All personnel will utilize a harness and lifeline securing them safely inside the basket at all time during usage • All outriggers or stabilizers are to be properly utilized, and basket weight limits strictly adhered to during operation • Care will be taken when operating close to buildings to avoid pinching or crushing hands between basket and building.
All Activities Onsite	Slip, Trip, and Falls	• Inspect work areas for washes, potholes, or other surface irregularities that could cause slips, trips or falls • Beware that uneven ground animal burrows could be obscured by vegetation earth and/or concrete rubble • Always establish good footing • Maintain good house keeping. Keep walkways clear of construction debris, and tools • Wear lug-soled safety boots
	High/Low Ambient Temperature	• Protect skin from ultraviolet rays by wearing your hard hat, long pants, long sleeved shirts, and sunscreen lotion • Wear clothing / PPE suitable for weather and working conditions • Keep an eye on your working buddy for signs of heat or cold stress. • Drink fluids and rest when needed • Monitor Heat/Cold Stress per SEI Procedure HS400/HS401
Lifting Equipment and Materials	Muscle strains	• Observe 60 lb individual lifting limit • Don't lift and twist • Get help for awkward loads and for loads greater than 60 lbs • Train workers in safe lifting techniques

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Lifting Equipment and Materials (Continued)	Struck By/Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review posted hand signals
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	Biological Hazards (including insects and spiders)	• Inspect areas for, and avoid insects, spiders, snakes and poisonous plants • Avoid placing hands or feet into concealed areas • Use additional protective equipment such as coveralls and gloves if needed
Mobile Equipment	Striking workers or equipment	• Use spotters when backing • Inspect area for overhead and underground hazards • Know the safest route to and from your work area • Use flags, traffic cones to control traffic
Changed or Unanticipated Conditions	Safety or health hazards that may be derived from changed or unanticipated conditions	• Modify the AHA as often as necessary to address new or unanticipated hazards. Use SEI procedure HS045 “Job Safety Analysis” to facilitate field documentation

SECTION 2

ACTIVITY: Utility clearing, install temporary fencing		
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
• Level D PPE: hard hat, safety boots, sleeved shirts and pants, abrasion resistant gloves, safety glasses	• Inspect equipment daily prior to use	• Tailgate Safety Meeting • Site-specific orientation • Hazards of task specific tools and equipment

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING

SECTION 1

Location:	Contract No.:	Project Title:
Site 12, Treasure Island	N68711-01-D-6011 Contract Task Order 0010	Site 12 Final Remedy Removal Action
Activity:	**Prime Contractor:**	**Subcontractors:**
Remove vegetation in areas to be excavated using chain saw, and weed eaters	Shaw Environmental, Inc.	None

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Preparing for Clearing and Grubbing	Carrying heavy equipment	• Observe maximum manual lifting limit of 60 lbs. • Get help for loads greater than 60 lbs. • Train for proper lifting techniques • Keep manual loads close to the body while carrying • Use lifting, carrying aids, such as carts or dollies to move heavy objects
	Spiders	• Wear leather or cotton gloves. • Wear long pants, long sleeved shirts preferred. • Instruction in recognition and identification of poisonous insects known to be in the area. • Do not assign hypersensitive employee (e.g., someone with a bee sting allergy) to duties having high risk of exposure. • Be cautious where you put your hands, feet and body. Inspect area for hazards.

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Preparing for Clearing and Grubbing (continued)	Exposure to severe inclement weather, sun, heat, rain and wind	• Protect skin from ultraviolet rays by wearing your hard hat, long pants, long sleeved shirts, and sunscreen lotion, • Wear clothing / PPE suitable for weather and working conditions • Keep an eye on your working buddy for signs of heat or cold stress. • Drink fluids and rest when needed. • Monitor Heat/Cold Stress per SEI Procedure HS400/HS401
	Working alone	• Practice buddy system at all times
Preparing to Operate Chain Saw	Injury due to faulty equipment	• Competent person shall inspect for safety and operability • Have repairs made by a qualified repair person. • All chain saws placed in service after Feb. 1995 shall meet all requirements of ANSIB175.1-1991. Chain saw shall be equipped with at least two separate anti-kick back features. Chain brake, low kick back chain, reduced kick back bar, or nose guard.
Fueling Chain Saw	Burns from flammable liquid	• Instruction in proper handling, storage and disposal of flammable liquids. • Equipment will be shut down during fueling and servicing activities. • An operable fire extinguisher shall be on site and available during refueling. • Allow engine to cool down before refueling. • Use a funnel or flexible hose fitting to the container when fueling saws. • Clear the area around fueling site of flammable material before fueling • Do not start the saw within a 10 foot radius of the fuel container.
Operating Chain Saw	Injury from flying debris	• Operator to wear proper PPE including face shields, safety glasses, hard hats, leather gloves, leather chaps, steel toed boots and long sleeved shirts. If the proper PPE is not available, do not proceed with task, • Inspect work area for hazardous conditions and debris before starting task. Remove all loose items not intended to be cut. • Do not allow other personnel in area without proper PPE. • All safe guards will remain installed and properly used.
	Excessive noise	• Use ear plugs or muffs while operating chain saw.

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Operating Chain Saw (Continued)	Unsafe Terrain, Slip, Trip, Fall Hazards	• Properly support material on ground for cutting or use saw bucks • Keep engine free of saw dust • Keep cutting speed under control to avoid cutting to deep or at an improper angle • Stop the saw when doubtful about safety. • Prior to chain saw work all slopes and work areas will be thoroughly inspected for washes, potholes, or other surface irregularities that could cause you to slip, trip of fall. • Prior to chain saw work areas will be cleared of brush, rocks, fencing, and other obstacles which might hinder movement. • Always establish good footing • Keep personnel clear from areas of falling trees or rolling logs • Be alert for nails, wire, metal taps, in trees. • When moving with a saw, it should be grasped firmly in one hand and carried at the side with the bar pointing backwards. Special caution is necessary when the engine is running. Chain break should be engaged during transport. • Look to the side before turning around. Face and hearing protection and engine noise will limit the operator's ability to know if someone is close. • Secure racks, boxes, bar holsters or sheathing, or other means shall be used for transporting chain saw. • Maintain good housekeeping; keep walkways clear of tools, materiel, and debris.
Preparing to Operate Weed Eater	Equipment failure	• Competent person to inspect equipment prior to use. No equipment will be placed in service until all deficiencies are corrected. • Have repairs made by a qualified repairperson. • Know your equipment and follow the manufacturer's operating manual instructions.
Fueling Weed Eater	Burns from flammable liquids and hot surfaces while fueling weed eater	• Instruction in proper handling, storage and disposal of flammable liquids. • Equipment will be shut down during fueling and servicing activities. • An operable fire extinguisher shall be on site and available during refueling. • Allow engine to cool down before refueling.

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Replacing Cutting Line in Weed Eater	Cuts, abrasions while replacing weed eater cutting line	• Turn the power off to the equipment before replacing the cutting line. • Make sure cutting line is installed according to manufacturer's instruction.
Operating Weed Eater	Injury from flying debris	• Operator to wear proper PPE, including face shields, safety glasses hard hats, leather gloves, steel toed boots and long sleeved shirts, and ear protectors. • Inspect work area for hazardous conditions and debris before starting task. Remove all loose items not intended to be cut. • Do not allow other personnel in area without proper PPE. • All safe guards will remain installed and properly used.
	Excessive noise	• Use ear plugs or muffs while operating weed eater.
	Cuts and abrasions from moving parts	• Never put your hands, feet or other body parts in the path of the moving parts. • Do not point the cutting end at anyone. • Keep the cutting edge pointed down at all times. • All safe guards will remain installed and properly used. • Beware of your surroundings at all times watch what you are cutting.
	Slips, trips, falls,	• Inspect work areas for washes, potholes, or other surface irregularities that could cause slips, trips or falls. • Prior to chain saw work areas will be cleared of brush, rocks, fencing, and other obstacles which might hinder movement. • Always establish good footing • Keep personnel clear from areas of falling trees or rolling logs • Be alert for nails, wire, metal taps, in trees.
	Fire hazards near dry vegetation	• Keep fire extinguisher nearby and be prepared to use it
Changed or Unanticipated Conditions	Safety or health hazards that may be derived from changed or unanticipated conditions	• Modify the AHA as often as necessary to address new or unanticipated hazards. Use SEI procedure HS045 "Job Safety Analysis" to facilitate field documentation

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING

SECTION 2

ACTIVITY: Site Preparation		
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
• Modified Level D – Tyvek blue coveralls, chaps, safety boots, hearing protection , face shield, safety glasses and abrasion resistant gloves, ear protection • Chain saw • Weed eater • Fire extinguisher	• Competent person shall inspect equipment prior to each use. No equipment will be placed in service until all deficiencies are corrected. • Complete Shaw's equipment inspection form	• Tailgate Safety Meeting • Site-specific orientation / • Operator must be trained in the safe operation of the equipment to be used; including the manufacturer's operating manual instructions. • HAZWOPER 40 hr. • HAZWOPER 8 hour refresher • First Aid/CPR

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION

SECTION 1

Location:	Contract No.:	Project Title:
Site 12, Treasure Island	N68711-01-6011 Contract Task Order 0010	Site 12 Final Remedy Removal Action
Activity:	**Prime Contractor:**	**Subcontractors:**
Excavation	Shaw Environmental, Inc.	None

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Excavation	Contact with underground or overhead utilities	• Identify all mark utilities around the site before work commences • Strict adherence to Shaw Health and Safety Procedure HS-308, "Underground/Overhead Utility Contact Prevention," will be observed prior to intrusive activities • Cease work immediately if unknown utility markers are uncovered • Re-route selected utilities if necessary • Use manual excavation within 3 feet of known utilities • Maintain required overhead clearances from power lines: Nominal System Voltage — Minimum Required Clearance 0.6 - 50 kV — 10 feet over 50 - 75 kV — 11 feet over 75 - 125 kV — 13 feet over 125 - 175 kV — 15 feet over 175 - 250 kV — 17 feet over 250 - 370 kV — 21 feet over 370 - 550 kV — 27 feet over 550 - 1000 kV — 42 feet

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Excavation (continued)	Unstable excavation, cave in	• Excavation competent person will be on site during all excavation work • No one is permitted in unprotected excavations greater than 5 feet in depth • Persons who must enter an excavation will be protected with benching, sloping or shoring in accordance with Cal/OSHA standards • Excavation, spoils to be stockpiled no closer then 2' from edge of the excavation
	Exposure to airborne dust	• Apply water for dust control • Stop operations in high winds • Monitor dust exposures for personnel and at excavation zone perimeters as per SHSP Table 2 "Action Levels" and adjust accordingly
	Struck By/Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Excavations must be clear of all personnel when excavation is in process. All workers must stand clear of this activity
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Excavation (continued)	Caught In/Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar injuries • Assure guards are in place to protect from these parts of equipment during operation • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA
	High/Low Ambient Temperature	• Protect skin from ultraviolet rays by wearing your hard hat, long pants, long sleeved shirts, and sunscreen lotion, • Wear clothing / PPE suitable for weather and working conditions • Keep an eye on your working buddy for signs of heat or cold stress. • Drink fluids and rest when needed. • Monitor Heat/Cold Stress

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION

SECTION 2

ACTIVITY: Excavation		
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
• Modified Level D: Blue Tyvek, hard hat, safety glasses, safety boots, latex boot covers, nitrile gloves • Excavator or backhoe • Water truck for dust control • Direct reading dust monitor	• Daily inspection of mobile equipment by competent person • Frequent excavation inspections by competent person.	• Excavation competent person • Tailgate Safety Meeting • Site-specific orientation • Hazard Communication • HAZWOPER 40 hr. • HAZWOPER 8 hour refresher

ACTIVITY HAZARD ANALYSIS FOR SOIL SAMPLING

SECTION 1

Location:	Contract No.:	Project Title:
Site 12, Treasure Island	N68711-01-D-6011	Site 12 Final Remedy Removal Action,
Activity:	**Prime Contractor:**	**Subcontractors:**
Soil sampling from the excavation for offsite laboratory analysis	Shaw Environmental, Inc.	Offsite laboratory

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Changed or Unanticipated Conditions	Safety or health hazards that may be derived from changed or unanticipated conditions	• Modify the AHA as often as necessary to address new or unanticipated hazards. Use SEI procedure HS045 "Job Safety Analysis" to facilitate field documentation
Walking Onsite	Slip, Trip, and Falls	• Inspect work areas for washes, potholes, or other surface irregularities that could cause slips, trips or falls • Beware that uneven ground animal burrows could be obscured by vegetation earth and/or concrete rubble • Always establish good footing • Maintain good house keeping. Keep walkways clear of construction debris, and tools
	Exposure to contaminated soil dust	• Handle samples carefully • Use proper PPE during sampling • Wash hands prior to eating or drinking

ACTIVITY HAZARD ANALYSIS FOR SOIL SAMPLING

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Lifting Equipment and Materials	Muscle strains	• Observe 60 lb individual lifting limit • Don't lift and twist • Get help for awkward loads and for loads greater than 60 lbs • Train workers in safe lifting techniques
Mobile Equipment	Striking workers or equipment,	• Use spotters when backing • Inspect area for overhead and underground hazards. • Know the safest route to and from your work area. • Use flags, traffic cones to control traffic
Walking or Working in Brush or Wooded Areas	Biological Hazards (insects)	• Inspect areas for spiders • Avoid placing hands or feet into concealed areas. • Use additional protective equipment such as coveralls and gloves if needed.
Sample Collection	Unstable excavation	• DO NOT ENTER EXCAVATIONS GREATER THAN 5 FEET DEEP WITHOUT AUTHORIZATION FROM AN EXCAVATION COMPETENT PERSON. • Samples from unprotected excavations greater than 5 feet deep may only be collected using an excavator bucket or a long handled sampling device.

SECTION 2

ACTIVITY: Soil sampling		
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
• Sample collection tools and jars • Modified Level D – Blue Tyvek coveralls, hard hat, safety boots, sleeved shirts and pants, nitrile gloves, safety glasses	• Inspect equipment daily prior to use	• Tailgate Safety Meeting • Site-specific orientation • Hazard Communication • HAZWOPER 40 hr. • HAZWOPER 8 hour refresher • Hazards of task specific tools and equipment

ACTIVITY HAZARD ANALYSIS FOR VEHICLE OPERATIONS

SECTION 1

Location:	Contract No.:	Project Title:
Site 12, Treasure Island	N68711-01-D-6011 Contract Task Order 0010	Site 12 Final Remedy Removal Action
Activity:	Prime Contractor:	Subcontractors:
Vehicle Operation	Shaw Environmental, Inc.	None

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Vehicle Operation	Backing	• Back into parking spaces upon arrival, whenever possible. • Walk around the vehicle before backing in or out to identify any new conditions or obstructions. • Use a spotter when backing in or out whenever possible. • Understand hand signals. • Sound horn prior to backing in or out. • Check the rearview and side mirrors prior to backing, remembering mirrors do not show everything. (Note: All vehicles, other than automobiles, must have small convex mirrors attached to the side mirrors.) • Back slowly in areas of obstructed vision. • Anticipate others who may be backing out into your pathway and adjust accordingly.
	Unfamiliar with vehicle	• Familiarize yourself with the vehicle before moving. • Review the dashboard controls, steering radius, overhead, and side clearances. • Properly adjust seat then mirrors. • Locate windshield wipers and lights.

ACTIVITY HAZARD ANALYSIS FOR VEHICLE OPERATIONS

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Vehicle Operation (continued)	Airbags (if equipped)	• Familiarize yourself with the vehicle airbag system. • Adjust seat so the driver is outside the inflation envelope of the airbag and can still operate the pedals comfortably. • Vehicles equipped with airbags control switches (i.e., pickup trucks) must be turned on.
	Speed	• Obey all posted speed limits. • Radar detectors are prohibited in all company owned, leased, or rented vehicles. • Reduce travel speed during hazardous conditions (i.e., rain, fog, snow). • Identify if your vehicle has Anti-Lock Brakes (ABS). If it does, DO NOT pump the brakes to stop when the vehicle has begun to skid. Apply steady pressure to the brakes. If the vehicle does not have ABS, you will want to pump the brakes to stop during slippery conditions.
	Distances/Spacing Tire Concept →	• Follow the 3 second rule. • Increase the 3 second rule as necessary during hazardous travel conditions. (add one second for each hazard) • Always leave yourself an “out” during travel. • When stopping, make sure that you leave enough distance between you and the car in front of you. You should be able to see the rear tires of the vehicle in front, when stopped. • Drive defensively. • When at a red light, and it turns green, use the “delayed start” technique, by counting to three before you take your foot off the brake. • DO NOT TAILGATE.
	Skids	• If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid (the direction you want the vehicle to go) and re-adjust the wheel, as necessary. • Slow travel speeds during hazardous travel conditions. • Use 4-wheel drive, if available, when driving vehicles off road, on steep inclines, muddy conditions, etc. • Do not take vehicles “Off Road” if they can not be operated safely.

ACTIVITY HAZARD ANALYSIS FOR VEHICLE OPERATIONS

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Vehicle Operation (continued)	Blind spots	• Become familiar with any blind spots associated with your vehicle. • Adjust mirrors properly. • Make sure you use your directional signals. • Always look over your shoulder to ensure the lane is clear when changing lanes. • Be cautious when approaching other driver's blind spots.
	Cellular phones	• Do NOT USE cellular phones while driving. • Pull over to the side of the road when making a call. (The shoulder of the freeway or expressway is not an authorized or a safe place to conduct phone calls. It is for emergencies only.)
	Accidents	• In the event of an accident: Stop, and call for medical assistance: notify police; complete Vehicle Accident Report and submit to your supervisor. • If a Shaw employee is injured, the Health Resource, Return to Work, Medical Release and Treatment of injury/illness forms must be completed at the health clinic or emergency room.
	Equipment failure	• Perform daily inspections of your vehicle. • Any vehicle with mechanical defects that may endanger the safety of the driver, passengers or the public shall not be used. • Ensure safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles should be available in larger trucks. • Ensure the proper documentation is in the vehicle. Documentation should include operations manual for the vehicle, insurance card, vehicle registration and Shaw accident forms.

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Vehicle Operation (continued)	Influenced by drugs and alcohol	• NEVER DRIVE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL. • Disciplinary actions, including termination, will be taken against any one who is convicted of or pleads no-contest to the charges of driving under the influence in accordance with Shaw Health and Safety Procedure HS800. • Project assigned hourly employees are not permitted to operate company owned, leased or rented vehicles after 10:00 p.m. without written authorization from their supervisor.
	Driver = Alertness Attitude and Physical Condition	• Do not operate any vehicle when abnormally tired, temporarily disabled, or under the influence of drugs or alcohol. • Keep an even temper when driving. Do not let the actions of others affect your attitude. • No employee is authorized to operate a company vehicle (including rentals) after having been on- duty for a period of 16 hours. • No employee may drive for more than 12 hours in a single on duty period.
	Vehicle Loading	• DO NOT OVERLOAD the vehicle. • Secure all equipment within the body of the vehicle. • Do not block side view mirrors with loads. • Do not transport Department of Transportation-manifested hazardous materials without a commercial driver's license. • Dispatch all equipment and personnel with proper forms and identification.

ACTIVITY HAZARD ANALYSIS FOR VEHICLE OPERATIONS

SECTION 2

ACTIVITY: Vehicle Operations		
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
• Valid drivers license • Seatbelt • Vehicles equipped with passenger airbags • A spare tire and jack, • First-aid kit, fire extinguisher, and flashlight • Operations manual for the vehicle • Insurance card, vehicle registration and Shaw Accident forms.	• Inspect vehicles daily • Insure airbag switch is turned on (pickup trucks)	• Review AHA with all site personnel • Review Shaw Health and Safety Procedure HS800

ACTIVITY HAZARD ANALYSIS FOR BACKFILL & COMPACTION

SECTION 1

Location:	Contract No.:	Project Title:
Site 12, Treasure Island	N68711-01-D-6011 Contract Task Order 0010	Site 12 Final Remedy Removal Action
Activity:	**Prime Contractor:**	**Subcontractors:**
Backfill and compaction of excavation areas	Shaw Environmental, Inc.	Compaction Testing

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Backfilling and compaction	Overhead Utilities	Required overhead clearances from power lines: Nominal System Voltage — Minimum Required Clearance 0.6 - 50 kV — 10 feet over 50 - 75 kV — 11 feet over 75 - 125 kV — 13 feet over 125 - 175 kV — 15 feet over 175 - 250 kV — 17 feet over 250 - 370 kV — 21 feet over 370 - 550 kV — 27 feet over 550 - 1000 kV — 42 feet
	Struck By/Against Heavy Equipment	• Wear reflective warning vests • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals

ACTIVITY HAZARD ANALYSIS FOR BACKFILL & COMPACTION

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Backfilling and compaction (continued)	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA
	High/Low Ambient Temperature	• Protect skin from ultraviolet rays by wearing your hard hat, long pants, long sleeved shirts, and sunscreen lotion, • Wear clothing / PPE suitable for weather and working conditions • Keep an eye on your working buddy for signs of heat or cold stress. • Drink fluids and rest when needed. • Monitor Heat/Cold Stress per SEI Procedure HS400/HS401
Dump truck operations	Faulty equipment	• The driver is responsible for understanding the capabilities and limitations of the truck and for inspecting the truck at the start of each shift: • Inspect for properly operating back-up alarms. • Test the effectiveness of the parking brake. • Inspect air brakes and brake lines, including drain tanks on large trucks. • Preventive maintenance should include regular lubrication of all pivot points. • Inspect tire sidewalls for cuts or gouges and for uniform inflation. • Cab windows must be kept clean. • Stairs, steps, straps used for climbing in and out of the cabs must be kept clean and in good repair. • Document inspection on Daily Driver Vehicle Inspection Report Form
	Inattentive driver	• Driver will not use head phones, cell phones, or other loud audio equipment in the cab while loading or dumping
All exclusion zone activities	Inhalation or ingestion of dust	• Use Modified Level D unless air monitoring indicates Level C is needed. • Avoid activities that generate airborne dust • Stop work in high winds • Control dust by applying water if necessary • Wash soil from hands prior to eating or drinking.

ACTIVITY HAZARD ANALYSIS FOR BACKFILL & COMPACTION

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Loading	Falling, leaking, material	• Do not load while any person is near the side of the truck • Prior to leaving the loading site, the driver is responsible for inspecting the load for even distribution, leakage, and stability. The loader operator will adjust the load if necessary. • Tarp the load if necessary.
Dumping	General	• Abort the dump and lower the bed if it begins to tilt • Do not dump while any person is near the side of the truck • ALWAYS LOWER THE BED FULLY BEFORE DRIVING THE TRUCK. A RAISED BED MAKES THE TRUCK VERY UNSTABLE WHILE TRAVELING.
	Unstable terrain = tip over hazard	• Stand on the ground to test for compressibility. If you sink in, call for heavy equipment to compact it. • Abort the dump and lower the bed if it begins to tilt.
	Uneven terrain = tip over hazard	• Have equipment operator “dress up” the area before dumping begins
	Overhead hazards	• Maintain safe clearances from overhead obstacles • Beware of obstacles and stability of the ground. Test the ground for firmness by standing on it
	Wind = tip over hazard	• Always dump parallel to the direction of the wind (either facing directly into or directly away from the wind.) • If the wind conditions threaten truck stability, suspend operations until the winds die down.
	Slopes, trenches, or excavations = tip over hazard	• Use a spotter when dumping near slopes, excavations or trenches. • The spotter will: • Maintain a safe distance from trucks and other mobile equipment • Maintain eye contact with the driver • Agree with the drivers on a set of hand signals • Alert the driver to hazardous conditions • Watch for sinking tires and tilting of the bed as it is being raised • The driver will: • Keep wheels at least 5 feet away from the edge of any slope, excavation or trench. • Abort the dump and lower the bed if it begins to tilt.

Principal Steps	Potential Safety/ Health Hazards	Recommended Controls
Dumping (continued)	Load sticking to bed = tip over hazard	• Do not pop the clutch to loosen or free the load • Do not slam on the brakes to loosen the load • Have the excavator scrape stuck material out of the bed • Consider placing "slip sheets" in the bed prior to loading
Changed or unanticipated conditions	Safety or health hazards that may be derived from changed or unanticipated conditions	• Modify the AHA as often as necessary to address new or unanticipated hazards. Use SEI procedure HS045 "Job Safety Analysis" to facilitate field documentation

SECTION 2

ACTIVITY: Backfill, and compaction of excavation areas

Equipment To Be Used	Inspection Requirements	Training Requirements
• Dump trucks • Excavator • Dust control equipment • Compaction equipment	• Competent person to inspect equipment daily before use.	• Excavation competent person • Tailgate Safety Meeting • Site-specific orientation • Hazard Communication • HAZWOPER 40 hr. • HAZWOPER 8 hour refresher • Hazards of task specific equipment and tools

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION

SECTION 1

Location:	Contract No.:	Project Title:
Site 12, Treasure Island	N68711-01-D-6011 Contract Task Order 0010	Site 12 Final Remedy Removal Action
Activity:	**Prime Contractor:**	**Subcontractors:**
Remove temporary facilities and fencing	Shaw Environmental, Inc.	Fencing Contractor

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Changed or unanticipated Conditions	Safety or health hazards that may be derived from changed or unanticipated conditions	• Modify the AHA as often as necessary to address new or unanticipated hazards. Use SEI procedure HS045 "Job Safety Analysis" to facilitate field documentation
All activities onsite	Slip, Trip, and Falls	• Inspect work areas for washes, potholes, or other surface irregularities that could cause slips, trips or falls. • Beware that uneven ground animal burrows could be obscured by vegetation earth and/or concrete rubble • Always establish good footing • Maintain good house keeping. Keep walkways clear of construction debris, and tools. • Wear lug-soled safety boots.

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Heat/Cold Stress	High/Low Ambient Temperature	• Protect skin from ultraviolet rays by wearing your hard hat, long pants, long sleeved shirts, and sunscreen lotion, • Wear clothing / PPE suitable for weather and working conditions • Keep an eye on your working buddy for signs of heat or cold stress. • Drink fluids and rest when needed. • Monitor Heat/Cold Stress per SEI Procedure HS400/HS401
Lifting equipment and materials	Muscle strains	• Observe 60 lb individual lifting limit, • Don't lift and twist • Get help for awkward loads and for loads greater than 60 lbs • Train workers in safe lifting techniques
Removal of temporary facilities and fencing	Struck By/Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review posted hand signals
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION

Principal Steps	Potential Safety/Health Hazards	Recommended Controls
Revegetation	Biological Hazards (including insects and spiders)	• Inspect areas for, and avoid insects, spiders • Avoid placing hands or feet into concealed areas • Use additional protective equipment such as coveralls and gloves if needed
Regrading with mobile equipment	Striking workers or equipment,	• Use spotters when backing • Inspect area for overhead and underground hazards • Know the safest route to and from your work area • Use flags, traffic cones to control traffic

SECTION 2

ACTIVITY: Site Restoration		
Equipment To Be Used	**Inspection Requirements**	**Training Requirements**
• Level D PPE: hard hat, safety boots, sleeved shirts and pants, abrasion resistant gloves, safety glasses	• Inspect equipment daily prior to use	• Tailgate Safety Meeting • Site-specific orientation • Hazards of task specific tools and equipment

Attachment 4
Material Safety Data Sheets

CHEVRON
DIESEL FUEL NO. 2 Revised: 06/23/2000

MSDS Contents

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION
2. COMPOSITION/INFORMATION ON INGREDIENTS
3. HAZARDS IDENTIFICATION
4. FIRST AID MEASURES
5. FIRE FIGHTING MEASURES
6. ACCIDENTAL RELEASE MEASURES
7. HANDLING AND STORAGE
8. EXPOSURE CONTROLS/PERSONAL PROTECTION
9. PHYSICAL AND CHEMICAL PROPERTIES
10. STABILITY AND REACTIVITY
11. TOXICOLOGICAL INFORMATION
12. ECOLOGICAL INFORMATION
13. DISPOSAL CONSIDERATIONS
14. TRANSPORT INFORMATION
15. REGULATORY INFORMATION
16. OTHER INFORMATION

CHEVRON

MATERIAL SAFETY DATA SHEET

CHEVRON LS DIESEL 2

MSDS: 6894

REVISION #: 1

REVISION DATE: 06/23/00

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

DIESEL FUEL NO. 2

PRODUCT NUMBER(S):
CPS220122 CPS225114 CPS225115 CPS225150
CPS266176 CPS270005 CPS271006 CPS272093
CPS272102 CPS272126 CPS272152 CPS272185
CPS272190 CPS272593 CPS272601 CPS272693
CPS272793 CPS273003 CPS273030 CPS273053

SYNONYM:
CALCO LS DIESEL 2
CHEVRON LS DIESEL 2
DIESEL FUEL OIL
GAS OIL
HS DIESEL 2
HS HEATING FUEL 2
LS DIESEL 2
LS HEATING FUEL 2
MARINE DIESEL
RR DIESEL FUEL

COMPANY IDENTIFICATION:

CHEVRON PRODUCTS COMPANY
575 MARKET ST.
SAN FRANCISCO, CA 94105-2856

EMERGENCY TELEPHONE NUMBERS:

HEALTH (24 HR): (800) 231-0623 OR (510) 231-0623 (INTERNATIONAL)

TRANSPORTATION (24 HR):
CHEMTREC: (800) 424-9300 OR (703) 527-3887

EMERGENCY INFORMATION CENTERS ARE LOCATED IN U.S.A.
INT'L COLLECT CALLS ACCEPTED

PRODUCT INFORMATION:
MSDS REQUESTS:
(800) 689-3998
(510) 242-5357 TECHNICAL INFORMATION

SPECIAL NOTES:
THIS MSDS COVERS ALL CHEVRON AND CALCO NON-CARB DIESEL NO. 2 FUELS. THE SULFUR CONTENT IS LESS THAN 0.5% (MASS). RED DYE IS ADDED TO NON-TAXABLE FUEL.

2. COMPOSITION/INFORMATION ON INGREDIENTS

100.0 % DIESEL FUEL NO. 2

CONTAINING:

COMPONENTS	AMOUNT	LIMIT/QTY	AGENCY/TYPE
DIESEL FUEL NO. 2 CHEMICAL NAME: FUELS, DIESEL, NO. 2 CAS: 68476346	100.00 %	NONE	NA

POTENTIALLY INCLUDING:

HDS DISTILLATE, MIDDLE CHEMICAL NAME: DISTILLATES, HYDRODESULFURIZED MIDDLE CAS: 64742809	NONE	NA
GAS OIL, LIGHT CHEMICAL NAME: DISTILLATES, STRAIGHT RUN MIDDLE CAS: 64741442	NONE	NA
KEROSENE CHEMICAL NAME: KEROSENE CAS: 8008206	NONE	NA
HYDRODESULFURIZED KEROSENE CHEMICAL NAME: KEROSENE, HYDRODESULFURIZED CAS: 64742810	NONE	NA
CAT CRACKED DISTILLATE, LIGHT CHEMICAL NAME: DISTILLATES, LIGHT CATALYTIC CRACKED CAS: 64741599	NONE	NA

TOTAL SULFUR, MASS %: <0.50%

COMPOSITION COMMENT:
ALL THE COMPONENTS OF THIS MATERIAL ARE ON THE TOXIC SUBSTANCES CONTROL ACT CHEMICAL SUBSTANCES INVENTORY.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:
CLEAR TO PALE YELLOW LIQUID IF UNDYED, RED LIQUID IF DYED.

COMBUSTIBLE LIQUID AND VAPOR
HARMFUL OR FATAL IF SWALLOWED - CAN ENTER LUNGS AND CAUSE DAMAGE
CAUSES SKIN IRRITATION
POSSIBLE CANCER HAZARD - CONTAINS MATERIAL THAT MAY CAUSE CANCER BASED ON ANIMAL DATA

IMMEDIATE HEALTH EFFECTS:

EYE: NOT EXPECTED TO CAUSE PROLONGED OR SIGNIFICANT EYE IRRITATION.

SKIN: CONTACT WITH THE SKIN CAUSES IRRITATION.

INGESTION:
BECAUSE OF ITS LOW VISCOSITY, THIS MATERIAL CAN DIRECTLY ENTER THE LUNGS, IF SWALLOWED, OR IF SUBSEQUENTLY VOMITED. ONCE IN THE LUNGS IT IS VERY DIFFICULT TO REMOVE AND CAN CAUSE SEVERE INJURY OR DEATH.

INHALATION:
EXCESSIVE OR PROLONGED BREATHING OF THIS MATERIAL MAY CAUSE CENTRAL NERVOUS SYSTEM EFFECTS. MISTS OF THIS MATERIAL MAY CAUSE RESPIRATORY IRRITATION.

SIGNS AND SYMPTOMS OF EXPOSURE:

SKIN IRRITATION: MAY INCLUDE PAIN, REDDENING, SWELLING, AND BLISTERING.

RESPIRATORY IRRITATION:
MAY INCLUDE COUGHING AND DIFFICULTY BREATHING. CENTRAL NERVOUS SYSTEM EFFECTS MAY INCLUDE HEADACHE, DIZZINESS, NAUSEA, VOMITING, WEAKNESS, LOSS OF COORDINATION, BLURRED VISION, DROWSINESS, CONFUSION, OR DISORIENTATION. AT EXTREME EXPOSURES, CENTRAL NERVOUS SYSTEM EFFECTS MAY INCLUDE RESPIRATORY DEPRESSION, TREMORS OR CONVULSIONS, LOSS OF CONSCIOUSNESS, COMA OR DEATH.

CARCINOGENICITY:
PROLONGED OR REPEATED SKIN CONTACT WITH THIS MATERIAL MAY CAUSE CANCER BASED ON ANIMAL DATA. RISK OF CANCER DEPENDS ON DURATION AND LEVEL OF EXPOSURE. SEE SECTION 11 FOR ADDITIONAL INFORMATION.

WHOLE DIESEL ENGINE EXHAUST WAS REVIEWED BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) IN THEIR MONOGRAPH 46 (1989). EVIDENCE FOR CAUSING CANCER WAS CONSIDERED SUFFICIENT IN ANIMALS AND LIMITED IN HUMANS. IARC PLACED DIESEL EXHAUST IN CATEGORY 2A, CONSIDERING IT PROBABLY CARCINOGENIC TO HUMANS.

DIESEL EXHAUST IS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

4. FIRST AID MEASURES

EYE:
NO SPECIFIC FIRST AID MEASURES ARE REQUIRED BECAUSE THIS MATERIAL IS NOT EXPECTED TO CAUSE EYE IRRITATION. AS A PRECAUTION REMOVE CONTACT LENSES, IF WORN, AND FLUSH EYES WITH WATER.

SKIN:
WASH SKIN IMMEDIATELY WITH SOAP AND WATER AND REMOVE CONTAMINATED CLOTHING AND SHOES. GET MEDICAL ATTENTION IF IRRITATION PERSISTS. DISCARD CONTAMINATED CLOTHING AND SHOES OR THOROUGHLY CLEAN BEFORE REUSE.

INGESTION:
IF SWALLOWED, DO NOT INDUCE VOMITING. GIVE THE PERSON A GLASS OF WATER OR MILK TO DRINK AND GET IMMEDIATE MEDICAL ATTENTION. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

INHALATION:
MOVE THE EXPOSED PERSON TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. GET MEDICAL ATTENTION IF SYMPTOMS CONTINUE.

NOTE TO PHYSICIANS:
INGESTION OF THIS PRODUCT OR SUBSEQUENT VOMITING CAN RESULT IN ASPIRATION OF LIGHT HYDROCARBON LIQUID WHICH CAN CAUSE PNEUMONITIS.

5. FIRE FIGHTING MEASURES

FIRE CLASSIFICATION:
OSHA CLASSIFICATION (29 CFR 1910.1200):
COMBUSTIBLE LIQUID. SEE SECTION 7 FOR APPROPRIATE HANDLING AND STORAGE CONDITIONS.

FLAMMABLE PROPERTIES:

FLASH POINT: (P-M) 125F (52C) MINIMUM

AUTOIGNITION: NDA

FLAMMABILITY LIMITS (% BY VOLUME IN AIR):
LOWER: 0.6
UPPER: 4.7

EXTINGUISHING MEDIA: CO_2, DRY CHEMICAL, AFFF FOAM.

NFPA RATINGS:
HEALTH 0
FLAMMABILITY 2
REACTIVITY 0

FIRE FIGHTING INSTRUCTIONS:
USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS AND TO PROTECT PERSONNEL. FOR FIRES INVOLVING THIS MATERIAL, DO NOT ENTER ANY ENCLOSED OR CONFINED FIRE SPACE WITHOUT PROPER PROTECTIVE EQUIPMENT, INCLUDING SELF-CONTAINED

BREATHING APPARATUS.

COMBUSTION PRODUCTS:
NORMAL COMBUSTION FORMS CARBON DIOXIDE AND WATER VAPOR; INCOMPLETE COMBUSTION CAN PRODUCE CARBON MONOXIDE.

6. ACCIDENTAL RELEASE MEASURES

CHEMTREC EMERGENCY NUMBER (24 HR):
(800) 424-9300 OR (703) 527-3887
INTERNATIONAL COLLECT CALLS ACCEPTED

ACCIDENTAL RELEASE MEASURES:
ELIMINATE ALL SOURCES OF IGNITION IN THE VICINITY OF THE SPILL OR RELEASED VAPOR.

STOP THE SOURCE OF THE LEAK OR RELEASE. CLEAN UP RELEASES AS SOON AS POSSIBLE, OBSERVING PRECAUTIONS IN EXPOSURE CONTROLS/PERSONAL PROTECTION. CONTAIN LIQUID TO PREVENT FURTHER CONTAMINATION OF SOIL, SURFACE WATER OR GROUNDWATER. CLEAN UP SMALL SPILLS USING APPROPRIATE TECHNIQUES SUCH AS SORBENT MATERIALS OR PUMPING. WHERE FEASIBLE AND APPROPRIATE, REMOVE CONTAMINATED SOIL. FOLLOW PRESCRIBED PROCEDURES FOR REPORTING AND RESPONDING TO LARGER RELEASES. PLACE CONTAMINATED MATERIALS IN DISPOSABLE CONTAINERS AND DISPOSE OF IN A MANNER CONSISTENT WITH APPLICABLE REGULATIONS. CONTACT LOCAL ENVIRONMENTAL OR HEALTH AUTHORITIES FOR APPROVED DISPOSAL OF THIS MATERIAL.

RELEASE OF THIS PRODUCT SHOULD BE PREVENTED FROM CONTAMINATING SOIL AND WATER AND FROM ENTERING DRAINAGE AND SEWER SYSTEMS. U.S.A. REGULATIONS REQUIRE REPORTING SPILLS OF THIS MATERIAL THAT COULD REACH ANY SURFACE WATERS. THE TOLL FREE NUMBER FOR THE U.S. COAST GUARD NATIONAL RESPONSE CENTER IS (800) 424-8802.

7. HANDLING AND STORAGE

LIQUID EVAPORATES AND FORMS VAPOR (FUMES) WHICH CAN CATCH FIRE AND BURN WITH EXPLOSIVE FORCE. INVISIBLE VAPOR SPREADS EASILY AND CAN BE SET ON FIRE BY MANY SOURCES SUCH AS PILOT LIGHTS, WELDING EQUIPMENT, AND ELECTRICAL MOTORS AND SWITCHES. FIRE HAZARD IS GREATER AS LIQUID TEMPERATURE RISES ABOVE 85F.

ELECTROSTATIC CHARGE MAY ACCUMULATE AND CREATE A HAZARDOUS CONDITION WHEN HANDLING THIS MATERIAL. TO MINIMIZE THIS HAZARD, REVIEW ALL OPERATIONS WHICH HAVE THE POTENTIAL OF GENERATING AN ACCUMULATION OF ELECTROSTATIC CHARGE AND/OR A FLAMMABLE ATMOSPHERE (INCLUDING TANK AND CONTAINER FILLING, SPLASH FILLING, TANK CLEANING, SAMPLING, GAUGING, SWITCH LOADING, FILTERING, MIXING, AGITATION, AND VACUUM TRUCK OPERATIONS) AND USE APPROPRIATE MITIGATING PROCEDURES. FOR MORE INFORMATION, REFER TO AMERICAN PETROLEUM INSTITUTE (API) RECOMMENDED PRACTICE 2003, "PROTECTION AGAINST IGNITIONS ARISING OUT OF STATIC, LIGHTING, AND STRAY CURRENTS" AND/OR NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 77, "RECOMMENDED PRACTICE ON STATIC ELECTRICITY.

DO NOT USE OR STORE NEAR HEAT, SPARKS OR OPEN FLAMES. USE OR STORE ONLY IN A WELL-VENTILATED AREA. KEEP CONTAINER CLOSED WHEN MATERIAL IS NOT IN USE. CONTAINER IS NOT DESIGNED TO CONTAIN PRESSURE. DO NOT USE PRESSURE TO EMPTY

CONTAINER OR IT MAY RUPTURE WITH EXPLOSIVE FORCE. EMPTY CONTAINERS RETAIN PRODUCT RESIDUE (SOLID, LIQUID, AND/OR VAPOR) AND CAN BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. EMPTY CONTAINERS SHOULD BE COMPLETELY DRAINED, PROPERLY CLOSED, AND PROMPTLY RETURNED TO A DRUM RECONDITIONER, OR PROPERLY DISPOSED OF.

WARNING!
DO NOT USE AS PORTABLE HEATER OR APPLIANCE FUEL. TOXIC FUMES MAY ACCUMULATE AND CAUSE DEATH.

DO NOT TASTE OR SWALLOW. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING. WASH THOROUGHLY AFTER HANDLING. KEEP OUT OF REACH OF CHILDREN.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
CONSIDER THE POTENTIAL HAZARDS OF THIS MATERIAL (SEE SECTION 3), APPLICABLE EXPOSURE LIMITS, JOB ACTIVITIES, AND OTHER SUBSTANCES IN THE WORK PLACE WHEN DESIGNING ENGINEERING CONTROLS AND SELECTING PERSONAL PROTECTIVE EQUIPMENT. IF ENGINEERING CONTROLS OR WORK PRACTICES ARE NOT ADEQUATE TO PREVENT EXPOSURE TO HARMFUL LEVELS OF THIS MATERIAL, THE PERSONAL PROTECTIVE EQUIPMENT LISTED BELOW IS RECOMMENDED. THE USER SHOULD READ AND UNDERSTAND ALL INSTRUCTIONS AND LIMITATIONS SUPPLIED WITH THE EQUIPMENT SINCE PROTECTION IS USUALLY PROVIDED FOR A LIMITED TIME OR UNDER CERTAIN CIRCUMSTANCES.

ENGINEERING CONTROLS:
IF USER OPERATIONS GENERATE AIRBORNE MATERIAL, USE PROCESS ENCLOSURES, LOCAL EXHAUST VENTILATION, OR OTHER ENGINEERING CONTROLS TO CONTROL EXPOSURE.

PERSONAL PROTECTIVE EQUIPMENT:

EYE/FACE PROTECTION:
NO SPECIAL EYE PROTECTION IS NORMALLY REQUIRED. WHERE SPLASHING IS POSSIBLE, WEAR SAFETY GLASSES WITH SIDE SHIELDS AS A GOOD SAFETY PRACTICE.

SKIN PROTECTION:
NO SPECIAL PROTECTIVE CLOTHING IS NORMALLY REQUIRED. WHERE SPLASHING IS POSSIBLE, SELECT PROTECTIVE CLOTHING DEPENDING ON OPERATIONS CONDUCTED, PHYSICAL REQUIREMENTS AND OTHER SUBSTANCES. SUGGESTED MATERIALS FOR PROTECTIVE GLOVES INCLUDE:
(NITRILE) (VITON) (CHLORINATED POLYETHYLENE (OR CHLOROSULFONATED POLYETHYLENE OR CPE)) (POLYURETHANE)

RESPIRATORY PROTECTION:
IF USER OPERATIONS GENERATE HARMFUL LEVELS OF AIRBORNE MATERIAL THAT IS NOT ADEQUATELY CONTROLLED BY VENTILATION, WEAR A NIOSH APPROVED RESPIRATOR THAT PROVIDES ADEQUATE PROTECTION. USE THE FOLLOWING ELEMENTS FOR AIR-PURIFYING RESPIRATORS: ORGANIC VAPOR.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION:

CLEAR TO PALE YELLOW LIQUID IF UNDYED, RED LIQUID IF DYED.

pH: NDA

VAPOR PRESSURE: 0.04 PSIA @ 40C

VAPOR DENSITY (AIR = 1): NDA

BOILING POINT: 176 - 370C (348-698F)

FREEZING POINT: NDA

MELTING POINT: NA

SOLUBILITY: SOLUBLE IN HYDROCARBON SOLVENTS; INSOLUBLE IN WATER.

SPECIFIC GRAVITY: 0.84 @ 15.6/15.6C (TYPICAL)

VISCOSITY: 1.9 - 4.1 CST @ 40C

10. STABILITY AND REACTIVITY

HAZARDOUS DECOMPOSITION PRODUCTS: NONE KNOWN

CHEMICAL STABILITY: STABLE.

CONDITIONS TO AVOID: SEE SECTION 7.

INCOMPATIBILITY WITH OTHER MATERIALS:
MAY REACT WITH STRONG OXIDIZING AGENTS, SUCH AS CHLORATES, NITRATES, PEROXIDES, ETC.

HAZARDOUS POLYMERIZATION: POLYMERIZATION WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS: MINIMAL EFFECTS CLEARING IN LESS THAN 24 HOURS.

SKIN EFFECTS:
MODERATE IRRITATION AT 72 HOURS. (MODERATE ERYTHEMA). THE ACUTE DERMAL LD50 IN RABBITS IS >5 ML/KG. THIS MATERIAL DID NOT CAUSE SKIN SENSITIZATION REACTIONS IN A BUEHLER GUINEA PIG TEST.

ACUTE ORAL EFFECTS: THE ACUTE ORAL LD50 IN RATS IS >5 ML/KG.

ACUTE INHALATION EFFECTS: THE 4-HOUR INHALATION LC50 IN RATS IS >5 MG/L.

THE DATA ABOVE IS OBTAINED FROM STUDIES SPONSORED BY THE AMERICAN PETROLEUM INSTITUTE.

CHRONIC EFFECTS/CARCINOGENICITY:
THIS PRODUCT CONTAINS A MIXTURE OF PETROLEUM HYDROCARBONS CALLED MIDDLE DISTILLATES (WHICH MEANS THEY BOIL BETWEEN APPROXIMATELY 350F AND 700F). BECAUSE OF THIS BROAD DESCRIPTION, MANY PRODUCTS ARE CONSIDERED MIDDLE

DISTILLATES YET THEY ARE PRODUCED BY A VARIETY OF DIFFERENT PETROLEUM REFINING PROCESSES. TOXICOLOGY DATA DEVELOPED ON SOME MIDDLE DISTILLATES FOUND THAT THEY CAUSED POSITIVE RESPONSES IN SOME MUTAGENICITY TESTS AND CAUSED SKIN CANCER WHEN REPEATEDLY APPLIED TO MICE OVER THEIR LIFETIME. THIS PRODUCT MAY CONTAIN SOME MIDDLE DISTILLATES FOUND TO CAUSE THOSE ADVERSE EFFECTS.

THIS PRODUCT MAY CONTAIN SIGNIFICANT AMOUNTS OF POLYNUCLEAR AROMATIC HYDROCARBONS (PAH'S) WHICH HAVE BEEN SHOWN TO CAUSE SKIN CANCER AFTER PROLONGED AND FREQUENT CONTACT WITH THE SKIN OF TEST ANIMALS. BRIEF OR INTERMITTENT SKIN CONTACT WITH THIS PRODUCT IS NOT EXPECTED TO HAVE SERIOUS EFFECTS IF IT IS WASHED FROM THE SKIN. WHILE SKIN CANCER IS UNLIKELY TO OCCUR IN HUMAN BEINGS FOLLOWING USE OF THIS PRODUCT, SKIN CONTACT AND BREATHING OF MISTS OR VAPORS SHOULD BE REDUCED TO A MINIMUM.

THIS PRODUCT CONTAINS KEROSENE. CONCAWE (PRODUCT DOSSIER 94/106) HAS SUMMARIZED CURRENT HEALTH, SAFETY AND ENVIRONMENTAL DATA AVAILABLE FOR A NUMBER OF KEROSENES (TYPICALLY STRAIGHT-RUN KEROSENE, CAS 8008-20-6, OR HYDRODESULFURIZED KEROSENE, CAS 64742-81-0). FOLLOWING ACUTE EXPOSURE TO KEROSENE, SIGNS OBSERVED IN RATS AND RABBITS WERE OF A LOW ORDER OF TOXICITY:
CENTRAL NERVOUS SYSTEM DEPRESSION OCCURRED FOLLOWING ORAL EXPOSURE, SKIN IRRITATION (RANGING FROM SLIGHT TO SEVERE IRRITATION) OCCURRED WITH DERMAL EXPOSURE, AND RESPIRATORY TRACT IRRITATION OCCURRED WITH INHALATION EXPOSURE. NONE OF THE KEROSENES TESTED PRODUCED MORE THAN SLIGHT EYE IRRITATION AND NONE WERE SKIN SENSITIZERS. HOWEVER, INTRATRACHEAL ADMINISTRATION OR ARTIFICIAL ASPIRATION OF SMALL VOLUMES (0.1 TO 0.2 ML) OF KEROSENE INTO THE LUNGS OF RATS, CHICKENS AND PRIMATES RESULTED IN LUNG DAMAGE AND/OR DEATH. CHRONIC (3 TO 24 MONTHS) MOUSE DERMAL TOXICITY STUDIES OF KEROSENES AND JET FUELS PRODUCED MILD TO MODERATE SKIN IRRITATION, WHILE LONG-TERM (2+ YEARS) STUDIES SHOWED MODERATE TO SEVERE SKIN DAMAGE AS WELL AS AN INCREASED INCIDENCE OF TUMORS AFTER LONG LATENCY PERIODS (PROBABLY DUE TO A SECONDARY MECHANISM RELATED TO SKIN IRRITANCY). IN A STUDY IN WHICH RATS, MICE, RABBITS AND CATS WERE EXPOSED TO KEROSENE AEROSOL CONCENTRATIONS IN THE RANGE 0.05 TO 120 MG/L FOR UP TO FOUR WEEKS, REDUCTIONS IN RESPIRATORY RATE, PULMONARY HYPEREMIA, LEUCOCYTOSIS, MONOCYTOSIS AND DECREASED ERYTHROCYTE SEDIMENTATION RATE WERE OBSERVED, AND HISTOLOGICAL EXAMINATION REVEALED INFLAMMATORY CHANGES IN THE RESPIRATORY TRACT (TRACHEITIS, BRONCHITIS AND PNEUMONIA).

HYDRODESULFURIZED KEROSENE WAS TESTED BY THE PETROLEUM PRODUCT STEWARDSHIP COUNCIL IN AN OECD GUIDELINE 421 REPRODUCTIVE/DEVELOPMENTAL TOXICITY STUDY. THE KEROSENE SAMPLE WAS DILUTED TO 494 (60%), 330 (40%), AND 165 (20%) MG/KG/DAY IN FOOD GRADE MINERAL OIL AND APPLIED DAILY DURING PRE-MATING AND MATING TO DAY 19 OF GESTATION. THERE WAS NO APPARENT MATERNAL, REPRODUCTIVE, OR DEVELOPMENTAL TOXICITY AT ANY DOSE. MALES TREATED FOR EIGHT WEEKS HAD INCREASED RELATIVE KIDNEY WEIGHTS IN THE HIGH DOSE GROUP BUT NO MICROSCOPIC CHANGES IN TESTES OR EPIDIDYMIDES. NO GROSS ANOMALIES WERE OBSERVED IN THE PUPS.

THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH (NIOSH) HAS RECOMMENDED THAT WHOLE DIESEL EXHAUST BE REGARDED AS POTENTIALLY CAUSING CANCER. THIS RECOMMENDATION WAS BASED ON TEST RESULTS SHOWING INCREASED LUNG CANCER IN LABORATORY ANIMALS EXPOSED TO WHOLE DIESEL EXHAUST.

12. ECOLOGICAL INFORMATION

ECOTOXICITY:

A SERIES OF STUDIES ON THE ACUTE TOXICITY OF 4 DIESEL FUEL SAMPLES WERE CONDUCTED BY ONE LABORATORY USING WATER ACCOMMODATED FRACTIONS. THE RANGE OF EFFECTIVE (EC50) OR LETHAL CONCENTRATIONS (LC50) EXPRESSED AS LOADING RATES WERE:
THE 96-HOUR LC50 FOR RAINBOW TROUT (SALMO GAIRDNERI) IS 21-210 MG/L.
THE 48-HOUR EC50 FOR DAPHNIA (DAPHNIA MAGNA) IS 20-210 MG/L.
THE 72-HOUR EC50 IN ALGA (RAPHIDOCELLUS SUBCAPITATA) IS 2.6-25 MG/L.

ENVIRONMENTAL FATE:
ON RELEASE TO THE ENVIRONMENT THE LIGHTER COMPONENTS OF DIESEL FUEL WILL GENERALLY EVAPORATE BUT DEPENDING ON LOCAL ENVIRONMENTAL CONDITIONS (TEMPERATURE, WIND, MIXING OR WAVE ACTION, SOIL TYPE, ETC.) THE REMAINDER MAY BECOME DISPERSED IN THE WATER COLUMN OR ABSORBED TO SOIL OR SEDIMENT. DIESEL FUEL WOULD NOT BE EXPECTED TO BE "READILY BIODEGRADABLE". IN A MODIFIED STRUM TEST (OECD METHOD 301B) APPROXIMATELY 40% BIODEGRADATION WAS RECORDED OVER 28 DAYS. HOWEVER, IT HAS BEEN SHOWN THAT MOST HYDROCARBON COMPONENTS OF DIESEL FUEL ARE DEGRADED IN SOIL IN THE PRESENCE OF OXYGEN. UNDER ANAEROBIC CONDITIONS, SUCH AS IN ANOXIC SEDIMENTS, RATES OF BIODEGRADATION ARE NEGLIGIBLE.

13. DISPOSAL CONSIDERATIONS

USE MATERIAL FOR ITS INTENDED PURPOSE OR RECYCLE IF POSSIBLE. THIS MATERIAL, IF IT MUST BE DISCARDED, MAY MEET THE CRITERIA OF A HAZARDOUS WASTE AS DEFINED BY USEPA UNDER RCRA (40CFR261) OR OTHER STATE AND LOCAL REGULATIONS. MEASUREMENT OF CERTAIN PHYSICAL PROPERTIES AND ANALYSIS FOR REGULATED COMPONENTS MAY BE NECESSARY TO MAKE A CORRECT DETERMINATION. IF THIS MATERIAL IS CLASSIFIED AS A HAZARDOUS WASTE, FEDERAL LAW REQUIRES DISPOSAL AT A LICENSED HAZARDOUS WASTE DISPOSAL FACILITY.

14. TRANSPORT INFORMATION

THE DESCRIPTION SHOWN MAY NOT APPLY TO ALL SHIPPING SITUATIONS. CONSULT 49CFR, OR APPROPRIATE DANGEROUS GOODS REGULATIONS, FOR ADDITIONAL DESCRIPTION REQUIREMENTS (E.G., TECHNICAL NAME) AND MODE-SPECIFIC OR QUANTITY-SPECIFIC SHIPPING REQUIREMENTS.

DOT SHIPPING NAME: GAS OIL

DOT HAZARD CLASS: COMBUSTIBLE LIQUID

DOT IDENTIFICATION NUMBER: UN1202

DOT PACKING GROUP: III

15. REGULATORY INFORMATION

SARA 311 CATEGORIES:
1. IMMEDIATE (ACUTE) HEALTH EFFECTS: YES
2. DELAYED (CHRONIC) HEALTH EFFECTS: YES
3. FIRE HAZARD: YES

4. SUDDEN RELEASE OF PRESSURE HAZARD: NO
5. REACTIVITY HAZARD: NO

REGULATORY LISTS SEARCHED:
01=SARA 313
02=MASS RTK
03=NTP CARCINOGEN
04=CA PROP 65-CARCIN
05=CA PROP 65-REPRO TOX
06=IARC GROUP 1
07=IARC GROUP 2A
08=IARC GROUP 2B
09=SARA 302/304
10=PA RTK
11=NJ RTK
12=CERCLA 302.4
13=MN RTK
14=ACGIH TWA
15=ACGIH STEL
16=ACGIH CALC TLV
17=OSHA PEL
18=DOT MARINE POLLUTANT
19=CHEVRON TWA
20=EPA CARCINOGEN
22=TSCA SECT 5(A)(2)
23=TSCA SECT 6
24=TSCA SECT 12(B)
25=TSCA SECT 8(A)
26=TSCA SECT 8(D)
27=TSCA SECT 4(A)
28=CANADIAN WHMIS
29=OSHA CEILING
30=CHEVRON STEL

THE FOLLOWING COMPONENTS OF THIS MATERIAL ARE FOUND ON THE REGULATORY LISTS INDICATED.

KEROSENE:
IS FOUND ON LISTS: 02, 10, 11

NEW JERSEY RTK CLASSIFICATION:
UNDER THE NEW JERSEY RIGHT-TO-KNOW ACT L. 1983 CHAPTER 315 N.J.S.A. 34:5A-1 ET. SEQ., THE PRODUCT IS TO BE IDENTIFIED AS FOLLOWS: DIESEL FUEL

WHMIS CLASSIFICATION:
CLASS B, DIVISION 3: COMBUSTIBLE LIQUIDS
CLASS D, DIVISION 2, SUBDIVISION B: TOXIC MATERIAL

*SKIN OR EYE IRRITATION

16. OTHER INFORMATION

NFPA RATINGS:
HEALTH 0
FLAMMABILITY 2
REACTIVITY 0

0-LEAST
1-SLIGHT
2-MODERATE
3-HIGH
4-EXTREME
PPE-PERSONAL PROTECTION EQUIPMENT INDEX RECOMMENDATION
*-CHRONIC EFFECT INDICATOR

THESE VALUES ARE OBTAINED USING THE GUIDELINES OR PUBLISHED EVALUATIONS PREPARED BY THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) OR THE NATIONAL PAINT AND COATING ASSOCIATION (FOR HMIS RATINGS).

REVISION STATEMENT:
THIS IS A NEW MATERIAL SAFETY DATA SHEET WHICH CONSOLIDATES AND REPLACES ALL PREVIOUS MSDS'S FOR DIESEL FUELS.

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:
TLV - THRESHOLD LIMIT VALUE
TWA - TIME WEIGHTED AVERAGE
STEL - SHORT-TERM EXPOSURE LIMIT
TPQ - THRESHOLD PLANNING QUANTITY
RQ - REPORTABLE QUANTITY
PEL - PERMISSIBLE EXPOSURE LIMIT
C - CEILING LIMIT
CAS - CHEMICAL ABSTRACT SERVICE NUMBER
A1-5 - APPENDIX A CATEGORIES
() - CHANGE HAS BEEN PROPOSED
NDA - NO DATA AVAILABLE
NA - NOT APPLICABLE

PREPARED ACCORDING TO THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) AND THE ANSI MSDS STANDARD (Z400.1) BY THE TOXICOLOGY AND HEALTH RISK ASSESSMENT UNIT, CRTC, P.O. BOX 1627, RICHMOND, CA 94804

THE ABOVE INFORMATION IS BASED ON THE DATA OF WHICH WE ARE AWARE AND IS BELIEVED TO BE CORRECT AS OF THE DATE HEREOF. SINCE THIS INFORMATION MAY BE APPLIED UNDER CONDITIONS BEYOND OUR CONTROL AND WITH WHICH WE MAY BE UNFAMILIAR AND SINCE DATA MADE AVAILABLE SUBSEQUENT TO THE DATE HEREOF MAY SUGGEST MODIFICATION OF THE INFORMATION, WE DO NOT ASSUME ANY RESPONSIBILITY FOR THE RESULTS OF ITS USE. THIS INFORMATION IS FURNISHED UPON CONDITION THAT THE PERSON RECEIVING IT SHALL MAKE HIS OWN DETERMINATION OF THE SUITABILITY OF THE MATERIAL FOR HIS PARTICULAR PURPOSE.

CHEVRON
PREMIUM UNLEADED GASOLINE **Revised: 03/31/2003**

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CHEVRON

MATERIAL SAFETY DATA SHEET

CHEVRON SUPREME UNLEADED GASOLINE

MSDS: 2653

REVISION #: 35

REVISION DATE: 3/31/2003

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

CHEVRON PREMIUM UNLEADED GASOLINE

PRODUCT USE: FUEL

PRODUCT NUMBER(S): CPS201019 (SEE SECTION 16 FOR ADDITIONAL PRODUCT NUMBERS)

SYNONYMS: CALCO PREMIUM GASOLINE, CHEVRON SUPREME UNLEADED GASOLINE

COMPANY IDENTIFICATION:
CHEVRON PRODUCTS COMPANY
MARKETING, MSDS COORDINATOR
6001 BOLLINGER CANYON ROAD
SAN RAMON, CA 94583
UNITED STATES OF AMERICA

TRANSPORTATION EMERGENCY RESPONSE:
CHEMTREC: (800) 424-9300 OR (703) 527-3887

HEALTH EMERGENCY:
CHEVRONTEXACO EMERGENCY INFORMATION CENTER:

LOCATED IN THE USA. INTERNATIONAL COLLECT CALLS ACCEPTED. (800) 231-0623 OR (510) 231-0623

PRODUCT INFORMATION:
TECHNICAL INFORMATION: (510) 242-5357

SPECIAL NOTES:
THIS MSDS APPLIES TO:
FEDERAL REFORMULATED GASOLINE, CALIFORNIA REFORMULATED GASOLINE, WINTERTIME OXYGENATED GASOLINE, LOW RVP GASOLINE AND CONVENTIONAL GASOLINE.

SECTION 2 COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
GASOLINE	86290-81-5	100 %VOLUME
BENZENE	71-43-2	0.1-4.9 %VOLUME
ETHYL BENZENE	100-41-4	0.1-3 %VOLUME
NAPHTHALENE	91-20-3	0.1-2 %VOLUME
ETHANOL	64-17-5	0-10 %VOLUME
METHYL TERT-BUTYL ETHER (MTBE)	1634-04-4	0-15 %VOLUME
TERTIARY AMYL METHYL ETHER (TAME)	994-05-8	0-17 %VOLUME
ETHYL TERT-BUTYL ETHER (ETBE)	637-92-3	0-18 %VOLUME

MOTOR GASOLINE IS CONSIDERED A MIXTURE BY EPA UNDER THE TOXIC SUBSTANCES CONTROL ACT (TSCA). THE REFINERY STREAMS USED TO BLEND MOTOR GASOLINE ARE ALL ON THE TSCA CHEMICAL SUBSTANCES INVENTORY. THE APPROPRIATE CAS NUMBER FOR REFINERY BLENDED MOTOR GASOLINE IS 86290-81-5. THE PRODUCT SPECIFICATIONS OF MOTOR GASOLINE SOLD IN YOUR AREA WILL DEPEND ON APPLICABLE FEDERAL AND STATE REGULATIONS.

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:
EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE
HARMFUL OR FATAL IF SWALLOWED - MAY CAUSE LUNG DAMAGE IF SWALLOWED
VAPOR HARMFUL
CAUSES SKIN IRRITATION
CAUSES EYE IRRITATION
LONG-TERM EXPOSURE TO VAPOR HAS CAUSED CANCER IN LABORATORY ANIMALS
KEEP OUT OF REACH OF CHILDREN
TOXIC TO AQUATIC ORGANISMS

IMMEDIATE HEALTH EFFECTS:

EYE:
CONTACT WITH THE EYES CAUSES IRRITATION. SYMPTOMS MAY INCLUDE PAIN, TEARING,

REDDENING, SWELLING AND IMPAIRED VISION.

SKIN:
CONTACT WITH THE SKIN CAUSES IRRITATION. SKIN CONTACT MAY CAUSE DRYING OR DEFATTING OF THE SKIN. SYMPTOMS MAY INCLUDE PAIN, ITCHING, DISCOLORATION, SWELLING, AND BLISTERING. CONTACT WITH THE SKIN IS NOT EXPECTED TO CAUSE AN ALLERGIC SKIN RESPONSE. NOT EXPECTED TO BE HARMFUL TO INTERNAL ORGANS IF ABSORBED THROUGH THE SKIN.

INGESTION:
BECAUSE OF ITS LOW VISCOSITY, THIS MATERIAL CAN DIRECTLY ENTER THE LUNGS, IF SWALLOWED, OR IF SUBSEQUENTLY VOMITED. ONCE IN THE LUNGS IT IS VERY DIFFICULT TO REMOVE AND CAN CAUSE SEVERE INJURY OR DEATH.

INHALATION:
THE VAPOR OR FUMES FROM THIS MATERIAL MAY CAUSE RESPIRATORY IRRITATION. SYMPTOMS OF RESPIRATORY IRRITATION MAY INCLUDE COUGHING AND DIFFICULTY BREATHING. BREATHING THIS MATERIAL AT CONCENTRATIONS ABOVE THE RECOMMENDED EXPOSURE LIMITS MAY CAUSE CENTRAL NERVOUS SYSTEM EFFECTS. CENTRAL NERVOUS SYSTEM EFFECTS MAY INCLUDE HEADACHE, DIZZINESS, NAUSEA, VOMITING, WEAKNESS, LOSS OF COORDINATION, BLURRED VISION, DROWSINESS, CONFUSION, OR DISORIENTATION. AT EXTREME EXPOSURES, CENTRAL NERVOUS SYSTEM EFFECTS MAY INCLUDE RESPIRATORY DEPRESSION, TREMORS OR CONVULSIONS, LOSS OF CONSCIOUSNESS, COMA OR DEATH.

DELAYED OR OTHER HEALTH EFFECTS:

REPRODUCTION AND BIRTH DEFECTS:
THIS MATERIAL IS NOT EXPECTED TO CAUSE BIRTH DEFECTS OR OTHER HARM TO THE DEVELOPING FETUS BASED ON ANIMAL DATA.

CANCER:
PROLONGED OR REPEATED EXPOSURE TO THIS MATERIAL MAY CAUSE CANCER. GASOLINE HAS BEEN CLASSIFIED AS A GROUP 2B CARCINOGEN (POSSIBLY CARCINOGENIC TO HUMANS) BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC).

CONTAINS BENZENE, WHICH HAS BEEN CLASSIFIED AS A CARCINOGEN BY THE NATIONAL TOXICOLOGY PROGRAM (NTP) AND A GROUP 1 CARCINOGEN (CARCINOGENIC TO HUMANS) BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC).
CONTAINS ETHYLBENZENE WHICH HAS BEEN CLASSIFIED AS A GROUP 2B CARCINOGEN (POSSIBLY CARCINOGENIC TO HUMANS) BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC).
CONTAINS NAPHTHALENE, WHICH HAS BEEN CLASSIFIED AS A GROUP 2B CARCINOGEN (POSSIBLY CARCINOGENIC TO HUMANS) BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC).

WHOLE GASOLINE EXHAUST HAS BEEN CLASSIFIED AS A GROUP 2B CARCINOGEN (POSSIBLY CARCINOGENIC TO HUMANS) BY THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC).
RISK DEPENDS ON DURATION AND LEVEL OF EXPOSURE. SEE SECTION 11 FOR ADDITIONAL INFORMATION.

SECTION 4 FIRST AID MEASURES

EYE:
FLUSH EYES WITH WATER IMMEDIATELY WHILE HOLDING THE EYELIDS OPEN. REMOVE CONTACT LENSES, IF WORN, AFTER INITIAL FLUSHING, AND CONTINUE FLUSHING FOR AT

LEAST 15 MINUTES. GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

SKIN:
WASH SKIN WITH WATER IMMEDIATELY AND REMOVE CONTAMINATED CLOTHING AND SHOES. GET MEDICAL ATTENTION IF ANY SYMPTOMS DEVELOP. TO REMOVE THE MATERIAL FROM SKIN, USE SOAP AND WATER. DISCARD CONTAMINATED CLOTHING AND SHOES OR THOROUGHLY CLEAN BEFORE REUSE.

INGESTION:
IF SWALLOWED, GET IMMEDIATE MEDICAL ATTENTION. DO NOT INDUCE VOMITING. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

INHALATION:
MOVE THE EXPOSED PERSON TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. GET MEDICAL ATTENTION IF BREATHING DIFFICULTIES CONTINUE.

NOTE TO PHYSICIANS:
INGESTION OF THIS PRODUCT OR SUBSEQUENT VOMITING MAY RESULT IN ASPIRATION OF LIGHT HYDROCARBON LIQUID, WHICH MAY CAUSE PNEUMONITIS.

SECTION 5 FIRE FIGHTING MEASURES

SEE SECTION 7 FOR PROPER HANDLING AND STORAGE.

FIRE CLASSIFICATION:
OSHA CLASSIFICATION (29 CFR 1910.1200): FLAMMABLE LIQUID.

NFPA RATINGS:
HEALTH: 1
FLAMMABILITY: 3
REACTIVITY: 0

FLAMMABLE PROPERTIES:

FLASHPOINT: (TAGLIABUE CLOSED CUP) < -45 DEG. C (< -49 DEG. F)

AUTOIGNITION: > 280 DEG. C (> 536 DEG. F)

FLAMMABILITY (EXPLOSIVE) LIMITS (% BY VOLUME IN AIR):
LOWER: 1.4
UPPER: 7.6

EXTINGUISHING MEDIA:
DRY CHEMICAL, CO2, AFFF FOAM OR ALCOHOL RESISTANT FOAM IF >15% VOLUME POLAR SOLVENTS (OXYGENATES).

PROTECTION OF FIRE FIGHTERS:

FIRE FIGHTING INSTRUCTIONS:
USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS AND TO PROTECT PERSONNEL. FOR FIRES INVOLVING THIS MATERIAL, DO NOT ENTER ANY ENCLOSED OR CONFINED FIRE SPACE WITHOUT PROPER PROTECTIVE EQUIPMENT, INCLUDING SELF-CONTAINED BREATHING APPARATUS.

COMBUSTION PRODUCTS:
HIGHLY DEPENDENT ON COMBUSTION CONDITIONS. A COMPLEX MIXTURE OF AIRBORNE

SOLIDS, LIQUIDS, AND GASES INCLUDING CARBON MONOXIDE, CARBON DIOXIDE, AND UNIDENTIFIED ORGANIC COMPOUNDS WILL BE EVOLVED WHEN THIS MATERIAL UNDERGOES COMBUSTION.

SECTION 6 ACCIDENTAL RELEASE MEASURES

PROTECTIVE MEASURES:
ELIMINATE ALL SOURCES OF IGNITION IN THE VICINITY OF THE SPILL OR RELEASED VAPOR. IF THIS MATERIAL IS RELEASED INTO THE WORK AREA, EVACUATE THE AREA IMMEDIATELY. MONITOR AREA WITH COMBUSTIBLE GAS INDICATOR.

SPILL MANAGEMENT:
STOP THE SOURCE OF THE RELEASE IF YOU CAN DO IT WITHOUT RISK. CONTAIN RELEASE TO PREVENT FURTHER CONTAMINATION OF SOIL, SURFACE WATER OR GROUNDWATER. CLEAN UP SPILL AS SOON AS POSSIBLE, OBSERVING PRECAUTIONS IN EXPOSURE CONTROLS/PERSONAL PROTECTION. USE APPROPRIATE TECHNIQUES SUCH AS APPLYING NON-COMBUSTIBLE ABSORBENT MATERIALS OR PUMPING. ALL EQUIPMENT USED WHEN HANDLING THE PRODUCT MUST BE GROUNDED. A VAPOR SUPPRESSING FOAM MAY BE USED TO REDUCE VAPORS. USE CLEAN NON-SPARKING TOOLS TO COLLECT ABSORBED MATERIAL. WHERE FEASIBLE AND APPROPRIATE, REMOVE CONTAMINATED SOIL. PLACE CONTAMINATED MATERIALS IN DISPOSABLE CONTAINERS AND DISPOSE OF IN A MANNER CONSISTENT WITH APPLICABLE REGULATIONS.

REPORTING:
REPORT SPILLS TO LOCAL AUTHORITIES AND/OR THE U.S. COAST GUARD'S NATIONAL RESPONSE CENTER AT (800) 424-8802 AS APPROPRIATE OR REQUIRED. THIS MATERIAL IS COVERED BY EPA'S COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA) PETROLEUM EXCLUSION. THEREFORE, RELEASES TO THE ENVIRONMENT MAY NOT BE REPORTABLE UNDER CERCLA.

SECTION 7 HANDLING AND STORAGE

PRECAUTIONARY MEASURES:
READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL. THIS PRODUCT PRESENTS AN EXTREME FIRE HAZARD. LIQUID VERY QUICKLY EVAPORATES, EVEN AT LOW TEMPERATURES, AND FORMS VAPOR (FUMES) WHICH CAN CATCH FIRE AND BURN WITH EXPLOSIVE VIOLENCE. INVISIBLE VAPOR SPREADS EASILY AND CAN BE SET ON FIRE BY MANY SOURCES SUCH AS PILOT LIGHTS, WELDING EQUIPMENT, AND ELECTRICAL MOTORS AND SWITCHES. NEVER SIPHON GASOLINE BY MOUTH.
USE ONLY AS A MOTOR FUEL. DO NOT USE FOR CLEANING, PRESSURE APPLIANCE FUEL, OR ANY OTHER SUCH USE. DO NOT STORE IN OPEN OR UNLABELED CONTAINERS. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING. DO NOT TASTE OR SWALLOW. DO NOT BREATHE VAPOR OR FUMES. WASH THOROUGHLY AFTER HANDLING. KEEP OUT OF THE REACH OF CHILDREN.

UNUSUAL HANDLING HAZARDS:
WARNING!
DO NOT USE AS PORTABLE HEATER OR APPLIANCE FUEL. TOXIC FUMES MAY ACCUMULATE AND CAUSE DEATH.

GENERAL HANDLING INFORMATION:
AVOID CONTAMINATING SOIL OR RELEASING THIS MATERIAL INTO SEWAGE AND DRAINAGE SYSTEMS AND BODIES OF WATER.

STATIC HAZARD:
ELECTROSTATIC CHARGE MAY ACCUMULATE AND CREATE A HAZARDOUS CONDITION WHEN HANDLING THIS MATERIAL. TO MINIMIZE THIS HAZARD, BONDING AND GROUNDING MAY BE NECESSARY BUT MAY NOT, BY THEMSELVES, BE SUFFICIENT. REVIEW ALL OPERATIONS WHICH HAVE THE POTENTIAL OF GENERATING AN ACCUMULATION OF ELECTROSTATIC CHARGE AND/OR A FLAMMABLE ATMOSPHERE (INCLUDING TANK AND CONTAINER FILLING, SPLASH FILLING, TANK CLEANING, SAMPLING, GAUGING, SWITCH LOADING, FILTERING, MIXING, AGITATION, AND VACUUM TRUCK OPERATIONS) AND USE APPROPRIATE MITIGATING PROCEDURES. FOR MORE INFORMATION, REFER TO OSHA STANDARD 29 CFR 1910.106, 'FLAMMABLE AND COMBUSTIBLE LIQUIDS', NATIONAL FIRE PROTECTION ASSOCIATION (NFPA 77, 'RECOMMENDED PRACTICE ON STATIC ELECTRICITY', AND/OR THE AMERICAN PETROLEUM INSTITUTE (API) RECOMMENDED PRACTICE 2003, 'PROTECTION AGAINST IGNITIONS ARISING OUT OF STATIC, LIGHTNING, AND STRAY CURRENTS'. IMPROPER FILLING OF PORTABLE GASOLINE CONTAINERS CREATES DANGER OF FIRE. ONLY DISPENSE GASOLINE INTO APPROVED AND PROPERLY LABELED GASOLINE CONTAINERS. ALWAYS PLACE PORTABLE CONTAINERS ON THE GROUND. BE SURE PUMP NOZZLE IS IN CONTACT WITH THE CONTAINER WHILE FILLING. DO NOT USE A NOZZLE'S LOCK-OPEN DEVICE. DO NOT FILL PORTABLE CONTAINERS THAT ARE INSIDE A VEHICLE OR TRUCK/TRAILER BED.

GENERAL STORAGE INFORMATION:
DO NOT USE OR STORE NEAR HEAT, SPARKS OR OPEN FLAMES. USE AND STORE ONLY IN WELL VENTILATED AREA. KEEP CONTAINER CLOSED WHEN NOT IN USE.

CONTAINER WARNINGS:
CONTAINER IS NOT DESIGNED TO CONTAIN PRESSURE. DO NOT USE PRESSURE TO EMPTY CONTAINER OR IT MAY RUPTURE WITH EXPLOSIVE FORCE. EMPTY CONTAINERS RETAIN PRODUCT RESIDUE (SOLID, LIQUID, AND/OR VAPOR) AND CAN BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. EMPTY CONTAINERS SHOULD BE COMPLETELY DRAINED, PROPERLY CLOSED, AND PROMPTLY RETURNED TO A DRUM RECONDITIONER OR DISPOSED OF PROPERLY.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
CONSIDER THE POTENTIAL HAZARDS OF THIS MATERIAL (SEE SECTION 3), APPLICABLE EXPOSURE LIMITS, JOB ACTIVITIES, AND OTHER SUBSTANCES IN THE WORK PLACE WHEN DESIGNING ENGINEERING CONTROLS AND SELECTING PERSONAL PROTECTIVE EQUIPMENT. IF ENGINEERING CONTROLS OR WORK PRACTICES ARE NOT ADEQUATE TO PREVENT EXPOSURE TO HARMFUL LEVELS OF THIS MATERIAL, THE PERSONAL PROTECTIVE EQUIPMENT LISTED BELOW IS RECOMMENDED. THE USER SHOULD READ AND UNDERSTAND ALL INSTRUCTIONS AND LIMITATIONS SUPPLIED WITH THE EQUIPMENT SINCE PROTECTION IS USUALLY PROVIDED FOR A LIMITED TIME OR UNDER CERTAIN CIRCUMSTANCES.

ENGINEERING CONTROLS:
USE PROCESS ENCLOSURES, LOCAL EXHAUST VENTILATION, OR OTHER ENGINEERING CONTROLS TO CONTROL AIRBORNE LEVELS BELOW THE RECOMMENDED EXPOSURE LIMITS.

PERSONAL PROTECTIVE EQUIPMENT:

EYE/FACE PROTECTION:
NO SPECIAL EYE PROTECTION IS NORMALLY REQUIRED. WHERE SPLASHING IS POSSIBLE, WEAR SAFETY GLASSES WITH SIDE SHIELDS AS A GOOD SAFETY PRACTICE.

SKIN PROTECTION:

NO SPECIAL PROTECTIVE CLOTHING IS NORMALLY REQUIRED. WHERE SPLASHING IS POSSIBLE, SELECT PROTECTIVE CLOTHING DEPENDING ON OPERATIONS CONDUCTED, PHYSICAL REQUIREMENTS AND OTHER SUBSTANCES IN THE WORKPLACE. SUGGESTED MATERIALS FOR PROTECTIVE GLOVES INCLUDE:
CHLORINATED POLYETHYLENE (OR CHLOROSULFONATED POLYETHYLENE), NITRILE RUBBER, POLYURETHANE, VITON.

RESPIRATORY PROTECTION:
DETERMINE IF AIRBORNE CONCENTRATIONS ARE BELOW THE RECOMMENDED EXPOSURE LIMITS. IF NOT, WEAR AN APPROVED RESPIRATOR THAT PROVIDES ADEQUATE PROTECTION FROM MEASURED CONCENTRATIONS OF THIS MATERIAL, SUCH AS:
AIR-PURIFYING RESPIRATOR FOR ORGANIC VAPORS. WHEN USED AS A FUEL, THIS MATERIAL CAN PRODUCE CARBON MONOXIDE IN THE EXHAUST. DETERMINE IF AIRBORNE CONCENTRATIONS ARE BELOW THE OCCUPATIONAL EXPOSURE LIMIT FOR CARBON MONOXIDE. IF NOT, WEAR AN APPROVED POSITIVE-PRESSURE AIR-SUPPLYING RESPIRATOR.
USE A POSITIVE PRESSURE AIR-SUPPLYING RESPIRATOR IN CIRCUMSTANCES WHERE AIR-PURIFYING RESPIRATORS MAY NOT PROVIDE ADEQUATE PROTECTION.

OCCUPATIONAL EXPOSURE LIMITS:

COMPONENT	LIMIT	TWA	STEL	CEILING	NOTATION
BENZENE	ACGIH_TLV	.5 PPM	2.5 PPM		SKIN A1
BENZENE	OSHA_PEL	1 PPM	5 PPM		
BENZENE	OSHA_Z2	10 PPM		25 PPM	
ETHANOL	ACGIH_TLV	1000 PPM			A4
ETHANOL	OSHA_PEL	1000 PPM			
ETHYL BENZENE	ACGIH_TLV	100 PPM	125 PPM		A3
ETHYL BENZENE	OSHA_PEL	100 PPM	125 PPM		
ETHYL TERT-BUTYL ETHER (ETBE)	ACGIH_TLV	5 PPM			
GASOLINE	ACGIH_TLV	300 PPM	500 PPM		A3
GASOLINE	OSHA_PEL	300 PPM	500 PPM		
METHYL TERT-BUTYL ETHER (MTBE)	ACGIH_TLV	50 PPM			A3
NAPHTHALENE	ACGIH_TLV	10 PPM	15 PPM		SKIN A4
NAPHTHALENE	OSHA_PEL	10 PPM	15 PPM		
TERTIARY AMYL METHYL ETHER (TAME)	CHEVRON		50 PPM		

REFER TO THE OSHA BENZENE STANDARD (29 CFR 1910.1028) AND TABLE Z-2 FOR DETAILED TRAINING, EXPOSURE MONITORING, RESPIRATORY PROTECTION AND MEDICAL SURVEILLANCE REQUIREMENTS BEFORE USING THIS PRODUCT.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

ATTENTION:
THE DATA BELOW ARE TYPICAL VALUES AND DO NOT CONSTITUTE A SPECIFICATION.

COLOR: COLORLESS TO YELLOW

PHYSICAL STATE: LIQUID

ODOR: PETROLEUM ODOR

pH: NA

VAPOR PRESSURE: 5 PSI - 15 PSI (TYPICAL) @ 37.8 DEG. C (100 DEG. F)

VAPOR DENSITY (AIR=1): 3 - 4 (TYPICAL)

BOILING POINT: 37.8 DEG. C (100 DEG. F) - 204.4 DEG. C (400 DEG. F) (TYPICAL)

SOLUBILITY: INSOLUBLE IN WATER; MISCIBLE WITH MOST ORGANIC SOLVENTS.

FREEZING POINT: NA

MELTING POINT: NA

SPECIFIC GRAVITY: 0.7 G/ML - 0.8 G/ML @ 15.6 DEG. C (60.1 DEG. F)

VISCOSITY: <1 SUS @ 37.8 DEG. C (100 DEG. F)

SECTION 10 STABILITY AND REACTIVITY

CHEMICAL STABILITY:
THIS MATERIAL IS CONSIDERED STABLE UNDER NORMAL AMBIENT AND ANTICIPATED STORAGE AND HANDLING CONDITIONS OF TEMPERATURE AND PRESSURE.

INCOMPATIBILITY WITH OTHER MATERIALS:
MAY REACT WITH STRONG OXIDIZING AGENTS, SUCH AS CHLORATES, NITRATES, PEROXIDES, ETC.

HAZARDOUS DECOMPOSITION PRODUCTS: NONE KNOWN (NONE EXPECTED)

HAZARDOUS POLYMERIZATION: HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS:

EYE IRRITATION:
THE DRAIZE EYE IRRITATION MEAN SCORE IN RABBITS FOR A 24-HOUR EXPOSURE WAS: 0/110.

SKIN IRRITATION:
FOR A 4-HOUR EXPOSURE, THE PRIMARY IRRITATION INDEX (PII) IN RABBITS IS: 4.8/8.0.

SKIN SENSITIZATION:
THIS MATERIAL DID NOT CAUSE SENSITIZATION REACTIONS IN A MODIFIED BUEHLER GUINEA PIG TEST.

ACUTE DERMAL TOXICITY:
24 HOUR(S) LD50: >3.75G/KG (RABBIT).

ACUTE ORAL TOXICITY:
LD50: >5 ML/KG (RAT)

ACUTE INHALATION TOXICITY:
4 HOUR(S) LD50: >2000PPM (RAT).

ADDITIONAL TOXICOLOGY INFORMATION:
GASOLINES ARE HIGHLY VOLATILE AND CAN PRODUCE SIGNIFICANT CONCENTRATIONS OF VAPOR AT AMBIENT TEMPERATURES. GASOLINE VAPOR IS HEAVIER THAN AIR AND AT HIGH CONCENTRATIONS MAY ACCUMULATE IN CONFINED SPACES TO PRESENT BOTH SAFETY AND HEATH HAZARDS. WHEN VAPOR EXPOSURES ARE LOW, OR SHORT DURATION AND INFREQUENT, SUCH AS DURING REFUELLING AND TANKER LOADING/UNLOADING, NEITHER TOTAL HYDROCARBON NOR COMPONENTS SUCH AS BENZENE ARE LIKELY TO RESULT IN ANY ADVERSE HEALTH EFFECTS. IN SITUATIONS SUCH AS ACCIDENTS OR SPILLS WHERE EXPOSURE TO GASOLINE VAPOR IS POTENTIALLY HIGH, ATTENTION SHOULD BE PAID TO POTENTIAL TOXIC EFFECTS OF SPECIFIC COMPONENTS. INFORMATION ABOUT SPECIFIC COMPONENTS IN GASOLINE CAN BE FOUND IN SECTIONS 2, 8 AND 15 OF THIS MSDS. MORE DETAILED INFORMATION ON THE HEALTH HAZARD OF SPECIFIC GASOLINE COMPONENTS CAN BE OBTAINED CALLING THE CHEVRON EMERGENCY INFORMATION CENTER (SEE SECTION 1 FOR PHONE NUMBERS).

NEUROTOXICITY:
PATHOLOGICAL MISUSE OF SOLVENTS AND GASOLINE, INVOLVING REPEATED AND PROLONGED EXPOSURE TO HIGH CONCENTRATIONS OF VAPOR IS A SIGNIFICANT EXPOSURE ON WHICH THERE ARE MANY REPORTS IN THE MEDICAL LITERATURE. AS WITH OTHER SOLVENTS, PERSISTENT ABUSE INVOLVING REPEATED AND PROLONGED EXPOSURES TO HIGH CONCENTRATIONS OF VAPOR HAS BEEN REPORTED TO RESULT IN CENTRAL NERVOUS SYSTEM DAMAGE AND EVENTUALLY, DEATH. IN A STUDY IN WHICH TEN HUMAN VOLUNTEERS WERE EXPOSED FOR 30 MINUTES TO APPROXIMATELY 200, 500 OR 1000 PPM CONCENTRATIONS OF GASOLINE VAPOR, IRRITATION OF THE EYES WAS THE ONLY SIGNIFICANT EFFECT OBSERVED, BASED ON BOTH SUBJECTIVE AND OBJECTIVE ASSESSMENTS. IN AN INHALATION STUDY, GROUPS OF 6 FISCHER RATS (3 MALE. 3 FEMALE) WERE EXPOSED TO 2056 PPM OF WHOLY VAPORIZED UNLEADED GASOLINE FOR 6 HOURS PERDAY, 5 DAY PER WEEK FOR UP TO 18 MONTHS. HISTOPATHOLOGY OF THE PERIPHERAL NERVOUS SYSTEM AND SPINAL CORD REVEALED NO DISTAL AXONAL NEUROPTHY OF THE TYPE ASSOCIATED WITH EXPOSURE TO N-HEXANE EVEN THOUGH GASOLINE CONTAINED 1.9% N-HEXANE. THE AUTHORS CONCLUDED THAT GASOLINE TREATMENT MAY HAVE AMPLIFIED THE INCIDENCE AND PROMINENCE OF SOME NATURALLY OCCURRING AGE-RELATED (SUBCLINICAL) IN THE NERVOUS SYSTEM. BIRTH DEFECTS AND REPRODUCTIVE TOXICITY:
AN INHALATION STUDY WITH RATS EXPOSED TO 0, 400 AND 1600 PPM OF WHOLLY VAPORIZED UNLEADED GASOLINE, 6 HOURS PER DAY ON DAY 6 THROUGH 16 OF GESTATION, SHOWED NO TERATOGENIC EFFECTS NOR INDICATION OF TOXICITY TO EITHER THE MOTHER OR THE FETUS. ANOTHER INHALATION STUDY IN RATS EXPOSED TO 3000, 6000, OR 9000 PPM OF GASOLINE VAPOR, 6 HOURS PER DAY ON DAY 6 THROUGH 20 OF GESTATION, ALSO SHOWED NO TERATOGENIC EFFECTS NOR INDICATIONS OF TOXICITY TO EITHER THE MOTHER OR THE FETUS.

CHRONIC TOXICITY/CANCER:
WHOLLY VAPORIZED UNLEADED GASOLINE WAS USED IN A 3 MONTH INHALATION STUDY. GROUPS OF 40 RATS (20 MALES, 20 FEMALE) AND 8 SQUIRREL MONKEYS (4 MALE, 4 FEMALE) WERE EXPOSED 6 HOURS PER DAY AND 5 DAYS PER WEEK FOR 13 WEEKS TO 384 OR 1552 PPM GASOLINE. ONE GROUP OF EACH SPECIES SERVED AS UNEXPOSED

CONTROLS. THE INITIAL CONCLUSION OF THIS STUDY WAS THAT INHALATION OF GASOLINE AT AIRBORNE CONCENTRATIONS OF UP TO 1522 PPM CAUSED NO TOXICITY IN RATS OR MONKEYS. HOWEVER, FURTHER HISTOPATHOLOGICAL EXAMINATION OF MALE RAT KIDNEYS ON THE HIGHEST DOSE GROUP REVEALED AN INCREASED INCIDENCE AND SEVERITY OF REGENERATIVE EPITHELIUM AND DILATED TUBULES CONTAINING PROTEINACEOUS DEPOSITS. LIFETIME INHALATION OF WHOLLY VAPORIZED UNLEADED GASOLINE AT 2056 PPM HAS CAUSED INCREASED LIVER TUMORS IN FEMALE MICE. THE MECHANISM OF THIS RESPONSE IS STILL BEING INVESTIGATED BUT IT IS THOUGHT TO BE AN EPIGENETIC PROCESS UNIQUE TO THE FEMALE MOUSE.

THIS EXPOSURE ALSO CAUSED KIDNEY DAMAGE AND EVENTUALLY KIDNEY CANCER IN MALE RATS. NO OTHER ANIMAL MODEL STUDIED HAS SHOWN THESE ADVERSE KIDNEY EFFECTS AND THERE IS NO PHYSIOLOGICAL REASON TO BELIEVE THAT THEY WOULD OCCUR IN MAN. EPA HAS CONCLUDED THAT MECHANISM BY WHICH WHOLLY VAPORZIED UNLEADED GASOLINE CAUSES KIDNEY DAMAGE IS UNQUE TO THE MALE RAT. THE EFFECTS IN THAT SPECIES (KIDNEY DAMAGE AND CANCER) SHOULD NOT BE USED IN HUMAN RISK ASSESMENT. IN THEIR 1988 REVIEW OF CARCINOGENIC RISK FROM GASOLINE, THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) NOTED THAT, BECAUSE PUBLISHED EPIDEMIOLOGY STUDIES DID NOT INCLUDE ANY EXPOSURE DATA, ONLY OCCUPATIONS WHERE GASOLINE EXPOSURE MAY HAVE OCURRED WERE REVIEWED. THESE INCLUDED GASOLINE SERVICE STATION ATTENDANTS AND AUTOMOBILE MECHANICS. IARC ALSO NOTED THAT THERE WAS NO OPPORTUNITY TO SEPARATE EFFECTS OF COMBUSTION PRODUCTS FROM THOSE OF GASOLINE ITSELF. ALTHOUGH IARC ALLOCATED GASOLINE A FINAL OVERALL CLASS IFICATION OF GROUP 2B, I.E. POSSIBLY CARCINOGENIC TO HUMANS, THIS WAS BASED ON LIMITED EVIDENCE IN EXPERIMENTAL ANIMALS PLUS SUPPORTING EVIDENCE INCLUDING THE PRESENCE IN GASOLINE OF BENZENE AND 1, 3-BUTADIENE. THE ACTUAL EVIDENCE FOR CARCINOGENICITY IN HUMANS WAS CONSIDERED INADEQUATE.

MUTAGENICITY:
GASOLINE WAS NOT MUTAGENIC, WITH OR WITHOUT ACTIVATION, IN THE AMES ASSAY (SALMONELLA TYPHIMURIUM), SACCHARAMYCES CEREVISESAE, OR MOUSE LYMPHOMA ASSAYS. IN ADDITION, POINT MUTATIONS WERE NOT INDUCED IN HUMAN LYMPHOCYTES. GASOLINE WAS NOT MUTAGENIC WHEN TESTED IN THE MOUSE DOMINANT LETHAL ASSAY. ADMINISTRATION OF GASOLINE TO RATS DID NOT CAUSE CHOMOSOMAL ABERRATIONS IN THEIR BONE MARROW CELLS.
EPIDEMIOLOGY:
TO EXPLORE THE HEALTH EFFECTS OF WORKERS POTENTIALLY EXPOSED TO GASOLINE VAPORS IN THE MARKETING AND DISTRIBUTION SECTORS OF THE PETROLEUM INDUSTRY, THE AMERICAN PETROLEUM INSTITUTE SPONSORED A COHORT MORTALITY STUDY (PUBLICATION 4555), A NESTED CASE-CONTROL STUDY (PUBLICATION 4551), AND AN EXPOSURE ASSESSMENT STUDY (PUBLICATION 4552). HISTORIES OF EXPOSURE TO GASOLINE WERE RECONSTRUCTED FOR COHORT OF MORE THAN 18,000 EMPLOYEES FROM FOUR COMPANIES FOR THE TIME PERIOD BETWEEN 1946 AND 1985. THE RESULTS OF THE COHORT MORTALITY STUDY INDIC ATED THAT THERE WAS NO INCREASED MORTALITY FROM EITHER KIDNEY CANCER OR LEUKEMIA AMONG MARKETING AND MARINE DISTRIBUTION EMPLOYEES WHO WERE EXPOSED TO GASOLINE IN THE PETROLEUM INDUSTRY, WHEN COMPARED TO THE GENERAL POPULATION. MORE IMPORTANTLY, BASED ON INTERNAL COMPARISONS, THERE WAS NO ASSOCIATION BETWEEN MORTALITY FROM KIDNEY CANCER OR LEUKEMIA AND VARIOUS INDICES OF GASOLINE EXPOSURE. IN PARTICULAR, NEITHER DURATION OF EMPLOYMENT, DURATION OF EXPOSURE, AGE AT FIRST EXPOSURE, YEAR OF FIRST EXPOSURE, JOB CATEGORY, CUMULATIVE EXPOSURE, FREQUENCY OF PEAK EXPOSURE, NOR AVERAGE INTENSITY OF EXPOSURE HAD ANY EFFECT ON KIDNEY CANCER OR LEUKEMIA MORTALITY. THE RESULTS OF THE NESTED CASE-CONTROL STUDY CONFIRMED THE FINDINGS OF THE ORIGINAL COHORT STUDY. THAT IS, EXPOSURE TO GASOLINE AT THE LEVELS EXPERIENCED BY THIS COHORT OF DISTRIBUTION WORKERS IS NOT A SIGNIFICANT RISK FACTOR FOR LEUKEMIA (ALL CELL TYPES), ACUTE MYELOID LEUKEMIA, KIDNEY CANCER OR MULTIPLE MYELOMA.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY:
THE 96 HOUR(S) LC50 FOR RAINBOW TROUT (ONCORHYNCHUS MYKISS) IS 2.7 MG/L.
THE 48 HOUR(S) LC50 FOR WATER FLEA (DAPHNIA MAGNA) IS 3.0 MG/L.
THE 96 HOUR(S) LC50 FOR SHEEPSHEAD MINNOW (CYPRINODON VARIEGATUS) IS 8.3 MG/L.
THE 96 HOUR(S) LC50 FOR MYSID SHRIMP (MYSIDOPSIS BAHIA) IS 1.8 MG/L.
THIS MATERIAL IS EXPECTED TO BE TOXIC TO AQUATIC ORGANISMS. GASOLINE STUDIES HAVE BEEN CONDUCTED IN THE LABORATORY UNDER A VARIETY OF TEST CONDITIONS WITH A RANGE OF FISH AND INVERTEBRATE SPECIES. AN EVEN MORE EXTENSIVE DATABASE IS AVAILABLE ON THE AQUATIC TOXICITY OF INDIVIDUAL AROMATIC CONSTITUENTS. THE MAJORITY OF PUBLISHED STUDIES DO NOT IDENTIFY THE TYPE OF GASOLINE EVALUATED, OR EVEN PROVIDE DISTINGUISHING CHARACTERISTICS SUCH AS AROMATIC CONTENT OR PRESENCE OF LEAD ALKYLS. AS A RESULT, COMPARISON OF RESULTS AMONG STUDIES USING OPEN AND CLOSED VESSELS, DIFFERENT AGES AND SPECIES OF TEST ANIMALS AND DIFFERENT GASOLINE TYPES, IS DIFFICULT.

THE BULK OF THE AVAILABLE LITERATURE ON GASOLINE RELATES TO THE ENVIRONMENTAL IMPACT OF MONOAROMATIC (BTEX) AND DIAROMATIC (NAPHTHALENE, METHYLNAPHTHALENES) CONSTITUENTS. IN GENERAL, NON-OXYGENATED GASOLINE EXHIBITS SOME SHORT-TERM TOXICITY TO FRESHWATER AND MARINE ORGANISMS, ESPECIALLY UNDER CLOSED VESSEL OR FLOW-THROUGH EXPOSURE CONDITIONS IN THE LABORATORY. THE COMPONENTS WHICH ARE THE MOST PROMINENT IN THE WATER SOLUBLE FRACTION AND CAUSE AQUATIC TOXICITY, ARE ALSO HIGHLY VOLATILE AND CAN BE READILY BIODEGRADED BY MICROORGANISMS.

ENVIRONMENTAL FATE:
THIS MATERIAL IS EXPECTED TO BE READILY BIODEGRADABLE. FOLLOWING SPILLAGE, THE MORE VOLATILE COMPONENTS OF GASOLINE WILL BE RAPIDLY LOST, WITH CONCURRENT DISSOLUTION OF THESE AND OTHER CONSTITUENTS INTO THE WATER. FACTORS SUCH AS LOCAL ENVIRONMENTAL CONDITIONS (TEMPERATURE, WIND, MIXING OR WAVE ACTION, SOIL TYPE, ETC), PHOTO-OXIDATION, BIODEGRADATION AND ADSORPTION ONTO SUSPENDED SEDIMENTS, CAN CONTRIBUTE TO THE WEATHERING OF SPILLED GASOLINE.

THE AQUEOUS SOLUBILITY OF NON-OXYGENATED UNLEADED GASOLINE, BASED ON ANALYSIS OF BENZENE, TOLUENE, ETHYLBENZENE+XYLENES AND NAPHTHALENE, IS REPORTED TO BE 112 MG/L. SOLUBILITY DATA ON INDIVIDUAL GASOLINE CONSTITUENTS ALSO AVAILABLE.

SECTION 13 DISPOSAL CONSIDERATIONS

USE MATERIAL FOR ITS INTENDED PURPOSE OR RECYCLE IF POSSIBLE. THIS MATERIAL, IF IT MUST BE DISCARDED, MAY MEET THE CRITERIA OF A HAZARDOUS WASTE AS DEFINED BY US EPA UNDER RCRA (40 CFR 261) OR OTHER STATE AND LOCAL REGULATIONS. MEASUREMENT OF CERTAIN PHYSICAL PROPERTIES AND ANALYSIS FOR REGULATED COMPONENTS MAY BE NECESSARY TO MAKE A CORRECT DETERMINATION. IF THIS MATERIAL IS CLASSIFIED AS A HAZARDOUS WASTE, FEDERAL LAW REQUIRES DISPOSAL AT A LICENSED HAZARDOUS WASTE DISPOSAL FACILITY.

SECTION 14 TRANSPORT INFORMATION

THE DESCRIPTION SHOWN MAY NOT APPLY TO ALL SHIPPING SITUATIONS. CONSULT

49CFR, OR APPROPRIATE DANGEROUS GOODS REGULATIONS, FOR ADDITIONAL DESCRIPTION REQUIREMENTS (E.G., TECHNICAL NAME) AND MODE-SPECIFIC OR QUANTITY-SPECIFIC SHIPPING REQUIREMENTS.

DOT SHIPPING NAME: GASOLINE

DOT HAZARD CLASS: 3 (FLAMMABLE LIQUID)

DOT IDENTIFICATION NUMBER: UN1203

DOT PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

SARA 311/312 CATEGORIES:
1.IMMEDIATE (ACUTE) HEALTH EFFECTS: YES
2.DELAYED (CHRONIC) HEALTH EFFECTS: YES
3. FIRE HAZARD: YES
4.SUDDEN RELEASE OF PRESSURE HAZARD: NO
5.REACTIVITY HAZARD: NO

REGULATORY LISTS SEARCHED:

4_I1=IARC GROUP 1
15=SARA SECTION 313

4_I2A=IARC GROUP 2A
16=CA PROPOSITION 65

4_I2B=IARC GROUP 2B
17=MA RTK

05=NTP CARCINOGEN
18=NJ RTK

06=OSHA CARCINOGEN
19=DOT MARINE POLLUTANT

09=TSCA 12(B)
20=PA RTK

THE FOLLOWING COMPONENTS OF THIS MATERIAL ARE FOUND ON THE REGULATORY LISTS INDICATED.

BENZENE	15, 16, 17, 18, 20, 4_I1, 5, 6
ETHANOL	17, 18, 20
ETHYL BENZENE	15, 17, 18, 20, 4_I2B
GASOLINE	17, 18, 20
METHYL TERT-BUTYL ETHER (MTBE)	15, 17, 18, 20, 9
NAPHTHALENE	15, 16, 17, 18, 20, 4_I2B
TERTIARY AMYL METHYL ETHER (TAME)	9

CERCLA REPORTABLE QUANTITIES(RQ)/SARA 302 THRESHOLD PLANNING QUANTITIES(TPQ):

COMPONENT	COMPONENT RQ	COMPONENT TPQ	PRODUCT RQ
BENZENE	10 LBS	NONE	186 LBS
ETHANOL	100 LBS	NONE	1961 LBS
ETHYL BENZENE	1000 LBS	NONE	34964 LBS
METHYL TERT-BUTYL ETHER (MTBE)	1000 LBS	NONE	7513 LBS
NAPHTHALENE	100 LBS	NONE	4000 LBS

CHEMICAL INVENTORIES:

CANADA:
ALL THE COMPONENTS OF THIS MATERIAL ARE ON THE CANADIAN DSL OR HAVE BEEN NOTIFIED UNDER THE NEW SUBSTANCE NOTIFICATION REGULATIONS, BUT HAVE NOT YET BEEN PUBLISHED IN THE CANADA GAZETTE.

UNITED STATES:
ALL OF THE COMPONENTS OF THIS MATERIAL ARE ON THE TOXIC SUBSTANCES CONTROL ACT (TSCA) CHEMICAL INVENTORY.

WHMIS CLASSIFICATION:
CLASS B, DIVISION 2: FLAMMABLE LIQUIDS
CLASS D, DIVISION 2, SUBDIVISION A: VERY TOXIC MATERIAL - CARCINOGENICITY
CLASS D, DIVISION 2, SUBDIVISION B: TOXIC MATERIAL - SKIN OR EYE IRRITATION

SECTION 16 OTHER INFORMATION

NFPA RATINGS:
HEALTH: 1
FLAMMABILITY: 3
REACTIVITY: 0

(0-LEAST, 1-SLIGHT, 2-MODERATE, 3-HIGH, 4-EXTREME, PPE:- PERSONAL PROTECTION EQUIPMENT INDEX RECOMMENDATION, *- CHRONIC EFFECT INDICATOR). THESE VALUES ARE OBTAINED USING THE GUIDELINES OR PUBLISHED EVALUATIONS PREPARED BY THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) OR THE NATIONAL PAINT AND COATING ASSOCIATION (FOR HMIS RATINGS).

ADDITIONAL PRODUCT NUMBER(S):
CPS201024, CPS201050, CPS201051, CPS201058, CPS201060, CPS201061, CPS201066, CPS201068, CPS201069, CPS201071, CPS201072, CPS201078, CPS201081, CPS201084, CPS201085, CPS201088, CPS201091, CPS201092, CPS201094, CPS201096, CPS201097, CPS201098, CPS201101, CPS201103, CPS201114, CPS201117, CPS201193, CPS201213, CPS201214, CPS201215, CPS201233, CPS201234, CPS201235, CPS201263, CPS201264, CPS201265, CPS201274, CPS201275, CPS201276, CPS201283, CPS201284, CPS201285, CPS201293, CPS201294, CPS201295, CPS201853, CPS201854, CPS201861, CPS201862, CPS201863, CPS204006, CPS204007, CPS204008, CPS204009, CPS204014, CPS204015, CPS204026, CPS204027, CPS204050, CPS204051, CPS204074, CPS204075, CPS204092, CPS204093, CPS204108, CPS204109, CPS204120, CPS204121, CPS204144, CPS204145, CPS204168, CPS204169, CPS204192, CPS204193, CPS204204, CPS204205, CPS204216, CPS204217, CPS204228, CPS204229, CPS204252, CPS204253, CPS204276, CPS204277,

CPS204294, CPS204295, CPS204327, CPS2043 28, CPS204329, CPS204351, CPS204353, CPS204355, CPS204357, CPS204362, CPS204363, CPS204368, CPS204369, CPS204374, CPS204375, CPS204380, CPS204381, CPS204386, CPS204387, CPS204392, CPS204393, CPS204398, CPS204399, CPS204404, CPS204405, CPS204410, CPS204411, CPS204416, CPS204417, CPS204422, CPS204423, CPS204428, CPS204429, CPS204434, CPS204435, CPS204440, CPS204441, CPS204443, CPS204447, CPS204451, CPS204455, CPS204459, CPS204463, CPS204470, CPS204471, CPS204488, CPS204489, CPS204506, CPS204507, CPS204524, CPS204525, CPS204542, CPS204543, CPS204560, CPS204561, CPS204578, CPS204579, CPS204596, CPS204597, CPS204614, CPS204615, CPS204632, CPS204633, CPS204650, CPS204651, CPS204668, CPS204669, CPS204683, CPS204694, CPS204695, CPS204700, CPS204701, CPS204706, CPS204707, CPS204712, CPS204713, CPS204725, CPS204726, CPS204731, CPS204732, CPS241766

REVISION STATEMENT:
THIS REVISION UPDATES THE FOLLOWING SECTIONS OF THIS MATERIAL SAFETY DATA SHEET:
SECTION 1 (PRODUCT CODES). THIS MATERIAL SAFETY DATA SHEET HAS BEEN PREPARED USING THE PROSTEWARD MSDS SYSTEM.

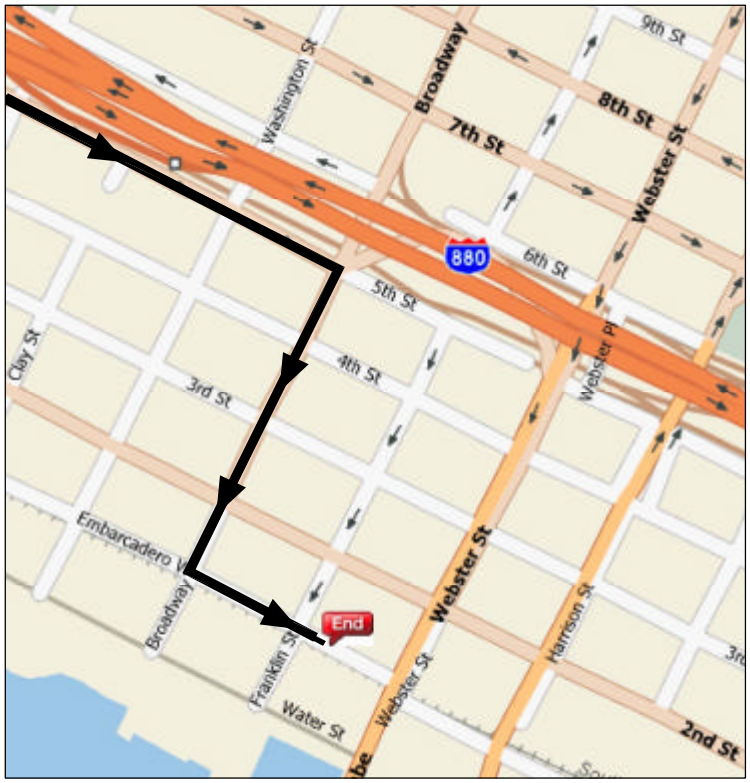
ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:
TLV - THRESHOLD LIMIT VALUE
TWA - TIME WEIGHTED AVERAGE
STEL - SHORT-TERM EXPOSURE LIMIT
PEL - PERMISSIBLE EXPOSURE LIMIT
CAS - CHEMICAL ABSTRACT SERVICE NUMBER
NDA - NO DATA AVAILABLE
NA - NOT APPLICABLE
/= - GREATER THAN OR EQUAL TO

PREPARED ACCORDING TO THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) AND THE ANSI MSDS STANDARD (Z400.1) BY THE CHEVRONTEXACO ENERGY RESEARCH & TECHNOLOGY COMPANY, 100 CHEVRON WAY, RICHMOND, CALIFORNIA 94802.

THE ABOVE INFORMATION IS BASED ON THE DATA OF WHICH WE ARE AWARE AND IS BELIEVED TO BE CORRECT AS OF THE DATE HEREOF. SINCE THIS INFORMATION MAY BE APPLIED UNDER CONDITIONS BEYOND OUR CONTROL AND WITH WHICH WE MAY BE UNFAMILIAR AND SINCE DATA MADE AVAILABLE SUBSEQUENT TO THE DATE HEREOF MAY SUGGEST MODIFICATIONS OF THE INFORMATION, WE DO NOT ASSUME ANY RESPONSIBILITY FOR THE RESULTS OF ITS USE. THIS INFORMATION IS FURNISHED UPON CONDITION THAT THE PERSON RECEIVING IT SHALL MAKE HIS OWN DETERMINATION OF THE SUITABILITY OF THE MATERIAL FOR HIS PARTICULAR PURPOSE.

Attachment 5
Route Maps to Medical Facilities

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
treasureiook.gif treasuretookesmall.gif	–	CONCORD	BJ	12-14-06	ME	2/26/07	LL	2/26/07	122412-A7



DIRECTIONS:

1. Start out going SOUTHEAST on AVENUE M toward 3RD ST. 0.1
2. Turn RIGHT onto CALIFORNIA AVENUE. 0.5
3. Turn LEFT onto AVENUE PALMS 0.2
4. Turn SLIGHT RIGHT onto TREASURE ISLAND RD. 0.4
5. TREASURE ISLAND RD becomes HILLCREST RD. 0.3
6. Stay STRAIGHT to go onto ramp. <0.1
7. Merge onto I-80 E. 2.6
8. Merge onto I-880S toward ALAMEDA/AIRPORT/SAN JOSE. 2.8
9. Take the exit toward BROADWAY/ALAMEDA. 0.3
10. Turn RIGHT onto 5TH ST. 0.1
11. Take the I-880 S ramp toward SAN JOSE. <0.1
12. Take the ramp toward BROADWAY / ALAMEDA. 0.2
13. Stay STRAIGHT to go onto 5TH ST. 0.5
14. Turn RIGHT onto BROADWAY. 0.2
15. Turn LEFT onto EMBARCADERO W. <0.1
16. End at CONCENTRA MEDICAL CENTER
    384 Embarcadero W, Oakland, CA.

CONCENTRA MEDICAL CENTER
384 Embarcadero W
OAKLAND, CALIFORNIA
(510) 465-9565

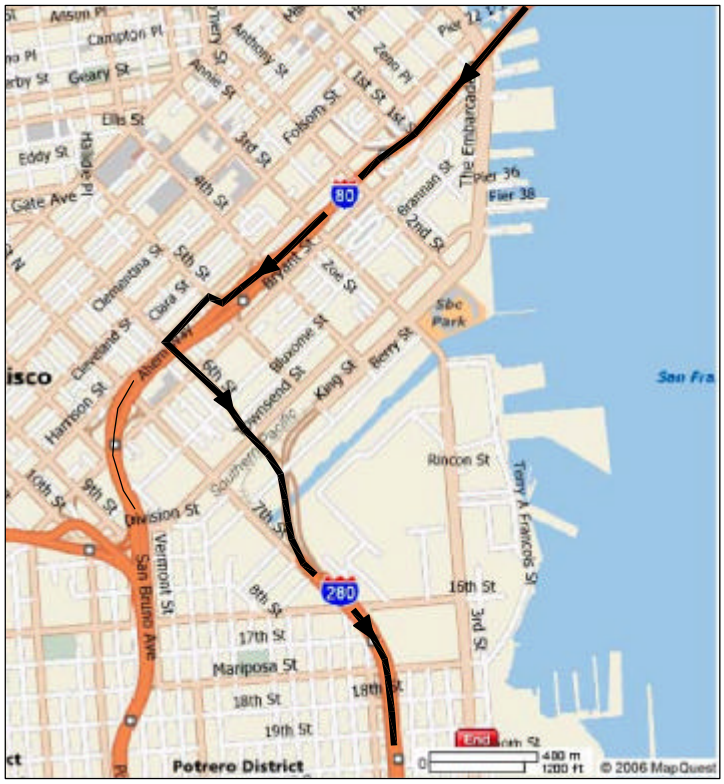
Shaw™ Shaw Environmental, Inc.

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

FIGURE 5A
ROUTE MAPS TO MEDICAL FACILITIES

TO CONCENTRA MEDICAL CENTER
OAKLAND, CALIFORNIA
TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

IMAGE	X-REF	OFFICE	DRAWN BY		CHECKED BY		APPROVED BY		DRAWING NUMBER
treasuretook.gif treasuretookemdl.gif	–	CONCORD	BJ	11-28-06	ME	2/26/07	LL	2/26/07	122412-A6



DIRECTIONS:

1. Start out going SOUTHEAST on AVENUE M toward 3RD ST. 0.1
2. Turn RIGHT onto CALIFORNIA AVENUE. 0.5
3. Turn LEFT onto AVENUE PALMS 0.2
4. Turn SLIGHT RIGHT onto TREASURE ISLAND RD. 0.4
5. Merge onto I-80 W via the ramp on the LEFT toward SAN FRANCISCO. 2.6
6. Take the 5TH ST exit on the LEFT toward US-101 N/GOLDEN GATE BRIDGE. 0.2
7. Turn LEFT onto HARRISON ST. 0.1
8. Turn LEFT onto 6TH ST. 0.2
9. Merge onto I-280 S. 0.8
10. Take the MARIPOSA ST. exit toward 18TH STREET. 0.1
11. Take the 18TH STREET ramp. <0.1
12. Turn RIGHT onto 18TH ST. <0.1
13. Turn LEFT onto PENNSYLVANIA AVE. 0.1
14. Turn LEFT onto 20TH ST.
15. End at CONCENTRA MEDICAL CENTER
    728 20th St., San Francisco, CA.

CONCENTRA MEDICAL CENTER
728 20th St.
SAN FRANCISCO, CALIFORNIA
(415) 648-9501

Shaw™ Shaw Environmental, Inc.

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

FIGURE 5B
ROUTE MAPS TO MEDICAL FACILITIES

TO CONCENTRA MEDICAL CENTER
SAN FRANCISCO, CALIFORNIA
TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

Google Maps

Start **Treasure Island**
End **350 Hawthorne Ave**
Oakland, CA 94609
Travel **7.7 mi – about 13 mins**

Notes Alta Bates Summit Med center
510.655.4000

Treasure Island

Drive: 7.7 mi – about 13 mins

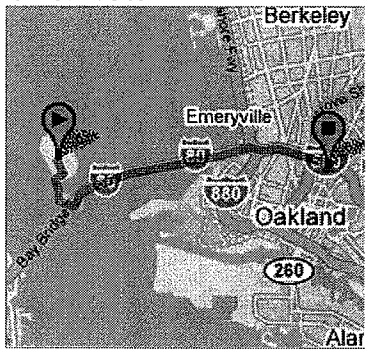
	1. Head **southeast** on **Ave D** toward **5th St**	0.3 mi 1 min
➡	2. Turn **right** at **California Ave**	0.2 mi 1 min
⬅	3. Turn **left** at **Ave Palms**	0.3 mi 1 min
	4. Continue on **Treasure Island Rd**	0.5 mi 1 min
➡	5. Slight **right** at **Hillcrest Rd**	0.4 mi 1 min
	6. Take the ramp onto **I-80 E**	3.4 mi 4 mins
	7. Take the exit onto **I-580 E** toward **Downtown Oakland/Hayward-Stockton/CA-24**	2.1 mi 2 mins
	8. Take the **Webster St** exit toward **Broadway N**	0.4 mi 1 min
⬅	9. Turn **left** at **Webster St**	0.1 mi
➡	10. Turn **right** at **Hawthorne Ave**	7 ft

350 Hawthorne Ave
Oakland, CA 94609

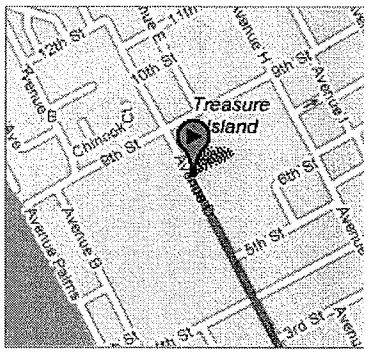
These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

Map data ©2007 NAVTEQ™

Overview



Start



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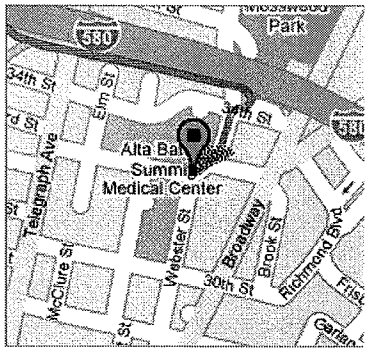


Map data ©2007 NAVTEQ™

Google Maps

Start **Treasure Island**
End **1001 Potrero Ave**
San Francisco, CA 94110
Travel **7.0 mi – about 12 mins, up to 25 mins in traffic**

Notes SF General Hospita
415.206.8000

Treasure Island

Drive: 7.0 mi – about 12 mins, up to 25 mins in traffic

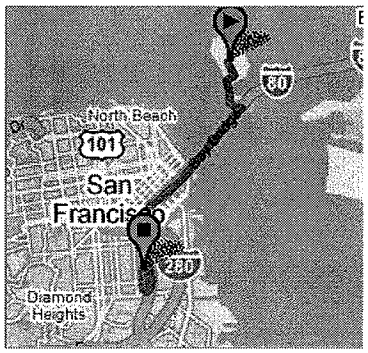
1.	Head **southeast** on **Ave D** toward **5th St**	0.3 mi 1 min
2.	Turn **right** at **California Ave**	0.2 mi 1 min
3.	Turn **left** at **Ave Palms**	0.3 mi 1 min
4.	Continue on **Treasure Island Rd**	0.4 mi 1 min
5.	Take the ramp to **San Francisco**	0.2 mi
6.	Merge onto **I-80 W**	3.7 mi 5 mins
7.	Continue on **US-101 S**	1.1 mi 1 min
8.	Take the **C Chavez St** exit	0.1 mi
9.	Keep **right** at the fork, follow signs for **Potrero Ave** and merge onto **Potrero Ave**	0.7 mi 2 mins

1001 Potrero Ave
San Francisco, CA 94110

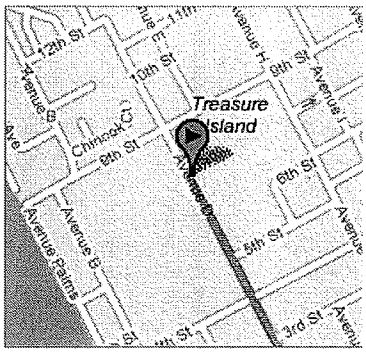
These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

Map data ©2007 NAVTEQ™, Sanborn

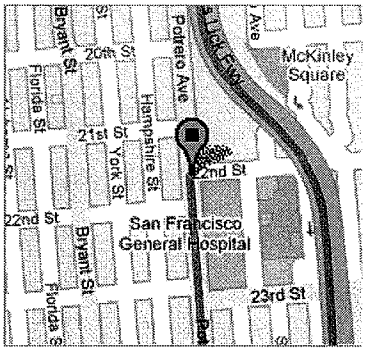
Overview



Start

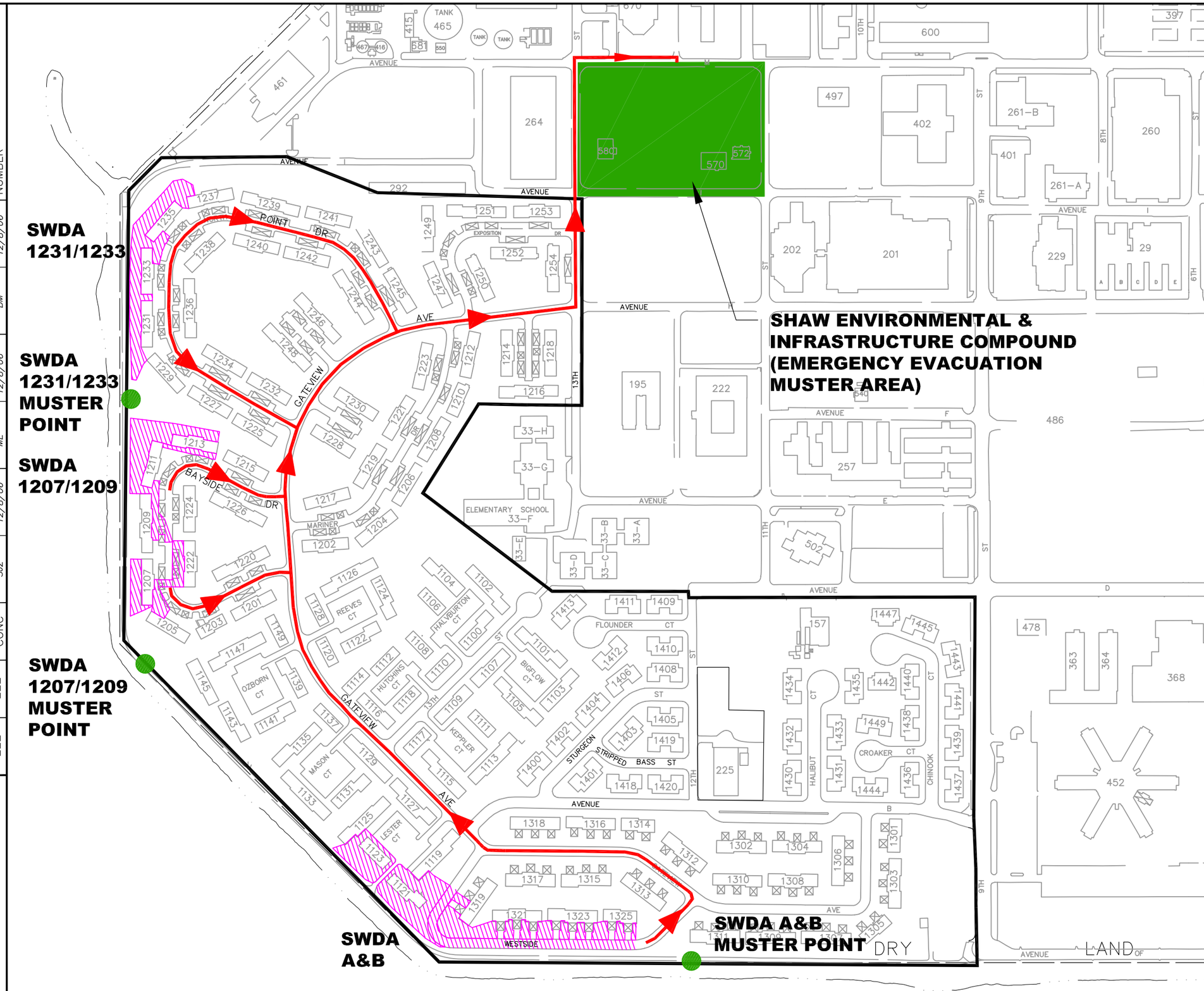


End



Map data ©2007 NAVTEQ™, Sanborn

Attachment 6
Muster Point Location and Exclusion Zone Evacuation Route Map



N

LEGEND

- EXCAVATION AREAS EXCLUSION ZONES
- SWDA MUSTER POINT LOCATION
- SITE 12 BOUNDARY
- EVACUATION ROUTE

SCALE

0 300 600 FEET

Shaw® Shaw Environmental, Inc.

DEPARTMENT OF THE NAVY
BRAC PMO WEST
SAN DIEGO, CALIFORNIA

ATTACHMENT 6
MUSTER POINT LOCATION AND EXCLUSION ZONE EVACUATION ROUTE MAP

NAVAL STATION TREASURE ISLAND

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
122412-B10	BM 12/8/06	ME 12/8/06	SJZ 12/8/06	CONC	---	---

Attachment 7
Incident Reporting and Investigation Procedures (HS020)

PROCEDURE

Subject: ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for incident reporting, investigation, and review. This procedure is an integral part of the company's overall accident prevention program and aids in the identification of potential causal factors and corrective actions necessary to prevent incident re-occurrence. Key elements of this procedure include:

- **All occupational injuries/illnesses, vehicle accidents, and near miss incidents must be promptly reported and investigated.**

- All Occupational Safety and Health Administration (OSHA) recordable injuries/illnesses and chargeable vehicle accidents must be reviewed by an Accident Review Board. The Accident Review Board report is submitted to the Corporate Safety Department, for safe keeping, on behalf of the Legal Department .

- All incidents involving a fatality, major injury/illness, or resulting in significant property damage will be immediately reported to: the business line Health & Safety Manager; the Corporate Health and Safety Department; the business line President and the Legal Department.

- All OSHA recordable injuries/illnesses, chargeable vehicle accidents, fatalities, major injury/illness, or incidents resulting in significant property damage are subject to being classified as A Confidential Attorney-Client / Attorney Work Product investigation status.

- All business line Health & Safety Managers are required to submit a Monthly Loss Report, by the 10th of the following month, summarizing all chargeable vehicle accidents and all injury/illness cases requiring outside medical care that took place during the previous reporting month to the Baton Rouge Corporate Safety Office.

2.0 TABLE OF CONTENTS

1.0 Purpose and Summary
2.0 Table of Contents
3.0 Responsibility Matrix
  3.1 Procedure Responsibility
  3.2 Action/Approval Responsibilities
4.0 Definitions
5.0 Text
  5.1 Incident Reporting Process
  5.2 Supervisor's Employee Injury Report

5.3 Vehicle Accident Report
5.4 Equipment, General Liability, Property Damage, and Loss Report
5.5 Incident Investigation Report
5.6 Witness Statement Form
5.7 Accident Review Board
5.8 Monthly Loss Report
6.0 Exception Provisions
7.0 Cross References
8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Corporate Health & Safety Department is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chargeable Vehicle Accident - Any **at-fault** vehicle accident meeting any **one** of the following criteria:

- An individual other than an employee of the company is a party in the accident
- Property owned by a person or entity other than the company is damaged
- When company owned, leased or rented vehicles are involved and damage exceeds $1,000.00.
- When an employee is driving a personal vehicle while on company business and damage exceeds $1,000.00.

Company - All affiliates, indirect and wholly owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Days Away From Work - Days away from work are the number of **calendar** days following the injury or illness, excluding the date of the injury.

Restricted Work – Occurs when, as the result of a work-related injury or illness:

- A physician or other licensed health care professional recommends that the employee not perform one or more of the routine functions of his or her job, or not work the full workday that he or she would otherwise have been scheduled to work

Note: Employers may stop counting days away from work and days of restricted work activity once the total of either or the combination of both reaches <u>180</u> days.

Near Miss Incident - Any incident where no injury occurred, but where the potential for injury existed.

OSHA Recordable Case – See Attachment 7

Vehicle - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. For the purpose of this procedure, off-road vehicles such as earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles.

5.0 TEXT

5.1 Incident Reporting Process

Employees are required to immediately report to their direct supervisor all occupational injuries, illnesses, accidents and near miss incidents having the potential for injury. Site Safety Officers / Managers or any supervisor (but preferably the supervisor directly responsible for the involved employees) with first-hand knowledge of an incident is required to:

- <u>Immediately</u> arrange for appropriate medical attention and notify the responsible health and safety representative.

- **<u>As soon as practical but not longer than one hour after occurrence</u>**, notify the Shaw Notification Hotline/Helpdesk by calling 1-866-299-3445 of any injury requiring off-site medical treatment, any chargeable vehicle accident or equipment incident involving property damage exceeding $1,000 in value (Shaw or third party).

- Inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made prior to transporting the employee such that they can coordinate physicians services prior to arrival of the employee to the clinic, and provide the following information:

  - Company Name (Shaw E&I) & Business Line (e.g. DOD, Commercial)
  - Employee Name
  - Name of treating medical facility and phone number
  - Brief description of incident.

  Health Resource's role is to interface with the treating physician to ensure that appropriate care is provided to the injured employee.

- Complete the *Authorization for Treatment, Release of Medical Information*, and *Return to Work* (Attachment 9A, 9B, 9C) and the *Supervisor's Employee Injury Report* (Attachment 2) for all cases requiring off-site medical attention. The Site Safety Officer / Manager or responsible supervisor shall ensure that the forms are completed and faxed to Health Resources at (800) 853-2641 prior to leaving the medical facility or as soon as reasonably possible.

- Post accident drug and alcohol testing shall occur in accordance with HS101 Drug and Alcohol Testing, immediately following an accident.

  NOTE: Prior to performing non-DOT post accident testing, it is the responsibility of the employee's supervisor to ensure that Health Resources has verified that this testing is not prohibited or restricted by state or local regulations.

- Prior to an injured employee returning to his/her job duties, a follow-up call by Health Resources will be made to the project site. The purpose of this call is to ensure work restrictions are clarified and planned work activities are consistent with medical recommendations.

- The Site Safety Officer and Supervisor shall initiate/complete the appropriate company documentation in accordance with the following incident classifications:

  - OSHA Recordable Cases
    a. Supervisor's Employee Injury/Illness Report (Attachment 2)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement Form (Attachment 6)
    d. Accident Review Board (Attachment 7)

  - First Aid Cases
    a. Supervisor's Employee Injury/Illness Report (Attachment 2)
    b. Incident Investigation Report (Attachment 5)

  - Chargeable Vehicle Accidents
    a. Vehicle Accident Report (Attachment 3)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement (Attachment 6)
    d. Accident Review Board (Attachment 7)
    e. Driving Record Certification (Procedure HS800)

  - Non-Chargeable Vehicle Accidents
    a. Vehicle Accident Report (Attachment 3)
    b. Incident Investigation Report (Attachment 5)
    c. Witness Statement (Attachment 6)

- Incidents Involving Equipment
  a. Incident Investigation Report (Attachment 5)
  b. Witness Statement Form (Attachment 6)
  c. Equipment, General Liability, Property Damage, and Loss Report (Attachment 5).

- Near Miss
  a. Incident Investigation Report (Attachment 5)

- Property Damage/General Liability
  a. Equipment, General Liability, Property Damage, and Loss Report (Attachment 4).
  b. Witness Statement (Attachment 6)

5.2 Supervisor's Employee Injury/Illness Report (Attachment 2)

The Supervisor's Employee Injury Report is to be completed for all incidents that result in an employee occupational injury or illness requiring off-site medical attention. It is to be initiated by the supervisor of the injured employee and forwarded to the respective Business Line Safety Manager for comments. Upon completion of review and comments the report should be forwarded to the Shaw Corporate Claims department in Baton Rouge.

5.3 Vehicle Accident Report (Attachment 3)

The Vehicle Accident Report must be completed for any vehicle accident in which a company vehicle is involved. This includes company-owned or leased vehicles, rental vehicles, and personal vehicles being used for company business. This report is to be initiated by both the employee involved in the accident and his/her direct supervisor and forwarded to the respective Business Line Safety Manager for comments. Upon completion of review and comments the report should be forwarded to the Shaw Corporate Claims department in Baton Rouge.

5.4 Equipment, General Liability, Property Damage, and Loss Report (Attachment 4)

The General Liability, Property Damage, and Loss Report is to be used for all losses or damage to company property in excess of $1,000.00. This form must be completed for all third party property, regardless of value, damaged as a result of company activities. The employee most familiar with the events that contributed to the loss or damage will complete the form, then forward it to the project/location manager. The Corporate Claims Department must receive a copy of the report within one business day of the incident.

5.5 Incident Investigation Report (Attachment 5)

All injuries, illnesses, accidents, and near miss incidents will be investigated. Once arrangements for immediate medical care have been made, the employee's direct supervisor, with assistance from the health and safety representative and Business Line Health and Safety Manager, will:

- Collect the facts;
- Describe and document (include sketch, photos, etc.) how the incident occurred;
- List witnesses and collect written statements;

  If applicable, contact the employee's Functional Manager in an effort to gain relative information
- Identify the causative factors;
- Identify potentially unsafe acts or unsafe conditions that may have contributed to the incident;
- Identify potential systematic deficiencies; and
- List the corrective actions which are to be taken to prevent re-occurrence of the incident, the person responsible for the corrective action, and the date by which action is to be completed.

The investigation will be started as soon as possible after the incident and a written report submitted to the appropriate health and safety representative within 72 hours. In addition to the previous information, reports from external sources (police, insurance carriers, testing laboratories, etc.) are to be obtained as soon as they become available and forwarded to the Business Line Safety Manager.

5.6 Witness Statement Form (Attachment 6)

The witness statement form was created to allow for consistency in the development of the investigation process. If there are witnesses to the accident/incident, this form should be completed and signed by the subject witness and attached to the incident investigation report. It is essential that the witness statement be executed immediately following the incident to ensure an accurate account of the events.

5.7 Accident Review Board (ARB) (Attachment 7)

As a directive of the Corporate Legal Department, each of the respective Business Line Health and Safety Managers whose project/location experiences an OSHA recordable or a chargeable vehicle accident is required to convene an ARB within **10 days** of the accident. The purpose of the Accident Review Board is to review the information, gathered for each incident, and take appropriate action to prevent its recurrence. The Accident Review Board shall be composed of the project/location manager, the employee's direct supervisor, a health and safety representative, and the employee(s) involved in the incident.

Additionally, there may be cases that involve an employee that has been assigned to a project and the Functional Manager of that employee may not have direct knowledge of an incident. In cases such as these, the Functional Manager shall be notified of the incident and requested to participate in the ARB. Also, as determined by the Business

Line Health and Safety Manager, a representative of other internal sources of expertise should be involved where applicable.

All OSHA recordable injuries/illnesses, chargeable vehicle accidents, fatalities, major injury/illness, or incidents resulting in significant property damage are subject to being classified under a Confidential Attorney-Client / Attorney Work Product investigation status. The determination as to whether the ARB is classified as a Confidential Attorney-Client / Attorney Work Product investigation status must be executed as soon as possible and always prior to initiation of the ARB process. If the determination is made to initiate the ARB under a Confidential Attorney-Client / Attorney Work Product status, all documents concerning the investigation process, including the ARB, will be submitted to the Corporate Safety Department, for purposes of confidentiality and safe keeping, on behalf of the Legal Department, in anticipation of litigation.

Unless the investigation is considered as a Confidential Attorney-Client / Attorney Work Product investigation, the ARB report shall be completed as soon as practicable and forwarded to the Corporate Safety Department, via the Corporate Claims fax number. Upon completing review of the draft ARB, the Business Line Safety Manager will be notified and the ARB shall be completed by the Business Line Safety Manager and signed by all members of the ARB.

It is generally not acceptable to discipline an employee for having an accident. However, if the Accident Review Board determines that the accident resulted from an intentional unsafe act or violation of company procedure on the employee's part, the employee may be subject to disciplinary action in accordance with the company's progressive disciplinary action system (see Human Resources Procedure HR207).

5.7 Monthly Loss Report

Each business line Health and Safety Manager is responsible to submit a Monthly Loss Report summarizing incidents that took place within their business line during the previous month. The business line Health and Safety Manager is responsible for submitting a consolidated package for the entire business line to the corporate health and safety office for **receipt no later than the 10th working day of the following month**.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HR207 Disciplinary Action
HS013 Health and Safety Procedure Variances
HS101 Drug and Alcohol Testing
HS800 Motor Vehicle Operations - General Requirements
HS810 Commercial Motor Vehicles

8.0 ATTACHMENTS

1. Responsibility Matrix

2. Supervisor's Employee Injury/Illness Report
3. Vehicle Accident Report
4. Equipment, General Liability, Property Damage, and Loss Report
5. Incident Investigation Report
6. Witness Statement
7. Accident Review Board Report
8. Injury/Illness Classification Guidelines
9. Medical Forms
    a. Authorization for Treatment of Occupational Injury/Illness
    b. Authorization for Release of Medical Information
    c. Return to Work Examination Form.

ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW RESPONSIBILITY MATRIX

Action	Procedure Section	*Responsible Party*					
		Employee	Supervisor	Project/ Location Manager	Health and Safety Officer	Business Line Health and Safety Manager	Corporate Health & Safety Manager
Issue, Revise, and Maintain Procedure	3.1						X
Report All Incidents to Supervisor	5.1	X					
Notify Health and Safety Representative	5.1		X				
Arrange Medical Care	5.1		X		X		
Notify Health Resources or Gates McDonald of Incident	5.1		X		X		
Initiate/Complete Company Forms	5.1		X				
Complete Investigation of Incident	5.5		X	X	X		
Conduct Accident Review Board	5.6		X	X	X		
Complete Monthly Loss Report	5.8					X	

Attachment 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO **225-932-2636**.
Phone all injuries/ illnesses to Shaw Notification Hotline/Helpdesk
1-866-299-3445

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION

Employee's Social Security Number:		Claim Number:	
Employee's Name:		Home Phone Number:	
Home Address:			Business Line Code:
Male Female	Date of Birth:	Hire Date:	
Dependents:	Dependents Under 18:	Marital Status:	
Occupation:		Department Name:	
State Hired:	Currently Weekly Wage:	Hourly Wage:	
Hours/Days Worked Per Week:	Days Per Week	Hours Worked Per Day:	
Employment Status:	Employee Report No.: N/A		Employee ID No.: N/A
Salaried Continued:	Paid For Date of Injury:		Education No. of Years:
Ever Injured on the Job:	Supervisor Name & Phone:		

EMPLOYER INFORMATION

Employer Name:	**The Shaw Group, Inc.**		
Work Location:			
Contact Name:	**John Mollere**	Telephone Number:	**(800)747-3322, Ext. 572**
Employer SIC:		Employer Location Code:	
Employer FED ID:		Employer Code:	N/A
Nature of Business:			
Policy Number:			

ACCIDENT INFORMATION

Date and Time of Injury:			
Did the Accident Occur at the Work Location:		If no, where did the accident occur?	N/A
Accident Address:			
Nature of Accident:			

Give a Full Description of the Accident: (Be as Factually Complete As Possible)

Are Other WC Claims Involved?	No	Date and Time Reported to Employer:	
Person Reported To:			

WITNESS INFORMATION

Were There Any Witnesses?

If Yes, List Names and How to Contact Them:

INJURY INFORMATION

Which Part of the Body Was Injured? (e.g. Head, Neck, Arm Leg)

What Was the Nature of Injury? (e.g. Fracture, Sprain, Laceration)

Part of Body Location: (e.g. Left, Right, Upper, Lower)

Injury Description:

Source of Injury: | Is Employee Hospitalized?

Lost Time: If Yes, What was First Full Day Out:

Date Last Day Worked: | Date Disability Began: N/A

Date Returned to Work: | Estimated Return Date: N/A

MEDICAL INFORMATION

ER Treated & Released: | Hospitalized: | Phy./Clinic:

Hospital - Name, Address, Phone Number: | Was Employee Transported via Ambulance: Yes No

N/A

Clinic - Name, Address, Phone Number:

ADDITIONAL COMMENTS & INFORMATION

REPORT PREPARED BY

Name: | Title:

Signature: | Phone:

ATTACHMENT 3
VEHICLE ACCIDENT REPORT
Page 1 of 2

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.

LOCATION OF ACCIDENT (CITY, STATE) _____

DESCRIPTION OF ACCIDENT _____

_____

_____

WITNESS _____ PHONE NO. _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

POLICE OFFICER'S NAME AND BADGE #_____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____

ADDRESS _____ _____ CITY _____ STATE _____ ZIP _____

WORK PHONE NO. _(_____)_____ S.S. NO. _____ PROJECT NAME/NO. _____

VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____

STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE

VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL

IF NOT COMPANY-OWNED: OWNER _____ PHONE NO _(____)_____

ADDRESS _____ _____ CITY _____ STATE _____ ZIP _____

VEHICLE DAMAGE _____

NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____

WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____

_____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

PHONE NO. _(_____)_____ S.S. NO. _____

OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

INSURANCE COMPANY _____ POLICY NO. _____

AGENT'S NAME _____ PHONE NO. _(_____)_____

ADDRESS _____ CITY _____ STATE _____ ZIP _____

VEHICLE YEAR _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____

VEHICLE I.D. NO. _____

VEHICLE DAMAGE _____

PASSENGERS: ☐ NO ☐ YES INJURIES: ☐ NO ☐ YES (If Yes, list names and telephone numbers below)

_____

_____

_____

VEHICLE ACCIDENT REPORT

WEATHER: ☐ Clear ☐ Cloudy ☐ Fog ☐ Rain ☐ Sleet ☐ Snow Other _____

PAVEMENT: ☐ Asphalt ☐ Steel ☐ Concrete ☐ Wood ☐ Gravel/Dirt ☐ Brick/Stone Other _____

CONDITION: ☐ Dry ☐ Wet ☐ Icy ☐ Pot Holes Other _____

TRAFFIC CONTROL: ☐ Traffic Light ☐ Stop Sign ☐ Railroad ☐ No Intersection ☐ No Control

ROADWAY: Number of Lanes Each Direction: _____ ☐ Residential ☐ Divided Highway ☐ Undivided Highway

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

Your Vehicle ①

Other Vehicle(s) ② ③

Pedestrian

Stop Sign

Yield

Railroad

ADDITIONAL INFORMATION: _____

EMPLOYEE _____ (Print) _____ (Signature) _____ (Date)

SUPERVISOR _____ (Print) _____ (Signature) _____ (Date)

HEALTH & SAFETY REP. _____ (Print) _____ (Signature) _____ (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY
REPORT ALL VEHICLE ACCIDENTS TO SHAW NOTIFICATION HOTLINE/HELPDESK
(PHONE: 1-866-299-3445)

ATTACHMENT 4

EQUIPMENT, GENERAL LIABILITY, PROPERTY DAMAGE, AND LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of $1,000.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION _____ PROJECT NO. _____ DATE _____

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

_____

_____

DESCRIPTION AND VALUE ($) OF DAMAGED/LOST/STOLEN PROPERTY: _____

_____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

_____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. ( ) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. ( ) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Home Phone ( ) _____
   Home Address _____ City _____
   Employer and Address _____
2. Name _____ Home Phone ( ) _____
   Home Address _____ City _____
   Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ _____ _____
(Print) (Signature) (Date)

PROJECT/LOCATION MANAGER: : _____ _____ _____
(Print) (Signature) (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY

ATTACHMENT 5
INCIDENT INVESTIGATION REPORT

*** MUST BE COMPLETED WITHIN 72 HOURS ***

Investigation Date _____ Date of Incident _____

Employee Name _____

Supervisor Name _____

Project Number/Name _____ / _____

Location of Incident _____

- Incident Classification

Injury	☐ First Aid	Vehicle	☐ Chargeable	DOT	☐ DOT Vehicle
	☐ OSHA Recordable		☐ Non-chargeable		☐ DOT Reportable
	☐ Lost Workday				
	☐ Restricted Workday	Near Miss	☐	General Liability	☐

- Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

_____

_____

- Analysis (What unsafe acts or conditions contributed to the incident?)

_____

_____

_____

_____

- Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

_____

_____

_____

- Witness Names (Complete Attachment 6 – Employee Witness Statement)

_____

_____

_____

_____

Investigated By _____ _____ _____
Print Name Signature Date

Project/Location Mgr. _____ _____ _____
Print Name Signature Date

(Attach Additional Pages if Needed)

ATTACHMENT 6
Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Ends _____ am pm

Witness Information:

Name _____

Home Phone No. _____

Home Address _____

County _____ Zip _____

Witness' Supervisor Name _____

If not employed by Shaw E&I, enter name of company _____

Company Phone Number _____

Did You See the Incident/Accident? _____

How Far From You (approx., in feet) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

_____

_____

_____

_____

_____

_____

_____

_____

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

_____ _____

Witness Signature/Date Print Name

ATTACHMENT 7

ACCIDENT REVIEW BOARD

DATE:	LOCATION:
BOARD MEMBERS:	
ACCIDENT DATE:	EMPLOYEE(S) INVOLVED IN INCIDENT:
INVESTIGATION COMPLETE: YES ☐ NO ☐	ACCIDENT CLASSIFICATION:

THE FOLLOWING INFORMATION MUST BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT):

SUPERVISOR: _____ **PROJECT/LOCATION MGR.:** _____

POTENTIAL CAUSE OF ACCIDENT:

ACTION BY BOARD*:

* ALL ACTIONS BY THE ACCIDENT REVIEW BOARD ARE SUBJECT TO FINAL REVIEW BY THE HUMAN RESOURCES AND LEGAL DEPARTMENTS.

ACCEPTED: _____ (Employee Signature)	_____ (Supervisor Signature)
APPROVED: _____ (Project/Location Manager)	REJECTED FOR: _____
APPROVED: _____ (Business Line Health and Safety Manager or Designee)	REJECTED FOR: _____
APPROVED: _____ (Business Line Vice President)	REJECTED FOR: _____

The determination as to whether the ARB is classified as being considered as a Confidential Attorney-Client / Attorney Work Product investigation must be executed as soon as possible and always prior to initiation of the ARB process.

ATTACHMENT 8

INJURY/ILLNESS CLASSIFICATION GUIDELINES

First Aid Treatment – If the incident requires only the following types of treatment, consider it first aid. **Do Not** record the case if it involves only:

- Using non-prescription medications at non-prescription strength
- Administering tetanus immunizations
- Cleaning, flushing, or soaking wounds on the skin surface
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages
- Using hot or cold therapy
- Using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.
- Using temporary immobilization devices while transporting an accident victim (slings, neck collars, or back boards)
- Drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters
- Using eye patches
- Using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye
- Using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye
- Using finger guards
- Using massages
- Drinking fluids to relieve heat stress

Medical Treatment – Includes managing and caring for a patient for the purpose of combating disease or disorder. The following are **not** considered medical treatments and are not recordable:

- Visits to a doctor or licensed health care professional (LHCP) solely for the purpose of observation or counseling
- Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes
- Any procedure that can be labeled first aid (see above descriptions)

Loss of Consciousness - If an employee loses consciousness as the result of a work-related injury/illness, the case must be recorded no matter what type of treatment was provided. The rationale behind this recording requirement is that loss of consciousness is generally associated with more serious injuries.

Restriction of Work or Motion - Restricted work activity occurs when the employee, when as the result of a job-related injury or illness, an employer or LHCP keeps, or recommends keeping, an employee from doing the routine functions of his or her job or from working the full workday that the employee would have been scheduled to work before the injury or illness occurred.

Transfer to Another Job - Injuries requiring transfer of the employee to another job are also considered serious enough to be recordable regardless of the type of treatment provided. Transfers are seldom the sole criterion for recordability because injury cases are almost always recordable on other grounds, primarily medical treatment or restriction of work or motion.

ATTACHMENT 9
MEDICAL FORMS

AUTHORIZATION FOR TREATMENT OF OCCUPATIONAL INJURY/ILLNESS

Employee Name: _____
Social Security #: _____ Injury: ☐ Illness: ☐
Job Title: _____ Incident Date: _____
Project/Location _____ Location of Accident/Exposure:
Telephone #: _____ _____
H&S Representative: _____
Body Part(s) Injured: _____
Describe in detail how incident occurred: _____
_____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work:
It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **Health Resources** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work:
It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **Health Resources** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

Health Resources: Telephone: 1-800-350-4511 Fax: (800) 853-2641

Please Send Reports To Both of the Following: **Health Resources** 600 West Cummings Park, Suite 3400 Woburn, Massachusetts 01801 ***AND*** **The Shaw Group, Inc. Corporate Claims Department** 4171 Essen Lane Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

DOCTOR, Please provide:
Medical Diagnosis: _____
Treatment Provided: _____
_____
Recommended Work Limitation/Restriction: _____
Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐
Physician Name: _____ Physician Telephone: _____
Physician Signature: _____ Date: _____

YOU MUST CALL HEALTH RESOURCES FOR ALL OCCUPATIONAL INJURIES/ILLNESSES REQUIRING OUTSIDE MEDICAL TREATMENT: 1-800-350-4511.
FAX COMPLETED FORM TO HEALTH RESOURCES (800) 853-2641.

ATTACHMENT 9B
MEDICAL FORMS

AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION

Patient Identification

Printed Name: _____ **Date of Birth:** _____

Address: _____

_____

Social Security #:_____ Home Telephone:_____

Authority to Release Protected Health Information

I hereby authorize the release of information, identified in this authorization form, from the medical records associated with my occupational injury / illness and provide such information to:

HEALTH RESOURCES
600 West Cummings Park, Suite 3400
Woburn, Massachusetts 01801
Phone: (800) 350-4511
Fax: (800) 853-2641

AND

The Shaw Group Inc.
4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The Information To Be Released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other, (specify)_____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my Protected Health Information as a result of an occupational injury or illness.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to previous drug and/or alcohol abuse, psychiatric care, sexually transmitted disease, hepatitis B or C testing, and/or other sensitive information, I agree to its release. ***Check One:*** ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. ***Check One:*** ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to ***The Corporate Claims Dept.*** **at** ***The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana 70809***. Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization, and my treatment or payment for services will not be denied if I do not sign this form. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge** ***The Shaw Group Inc*** **of any liability and the undersigned will hold** ***The Shaw Group Inc*** **harmless for complying with this Authorization.**

Signature: _____ Date: _____

Description of relationship if not patient:

_____

ATTACHMENT 9C
MEDICAL FORMS

RETURN-TO-WORK EXAMINATION FORM

Exam Date: _____ / _____ / _____ **Employee Name:** _____

Birth Date: _____ / _____ / _____ **Social Security #:** _____ - _____ - _____

Job Title: _____ **Sex:** ❑ Male ❑ Female

Examining Provider: **Please complete this form and fax to Health Resources at (800) 853-2041. Please contact Health Resources at (800) 350-4511 to report status of employee post-treatment.**

DIAGNOSIS: _____

TREATMENT PLAN: _____

MEDICATIONS: _____

PHYSICAL THERAPY: _____

OTHER: _____

❑ May return to full duty work effective ____/____/

❑ May return to limited duty from ____/____/____ to ____/____/

❑ Unable to return to work from ____/____/____ to ____/____/

WORK LIMITATIONS:

❑ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to ≤ 60 lbs).

❑ Work only with right/left hand.

❑ Restricted repetitive motion right/left hand.

❑ Sitting job only.

❑ Restricted operation of moving equipment.

❑ Other: _____

FOLLOW-UP PLAN:

❑ Release from care.

❑ Schedule for follow-up appointment on ____/____/____.
Time _____ AM/PM

❑ Referral to _____
Appointment date ____/____/____ Time _____ AM/PM

Comments: _____

_____	_____	_____
Examiner's Name (*print*)	Examiner's Signature	Date

Attachment 8
Heat Stress Procedures (HS400)

PROCEDURE

Subject: HEAT STRESS

1.0 PURPOSE AND SUMMARY

This procedure establishes guidelines to protect employees from the effects of heat related illness. It describes the five major types of heat-induced illnesses, methods of prevention and treatment, and prescribes heat stress monitoring methods.

If clients have requirements that differ from those contained in this procedure, the more protective requirements will be followed.

2.0 TABLE OF CONTENTS

1.0 Purpose and Summary
2.0 Table of Contents
3.0 Responsibility Matrix
- 3.1 Procedure Responsibility
- 3.2 Action/Approval Responsibilities

4.0 Definitions
5.0 Text
- 5.1 Signs, Symptoms, and Treatment
  - 5.1.1 Heat Rash
  - 5.1.2 Heat Cramps
  - 5.1.3 Heat Syncope
  - 5.1.4 Heat Exhaustion
  - 5.1.5 Heat Stroke
  - 5.1.6 Emergency Planning
- 5.2 Prevention
  - 5.2.1 Hydration
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  - 5.2.3 Acclimatization
  - 5.2.4 Access to Shade
  - 5.2.5 Cooling Devices
- 5.3 Monitoring
  - 5.3.1 Environmental Monitoring
  - 5.3.2 Physiological Monitoring
- 5.4 Training

6.0 Exception Provisions
7.0 Cross References
8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Acclimatization - Temporary adaptation of the body to work in the heat that occurs gradually when a person is exposed to it. Acclimatization peaks in most people within four to fourteen days of regular work for at least two hours per day in the heat.

Heat Stress – The net heat load to which a worker may be exposed from the combined contributions of metabolic cost of work, clothing requirements, and environmental factors such as air temperature, humidity, air movement, and radiant heat exchange. Mild or moderate heat stress can cause discomfort and adversely affect performance and safety but is not harmful to health. As the heat stress approaches human tolerance limits, the risk of heat illness increases.

Shade – Blockage from direct sunlight. Canopies, umbrellas and other temporary structures or devices may be used to provide shade. One indication that blockage is sufficient is when objects do not cast a shadow in the area of blocked sunlight. Shade is not adequate when heat in the area of shade defeats the purpose of the shade, which is to allow the body to cool.

5.0 TEXT

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in deleterious health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, increased accident probability, to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling thereby placing employees at considerably higher risk of developing heat stress.

Heat stress is caused by a number of interacting environmental and personal risk factors. Environmental risk factors include air temperature, relative humidity, radiant heat from the sun and other sources, conductive heat sources such as the ground, air movement, workload severity and duration, and personal protective equipment and clothing. Personal risk factors include age, degree of acclimatization, overall health, water consumption, alcohol consumption, caffeine consumption and use of prescription or over-the-counter drugs that affect the body's water retention or other physiological responses to heat. Because heat stress is a common and potentially serious occupational illness, regular monitoring and other preventive precautions are vital.

5.1 Signs, Symptoms, and Treatment

Employees must immediately report to the site supervisor or to the site safety officer any symptoms or signs of heat illness experienced by themselves or observed in co-workers. Regardless of the worker's protests, no employees with any symptoms of possible serious heat illness should be sent home or left unattended without medical assessment and authorization.

5.1.1 Heat Rash

Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing.

Signs and Symptoms: The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced.

Treatment: Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.

5.1.2 Heat Cramps

Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (abdominal and quadriceps) of blood which can cause painful muscle spasms and pain.

Signs and Symptoms: Muscle spasms and pain in the extremities and abdomen.

Treatment: Remove employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or stroke.

5.1.3 Heat syncope (fainting)

Heat syncope is a loss of consciousness because of low blood pressure. Heat causes the blood vessels to expand (dilate), so body fluid moves into the legs by gravity, which causes low blood pressure and may result in fainting. Heat syncope can be caused by blood pooling in the legs after standing still for a long time in a hot environment. It can also be caused after vigorous physical activity for two or more hours. The risk of heat syncope is higher among those who are not acclimated and to those who are dehydrated.

Signs and Symptoms: Feeling faint or lightheaded; pale, cool, and moist skin; lightheadedness when changing position, such as moving from a lying position to a standing position.

Treatment: Place the worker in a seated or supine position with legs raised. Give sips of water or electrolytic solution and move the patient to a cooler area. Recovery is usually rapid.

5.1.4 Heat Exhaustion

Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within one hour.

Signs and Symptoms: Weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue.

Treatment: Remove employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continually. Do not allow the affected person to become chilled; treat for shock if necessary.

5.1.5 Heat Stroke

Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. **THIS IS A MEDICAL EMERGENCY!**

Signs and Symptoms: Red, hot, dry skin (skin may be wet from previous perspiration particularly when evaporation-preventing clothing is worn); body temperature of 105° degrees Fahrenheit (F) or higher; no perspiration; nausea; dizziness; confusion and incoherence; strong, rapid pulse.

Treatment: Heat stroke is a true medical emergency. **Call 911 immediately**. Transportation of the victim to a medical facility must not be delayed. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102° F). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.

5.1.6 Emergency Planning

The site specific health and safety plan and/or job safety analysis must specify the site specific procedures for how emergency medical services will be provided, how to contact emergency medical services, and how emergency responders will be directed to the work site.

5.2 Prevention

The prevention of heat-related illnesses requires adequate hydration, nutrition, acclimatization, access to shade if heat stress symptoms appear, monitoring and in some cases the use of cooling devices.

5.2.1 Hydration

During periods of high heat, adequate liquids must be provided to replace lost body fluids. Most people do not become aware of thirst until they have lost 1 to 2 liters of body water. Highly motivated workers may incur losses of 3 to 4 liters before extreme thirst forces them to stop and drink. Therefore, workers must drink more than the amount required to satisfy thirst. Prehydration, the consuming of a large drink of water immediately before the start of heat exposure, is highly recommended.

In California, workers potentially exposed to heat stress in outdoor work sites are required have ready and easy access to potable water or liquid sufficient to provide one quart per employee per hour (Title 8, California Code of Regulations, Section 3395, Heat Stress Prevention). Replacement fluids can be a 0.1% (percent) salt water solution, commercial "sports drinks" or "thirst quenchers", or a combination of these with fresh water. However, drinks that are popular because they "cut" thirst are not recommended, because they inhibit intake before rehydration is complete. For this reason it is better to drink water or dilute flavored beverages and to avoid carbonation, caffeine and drinks with heavy concentrations of sugar or salt.

The replacement fluid temperature should be kept cool, 50°F to 60°F, and must be located within a few steps of each worker or brought to the worker every hour or more frequently under the most stressful conditions.

Alcohol is a common and serious problem among those who work in heat. Alcohol not only impairs intake of food and water, but also acts as a diuretic (increase in urination) and disturbs judgment. The adverse effects of alcohol extend many hours beyond the time of intake. Alcoholics who suffer heat stroke have a far higher mortality rate than non-alcoholic patients.

5.2.2. Nutrition

It is important to eat well-balanced meals and to avoid candy bars or snack foods, which lack important nutritional components. High sweat rates involve a continuous loss of sodium chloride and small amounts of potassium, which must be replaced on a daily basis. In addition, work in heat accelerates the turnover of trace elements including magnesium and zinc. All of these essential elements should normally be obtained from wholesome food.

Do not consume salt tablets, as they are easily abused, and overdoses lead to gastro-intestinal problems, increased urine output and greater susceptibility to heat illness.

5.2.3 Acclimatization

Acclimatization can greatly expand human tolerance to heat, so that work becomes easier after a period of gradual adjustment. Individuals with a high level of physical fitness generally display partial heat acclimatization and are able to complete the process more quickly and with less stress than sedentary persons. Season may also affect the time which must be allowed for acclimatization. Workers recruited in summer may already be partly heat acclimatized, while winter hires will require a longer period of adjustment.

Acclimatization for heavy work under extremely hot conditions may require a period of 4 to10 days of progressively increasing work time starting with about 2 hours work per day. For less severe conditions, the first 2 to 3 days of work in the heat should be limited to 2 to 4 hours. Employees undergoing acclimatization need to be monitored closely for signs and symptoms of heat illness.

Maintenance of full heat acclimatization requires exposure to work in heat three to four times per week; lower frequency or passive exposure to heat have a much weaker effect and may allow gradual decay of heat tolerance. However, weekends off work have no measurable effect on acclimatization. Discontinuing exposure for 2 to 3 weeks will cause loss of most acclimatization, although some will be retained in persons exposed to hot weather and/or regular aerobic exercise.

5.2.4 Access to Shade

Employees suffering from heat illness or believing a recovery period is needed will be provided access to an area with shade that is either open to the air or provided with ventilation for cooling for a period of no less than 5 minutes. Access to shade will be permitted at all times. **Employees will remove chemical protective garments during rest periods and will not be assigned other tasks during rest periods.**

5.2.5 Cooling devices

Vortex tubes or cooling vests may be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

5.3 Monitoring

Susceptibility to heat stress depends on numerous factors including ambient temperature, humidity, radiant heat, air movement, personal protective equipment, the degree of acclimatization, and physical condition of the individual workers. Therefore, the decision to start either environmental or physiological heat stress monitoring must be based the experience and observations of the site safety officer and on the professional judgment of the HS manager and in consideration of the guidelines summarized below. **However, on all job sites having potential heat stress conditions, the monitoring of site workers by watching for the signs and symptoms of heat stress (see section 5.1 above) must be ongoing by supervisors, site safety officers, and the workers themselves.**

5.3.1 Environmental Monitoring (American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs), most recent edition.)

The Wet Bulb Globe Temperature (WBGT) index is the simplest and most suitable technique to evaluate the environmental heat stress factors. If employees are performing moderate to heavy physical work on construction/remediation sites in standard permeable cotton or synthetic work clothing, heat stress monitoring is advisable when the ambient air temperature exceeds 90°F and any time discomfort due to heat stress is either noticed or reported. Either the WBGT index or physiological monitoring may be used. When WBGT exceeds 25.9°C (78°F), the work regiment in Table 2 of the ACGIH TLV/BEI booklet should be followed. **Note: WBGT measurements are not designed for and should not be used to assess heat stress involving the use of semi permeable or impermeable protective clothing**.

5.3.2 Physiological Monitoring (NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, 1985)

The advantage of physiological monitoring is that it determines each individual's unique response to environmental heat stress factors. If employees are wearing impermeable protective clothing physiological monitoring is advisable beginning at 70°F and/or any time discomfort due to heat stress is either noticed or reported.

Physiological monitoring may be performed by the site safety officer. Alternatively, it may be self-performed if the affected employees have been trained to do so. The two parameters that are to be monitored at the beginning of each rest period are:

- Heart Rate - Radial (wrist) pulse will be determined as early as possible during each rest period. Monitoring consists of taking the radial pulse of a worker for 30 seconds immediately after exiting the work area. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by 1/3 and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, increase the following rest period by 1/3. The initial rest period should be at least 5 minutes.

- Body Temperature - Each individual will measure his/her oral temperature with a disposable thermometer for one minute or with an electronic aural device as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third with the rest period remaining the same. Return to work is not permitted if body temperature exceeds 100.4°F. Remove impermeable garments from the affected worker when body temperature exceeds 100.6°F. Note: Some aural temperature devices, which are also

known as ear canal or tympanic devices, will not work accurately in high intensity ambient light.

Attachment 2 will be used to record the results of heat stress monitoring.

5.4 Training

Employees potentially exposed to heat stress conditions will be trained on the contents of this procedure. This training may be conducted during daily tailgate safety meetings. Training topics and attendance must be documented.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS045 Job Safety Analysis
HS051 Tailgate Safety Meetings
HS052 Health and Safety Plans

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Heat Stress Monitoring Record

ATTACHMENT 1
HEAT STRESS

Responsibility Matrix

Action	Procedure Section	*Responsible Party*			
		Director of Health and Safety	**Project Supervisor**	**Site Safety Officer**	**All Site Workers**
Issuance, Revision, and Maintenance of Procedure	3.1	X			
Immediately report symptoms or signs of heat illness in themselves or others to the site supervisor or safety officer	5.0				X
Conduct Monitoring	5.3			X	
Inform Employees About Procedure	5.4		X	X	

ATTACHMENT 2
HEAT STRESS MONITORING RECORD

Project/Location _____ Date _____

Employee Name	Initial Reading Time	First Work Period Time		Second Work Period Time		Third Work Period Time		Fourth Work Period Time		Fifth Work Period Time		Sixth Work Period Time	
	WBGT (°F)	WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)		WBGT (°F)	
	Air Temp. (°F)	Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)		Air Temp. (°F)	
	Initial Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.
	Initial Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.	Initial Temp.	Final Temp.
	Initial H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.	Initial H.R.	Final H.R.

Appendix F
Site 12 Sampling and Analysis Plan

FINAL

SAMPLING AND ANALYSIS PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number N68711-01-D-6011
Contract Task Order 0010

Document Control Number NAV010-002-H
Revision 0

February 26, 2007

Submitted to:

Department of the Navy
U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
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FINAL
SAMPLING AND ANALYSIS PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number N68711-01-D-6011
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Document Control Number NAV010-002-H
Revision 0

February 26, 2007

Approved By: _____ Date: February 22, 2007
Peter Bourgeois
Shaw Project Manager

Approved By: Rose Condit Date: February 22, 2007
Rose Condit
Shaw Program Chemist

Approved By: _____ Date: 2/27/2007
Nars Ancog
U.S. Navy Quality Assurance Officer

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Acronyms and Abbreviations

BaP	benzo(a)pyrene
bgs	below ground surface
CCR	California Code of Regulations
COC	chain of custody
CTO	Contract Task Order
DoD	Department of Defense
DOE	Department of Energy
dioxins	polychlorinated dibenzo-*p*-dioxins
DQO	data quality objective
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
furans	polychlorinated dibenzofurans
GC	gas chromatography
GC/MS	gas chromatography/mass spectrometry
LCS	laboratory control sample
LCS/LCD	laboratory control sample/ laboratory control duplicate
MDL	Method Detection Limit
mg/kg	milligrams per kilogram
MS	matrix spike
MSA	Method of Standard Addition
MSD	matrix spike duplicate
MS/MSD	matrix spike/matrix spike duplicate
Navy	U.S. Department of the Navy
NFESC	Naval Facilities Engineering Services Center
NIOSH	National Institute for Occupational Safety and Health
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
PRG	Preliminary Remediation Goals
QA	quality assurance
QAPP	Quality Assurance Project Plans
QC	quality control
QSM	Quality System Manual
RPD	relative percent difference
RSAP	Radiological Sampling and Analysis Plan
SAP	Sampling and Analysis Plan
SD	sample duplicate
SDG	sample delivery group
SOP	standard operating procedure
STLC	soluble threshold limit concentration
SVOC	semivolatile organic compound
SWDA	solid-waste disposal areas
SWDIV	Southwest Division
TCLP	Toxicity Characteristic Leaching Procedure

Acronyms and Abbreviations (Continued)

TI	Treasure Island
TPH	total petroleum hydrocarbons
VOC	volatile organic compound
WET	Waste Extraction Test

1.0 Introduction

Shaw Environmental, Inc. (here in referred to as Shaw) has prepared this Sampling and Analysis Plan (SAP) to support the proposed Non-Time Critical Removal Action activities for three solid-waste disposal areas (SWDAs) located in the Site 12 residential housing area at the former Naval Station on Treasure Island (TI). The removal action includes excavation of chemical- and solid waste-contaminated soil within the known SWDAs and potentially affected residential backyards, and collection of confirmation samples. Contaminants of potential concern within the Site 12 SWDAs include polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dioxins, and lead. Contaminants of potential concern within SWDA A&B include methane and 1,1,2,2-tetrachloroethane. Figure 1, "Site 12 Location Map," illustrates the location of Site 12 within TI.

This SAP was prepared under Contract Task Order (CTO) 0010 of Shaw's Environmental Multiple Award Contract N68711-01-D-6011. All work performed under this SAP will follow the provisions of the *Program Health and Safety Plan for Environmental Remedial Actions, Contract N68711-01-D-6011* and the *Quality Control Program Plan for Environmental Remedial Actions, Contract N68711-01-D-6011*.

This SAP provides complete guidance for all field sampling and analysis activities to be performed for the project. This SAP is based on the requirements of the following documents:

- U.S. Department of the Navy (Navy) *Installation Restoration Chemical Data Quality Manual* (Naval Facilities Engineering Services Center [NFESC], 1999)
- *Guidance for the Data Quality Objectives Process, EPA Quality Assurance (QA)/G-4* (U.S. Environmental Protection Agency [EPA], 2000)
- *Requirements for Quality Assurance Project Plans, EPA QA/R5* (EPA, 1999a)
- *Environmental Work Instruction #1 - Chemical Data Validation* (Navy, Southwest Division [SWDIV], Naval Facilities Engineering Command, 2001a)
- *Environmental Work Instruction #2 - Review, Approval, Revision, and Amendment of Field Sampling Plan and Analysis Project Plans* (Navy SWDIV, 2001b)
- *Environmental Work Instruction #3 - Laboratory Quality Assurance Program* (Navy, SWDIV, 2001c)
- *Environmental Work Instruction #4 – Implementing and Maintaining the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Administrative Record and Compendium at Southwest Division* (SWDIV, 2001d)

- Environmental Work Instruction #6 – *Environmental Data Management and Required Electronic Delivery Standards* (SWDIV, 2001e)
- Complies with *U.S. EPA Uniform Federal Policy for Quality Assurance Project Plans* (QAPP), (EPA, 2005)

1.1 Distribution List

The project distribution list for the CTO 0010 SAP/QAPP lists the parties that will receive the Final documents and any subsequent revisions to these documents.

SAP/QAPP Recipients	Title	Organization	Telephone Number	E-mail Address
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Mark Vennemeyer	Shaw Quality Control Manager	Shaw	415-277-6988	Mark.Vennemeyer@shawgrp.com
Project Site	------	Shaw	-------	------
Subcontract Environmental Laboratory	To be Determined	----	-------	------

- Environmental Work Instruction #6 – *Environmental Data Management and Required Electronic Delivery Standards* (SWDIV, 2001e)
- Complies with *U.S. EPA Uniform Federal Policy for Quality Assurance Project Plans* (QAPP), (EPA, 2005)

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Project Site	------	Shaw	-------	------
Subcontract Environmental Laboratory	To be Determined	----	-------	------

The Project Personnel Sign-Off Sheet will be used to document all key project personnel performing site work have read the applicable sections of the SAP/QAPP and will perform the sampling and analysis tasks as described.

Project Personnel Sign-Off Sheet (QAPP Worksheet #4)

Name	Organization	Title	Signature	Date QAPP Read
Patricia Flynn	Shaw	Project Chemist		
Mark Vennemeyer	Shaw	QC Manager		
Alex Naughton	Shaw	Technical Manager		
Barbara Matz	Shaw	Technical Manager		
Pete Bourgeois	Shaw	Project Manager		

I have read and understand this SAP and will perform the tasks as described

1.2 Site History and Background

As described in the Work Plan (Section 2.1), Site 12 contains 149 residential buildings in four housing areas. Within the housing areas, environmental restoration activities are planned at the SWDAs summarized below:

- SWDA A&B: Adjacent to or including buildings 1119, 1121, 1123, 1125, 1319, 1321, 1323, and 1325 (Figure 2, "SWDA A&B Excavation Areas and Proposed Sample Locations")
- SWDA 1207/1209: Adjacent to or including buildings 1205, 1207 1209, 1211, 1213, and 1222 (Figure 3, "SWDA 1207/1209 Excavation Areas and Proposed Sample Locations")
- SWDA 1231/1233: Adjacent to buildings 1231, 1233, 1235, and 1237 (Figure 4, "SWDA 1231/1233 Excavation Areas and Proposed Sample Locations")

Numerous investigations and removal actions were conducted at Site 12 between 1992 and 2002. Previous investigations and removal actions directly relevant to this removal action are summarized in Section 2.2 of the Work Plan. The SWDA boundaries were determined based on the results of the previous investigations of the housing areas.

1.3 Scope and Objectives

The scope of work for this project consists of the following tasks:

- Excavate three SWDA areas within Site 12 to four feet below ground surface (bgs).
- Perform radiological screening at every 1 foot excavation lift.
- Collect soil samples from each 1-foot excavation lift for gamma spectroscopy analysis.
- Describe soil at sample locations, and record areas of debris encountered in the excavations.
- Collect and analyze soil samples from excavation limits for lead, PCBs, PAHs, and polychlorinated dibenzo-*p*-dioxins (dioxins)/ polychlorinated dibenzofurans (furans).
- Collect and analyze soil samples from proposed backfill material.
- Backfill excavations, restore pavement, and landscaping.
- Sample, profile, and dispose all excavated soil.

This SAP has the following objectives:

- Provide a rationale for field sampling activities

- Describe the sampling strategy and design
- Describe and establish consistent field sampling procedures
- Establish data gathering, sample handling, and documentation methods that will be employed during field activities

Soil samples will be collected and analyzed to achieve the project objectives. Analytical data collected under the provisions of this SAP will be used for the following purposes:

- Confirm final site conditions at SWDAs within Site 12.
- Confirm findings of field radiological screening.
- Profile borrow material for use as backfill.
- Dispose of excavated soil.

1.4 Project Organization

The project organization consists of representatives from the Navy providing technical direction and QA oversight, and the Shaw Team. The project organization consists of the following members:

- Navy Remedial Project Manager, Base Realignment and Closure Program Management Office West
- Navy QA Officer
- Program Manager
- Installation Coordinator
- Project Manager
- Program Quality Control (QC) Manager
- Program Chemist
- Program Health and Safety Manager
- Site Health and Safety Officer
- Task/Technical Manager
- Construction Manager
- Project QC Manager
- Project Chemist
- Project Business Administrator

- Site Superintendent
- Transportation and Disposal Coordinator

The project organization is shown in Figure 5, “CTO 0010 Organization Chart.”

The responsibilities of the team members associated with data acquisition activities are presented in Table 1, “Project Personnel and Chemical Data Collection Responsibilities.”

2.0 Data Quality Objectives

The data quality objective (DQO) process is a series of planning steps based on scientific methods that are designed to ensure that the type, quantity, and quality of environmental data used for decision making are appropriate for the intended application. The DQO process, as defined by the EPA, consists of seven steps that are designed to provide a systematic approach to resolving issues that pertain to the site investigation and remediation (EPA, 2000). This section describes the outcome of the seven-step DQO process for data collection activities under this task.

The development of the project DQOs is summarized in the following sections.

2.1 Stating the Problem

Step 1: Identify the planning team members, including decision-makers, describe the problem, develop a conceptual model of the environmental hazard to be investigated, and determine resources such as budget, personnel, and schedule.

The planning team consists of representatives from the Navy and Shaw, the prime contractor for the Navy, with regulatory support and oversight from the Department of Toxic Substances Control. The Navy is the lead federal agency for the direction of site activities and the primary decision maker. The work will be conducted according to the Navy-approved budget and schedule.

Previous investigations at Site 12 have identified three SWDAs where debris- or chemical-contaminated soil may be present in residential backyards or common areas. Under this CTO, the Navy has contracted Shaw to conduct a remedial removal action, and to collect confirmation samples to document final site conditions after excavation.

2.2 Identifying the Decisions

Step 2. Identify the principal study question; define alternative decisions; develop a decision statement; and organize multiple decisions.

The following principal study questions have been formulated:

- Does soil at the excavation limits in the three SWDAs meet the screening criteria?

The decisions requiring environmental data acquisition will answer the following questions:

- Is additional step-out excavation necessary?
- Is borrow material acceptable to backfill the excavations?

- What are the disposal options for excavated soil?

2.3 Identifying Inputs to the Decisions

Step 3. Identify the information needed: determine sources for this information; determine the basis for determining the action level; and identify sampling and analysis methods that can meet the data requirements.

Existing data were used to establish the SWDA excavation boundaries. The following data and measurements will be obtained to confirm that chemical and debris contamination has been removed from the three areas and to verify the appropriate disposal classification.

2.3.1 Screening Criteria

The analytical data obtained from analysis of confirmation soil samples will be compared to action levels for this project presented in Table 2 "Interim Screening Criteria for Soil (QAPP Worksheet #15)" and listed below:

- The action level for lead is 400 milligrams per kilogram (mg/kg).
- The action level for PCBs (for any individual Aroclor mixture) is 1.0 mg/kg.
- The action levels for volatile organic compounds (VOCs)(Area A&B only) are the 2004 EPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil shown in Table 3, "Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004."
- The action level for PAHs as benzo(a)pyrene (BaP) toxic equivalency quotient is 0.62 mg/kg.
- The action level for dioxins as 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) equivalent is 3.9×10^{-6} mg/kg.

The proposed scope of work does not include handling of groundwater or appreciable amounts of saturated debris. The trench depth will be limited to the area above the groundwater table. Accumulated rainwater will be dealt with by using a perforated bucket for soil removal. In areas that are affected by tidal changes, elevated groundwater levels will be dealt with by waiting for low tide conditions.

Imported borrow material used to backfill the excavations will be sampled prior to use. The analytical results will be compared to the EPA Region 9, PRGs for Residential Soil and Treasure Island background metals concentrations, as show in Table 3 and Table 4, "Borrow Material Analytical Requirements Compared to Ambient Metals Concentrations in Artificial Fill, Treasure Island." The Residential PRGs are protective of human health for possible dermal and inhalation exposure, and therefore are suitable comparison criteria for imported backfill material.

For segregation and waste disposal, excavated soil will be screened for radiological activity by Shaw subcontractor, New World Technology. Screening for radiological activity will be performed in accordance with the *Radiological Sampling and Analysis Plan* (RSAP), Appendix C of the Work Plan. A radiation background value will be established daily by taking measurements outside site boundaries as described in Section 4.12.1 of the RSP. Excavated soil will be screened against this background value. If the excavated soil has a radiation reading two times the background reading, then this soil will be segregated into a separate disposal stockpile and held at Site 6. Planning for disposal of any soil segregated due to high radiation readings will proceed separately from these plans.

2.3.2 Benzo(a)pyrene Equivalency Calculation

The BaP equivalency will be calculated by summing concentrations of carcinogenic PAH compounds after multiplying each concentration by their toxicity equivalence factors (TEFs). The TEFs for the carcinogenic PAHs are as follows:

- Benzo(a)pyrene – 1.0
- Benz(a)anthracene – 0.1
- Benzo(b)fluoranthene – 0.1
- Benzo(k)fluoranthene – 0.1
- Chrysene – 0.01
- Dibenz(a,h)anthracene – 1.0
- Indeno(1,2,3-cd)pyrene – 0.1

Two BaP equivalency values are calculated; BaP(0) is calculated using only the detected values of all seven analytes and BaP(1/2 RL) is calculated using 1/2 of reporting limit values for analytes that are not detected.

2.4 Defining the Boundaries

Step 4. Define target population of interest; specify the spatial boundaries that clarify what the data must represent; determine the time frame for collecting data and making decisions; determine the practical constraints on collecting data.

Previous sampling at Site 12 common areas indicated the presence of lead, PAHs, and PCBs in soil in concentrations above the screening criteria. This current investigation covers three SWDAs delineated by previous site analytical data and visual observations of debris.

Figures 2 through 4 show the locations of the three SWDAs and the planned excavation boundaries. The areas will be excavated to a depth of four feet bgs in one-foot lifts. The excavations will be inspected for the presence of debris, which will be noted on field diagrams. Confirmation soil samples will be collected from the excavation bottom at the total depth of four

feet bgs and from excavation sidewalls for laboratory analyses of chemical constituents. All of these soil samples will be analyzed for lead, the primary constituent driving the removal action. All of the sidewall samples and twenty-five percent of the bottom samples will also be analyzed for PCBs and PAHs, and 25% of sidewall and bottom locations will be analyzed for dioxins/furans. In addition, sidewall samples collected in areas within SWDA A&B where methane and 1,1,2,2-tetrachloroethane have previously been detected will be analyzed for VOCs.

Based on site knowledge and previous investigations at the SWDAs, there is no reason to suspect that radiation hazards exist within Site 12; however radiological screening is required for waste characterization purposes. Therefore, each one-foot lift will undergo radiological screening of 50 percent of its surface, in accordance with the RSP (Appendix C). Sixteen confirmation soil samples will be collected from the survey area on each one-foot lift surface and submitted for laboratory analysis by gamma spectroscopy.

2.5 Developing a Decision Rule

Step 5. Specify an appropriate population parameter (mean, median, percentile); confirm that the action level exceeds measurement detection limits; and develop a decision rule (if…then statements).

Decisions related to any final remedial actions will be made by comparing analytical results to the site action levels. Decisions related to the selection of the disposal options for the excavated soil will be made upon review of the chemical analyses and by comparing them to the disposal facility acceptance requirements.

The following decisions may be made based on the results of the soil sampling and analysis:

- If lead is detected above the screening criteria (Table 2) in soil samples collected from the excavation perimeter, then additional lateral excavation may occur at the direction of the Navy, in 5-foot increments. However, lateral excavation will be restricted to areas of the excavation perimeter that do not abut the residential buildings or carports; no excavation will be conducted beneath these structures.
- If lead is not detected above the screening criteria (Table 2) in soil samples collected from the excavation limits, then excavation is completed and will be backfilled.
- If the concentration of lead in a sidewall sample is less than screening criteria (Table 2), then the sample will be analyzed for PCBs and PAHs. If PCBs and PAHs are less than screening criteria, then up to 25% will further be analyzed for dioxin and no further excavation is required at that location.
- Twenty-five percent of all bottom samples will be analyzed for PCBs, PAHs, and dioxins, for information only. No over-excavation will be performed at any bottom location.

- If lead, PAHs or PCBs are detected above screening criteria in a sample from a location where over-excavation is permitted, then the excavation will be extended five feet in the direction of each exceedance. One additional sample will be collected from each sidewall of the extension and analyzed for the lead, PAHs, and PCBs. If constituents are again detected above screening criteria, the over-excavation will be repeated and sampled as described until the excavation is impeded by structures or until halted by the Navy with the concurrence of regulatory agencies.
- If screening data from the excavated soil shows radiological activity two times above the background, then it will be segregated from other waste soil.
- If concentrations of analytes in samples from borrow material source are below the comparison criteria or below the TI ambient metal concentrations, shown in Table 3 and 4, then this material is suitable for use as backfill.
- If concentrations of analytes in samples from borrow material source are above the comparison criteria shown in Table 3 and 4, then this material may not be suitable for use as backfill and other sources may be investigated.
- If the excavated soil is considered hazardous by law, then soil waste will be transported for disposal at a state-approved hazardous waste disposal facility.
- If the excavated soil is considered non-hazardous by law, then the soil waste will be disposed of at a state-approved non-hazardous waste disposal facility.

2.6 Specifying Limits on Decision Error

Step 6. Determine the range of the parameter of interest; choose the null hypothesis; examine the consequences of making an incorrect decision; specify a range of values where the consequences are minor (gray region); and assign probability values to points above and below the action level that reflect tolerable probability for potential decision errors.

This step does not apply because sampling is not based on probabilistic designs. The number of samples to be collected is based on the existing experience of the Shaw project team and a systematic sampling scheme. To limit uncertainty in obtained environmental data, criteria for the precision, accuracy, representativeness, completeness, and comparability parameters and reporting limits for the contaminants of concern have been developed. The data that meet these criteria will be of definitive quality and of less uncertainty than the estimated data that do not meet the criteria.

2.7 Optimizing the Design for Obtaining Data

Step 7. Review the DQO outputs; develop data collection design alternatives; formulate mathematical expressions for each design; select sample size that satisfies the DQOs; decide on the most resource-effective design or agreed alternative; and document details in the SAP.

The locations of the excavation boundaries have been selected based on previous investigation data collected. After excavation, confirmation soil samples will be collected from each area. Confirmation sample locations are based on a systematic sampling grid pattern or specific linear distance. Section 3.0 discusses the sampling and analysis strategy in detail.

3.0 Sampling and Analysis Strategy

This section discusses the sampling and analysis strategy for soil and waste samples required to meet the project DQOs. Procedures for sample collection and handling are discussed in Section 5.0, "Field Methods and Sampling Procedures" of this SAP. Table 5, "Summary of Field Sampling and Analysis Sampling Location/IDs, Sample Depths, Sample Analyses and Sampling Procedures (QAPP Worksheet #18)" presents a summary of sampling and analysis for the project activities.

3.1 Sampling Personnel Training Requirements

All field personnel will be required to have completed the Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) Protection training, continued 8-hour HAZWOPER refresher and submit to annual medical surveillance, as required by OSHA. The Shaw Site Health and Safety Manager will be responsible for ensuring that training and/or certification is met and that qualified personnel are performing the work.

Sample collection activities will be performed by field technicians or the Project Chemist. The field technicians will be trained and monitored by the Project Chemist while performing any sampling tasks. Sample collection for radiological analysis will be performed by field technicians under the direction of the Radiation Control Technician.

3.2 Excavation

Soil will be excavated from the areas indicated on Figures 2, 3, and 4. The following subsections summarize the excavation and logging activities.

3.2.1 Air Monitoring

High-volume perimeter air monitoring will be performed during excavation activities to provide data to verify effective dust control and corresponding non-exposure of site workers and Site 12 residents to PAHs, PCBs, and lead. The air monitoring strategy and procedures are described in detail in Section 4.3.4. of the Work Plan. Perimeter air monitoring samples will be analyzed by the following methods:

- PAH using 4 inch Puff sample media analysis by EPA Method TO-13A
- PCB using 4 inch Puff sample media analysis by EPA Method TO-4A
- Lead using 8 inch by 10 inch filter media analysis by National Institute for Occupational Safety and Health (NIOSH) 7300

3.2.2 Excavation Logging

The excavation will be conducted in 1-foot lifts to facilitate in-situ radiological screening. Upon completion of a portion of the excavation to 4 feet bgs, the excavation will be logged.

The sidewalls and bottom of the excavation will be visually inspected for the presence of discolored soil, burn material, or debris. Debris observed in the excavation will be described in field notes and the location noted on field maps. The soil at each sample location will be described on the associated Sample Collection Log.

3.2.3 Radiological Confirmation Soil Sampling

Prior to beginning excavation and at the completion of each one-foot lift in each SWDA, 50 percent of the surface will undergo field radiological screening using the methods described in the RSAP. Upon completion of field screening of each survey unit (defined as one complete one-foot excavation surface in one SWDA), sixteen discrete soil samples will be collected from the survey unit using a square grid pattern originating from a random starting point, as described in Section 5.3 of the RSAP. Each SWDA sampling grid will have the following dimensions, based on the total area of each SWDA:

- SWDA A&B, length of grid pattern is 72 feet
- SWDA 1207/1209, length of grid pattern is 46 feet
- SWDA 1231/1233, length of grid pattern is 42.5 feet

The samples will be submitted for laboratory analysis by gamma spectroscopy, using U.S. Department of Energy (DOE) Method 901.1M (DOE 1997). This process will be completed at the surface and each of the four one-foot excavation lifts. The samples collected on the surface and excavation lifts to three feet bgs will be analyzed on site using a mobile radiological screening laboratory (see RSAP in Appendix C). Samples from the excavation floor, at four feet bgs, will be sent to an off-site laboratory for analysis.

3.2.4 Confirmation Soil Sampling

Upon completion of an excavation or portion to the target depth of 4 feet bgs, approximately 100-foot by 100-foot sample grids (approximately 10,000 square feet) will be marked on the floor of the excavation. Proposed sampling grids are shown on Figures 2 through 4. If any alteration of proposed sample locations is required due to site conditions, they will be adjusted such that sampling density requirements are met. The 100-foot bottom grids will be divided into 4 quadrants (approximately 50 by 50 foot square). One discrete soil sample will be collected from the center of each of two opposing quadrants within each 100-foot grid. To the extent allowed by site conditions, the pattern of opposing quadrants will be consistent across adjacent areas, to provide evenly-spaced coverage.

Soil samples will be collected from the excavation sidewalls at intervals of approximately 50 linear feet, in areas where lateral extension is feasible or where information is desired, as shown on Figures 2 through 4. One discrete soil sample will be collected from each 50-foot interval or at every change in sidewall direction. Sidewall sample locations will be placed at the midpoint of the sidewall, approximately 2 feet bgs.

Sidewall samples will be collected from soil adjacent to the perimeter road at a rate of one discrete sample per every 100-foot interval. Sidewall samples will be collected from soil adjacent to residential buildings at a rate of one discrete sample per every 50-foot interval with a minimum of one for every sidewall segment. Sidewall samples collected adjacent to the perimeter road and residential buildings are intended only to document final site conditions in these areas; the excavations will not be extended beneath these structures.

Each discrete sample will have a unique designation, as described in Section 5.4.2. The driver for excavation is the lead concentration in soil (Work Plan Section 2.2). Therefore, all confirmation soil samples collected from the excavation floor and sidewalls will be analyzed for lead by EPA Method 6010B. In addition, all of the sidewall samples and twenty-five percent (25%) of the bottom samples will also be analyzed for the following parameters:

- PCBs by EPA Method 8082
- PAHs by EPA Method 8270C Selective Ion Monitoring (SIM)

Twenty-five percent of all sidewall and bottom samples will be analyzed for dioxins/furans by EPA Method 8290.

If ash is observed in the floor or sidewall of an excavation, that location will be selected for the additional analyses; otherwise, the locations will be at the approximate center of the grid.

Methane occurs in an area west of Buildings 1319 and 1321, and 1,1,2,2-tetrachloroethane has previously been detected at low levels in soil near Building 1323; both of these areas are shown on Figure 2. All confirmation soil samples collected from sidewall locations within these two areas will also be analyzed for VOCs by EPA Methods 5035/8260B.

For samples from sidewall locations that could potentially be over-excavated, lead analysis will be performed on a 48-hour turnaround time to expedite additional excavation. For any lead-only sidewall sample that has a detected concentration less than the action level (400 mg/kg), additional analysis of the remaining soil for PAHs, PCBs and Dioxins (25%) will be requested, on normal turnaround time, to document the remaining concentrations of those analytes. No additional excavation will be performed based on PAH, PCB or Dioxin results. All other samples will be analyzed on a normal turnaround time.

All floor and sidewall sample locations will be recorded on maps as they are marked in the field. The locations will also be indicated on sample collection logs. Survey coordinates will be obtained for all sampling locations.

Samples will be collected directly from the excavation surface or from an excavator bucket, as dictated by site conditions. Disposable plastic scoops will be used to collect the soil samples, with a new unused scoop at each location.

Each soil sample will be uniquely identified, with the location incorporated into the sample identification number. The sample numbering system is discussed in Section 5.4.1, "Sample Numbering." Locations of final confirmation samples will be surveyed.

3.3 Borrow Material Testing

Borrow material will be used to backfill the excavations. Borrow material will be purchased as "clean" material. If analytical data is available from the vendor, that data will be used to verify the source material is clean for use as backfill. In addition, a minimum of four samples will be collected from the borrow source material and will be analyzed for the following parameters:

- Total petroleum hydrocarbons (TPH) as gasoline by EPA Methods 5035/8015B
- TPH as diesel and motor oil by EPA Method 8015B
- VOCs by EPA Methods 5035/8260B
- California Code of Regulations (CCR) Title 22 Metals by EPA Methods 6020/7000
- PCBs by EPA Method 8082
- Organochlorine pesticides by EPA Method 8081A
- Semivolatile organic compounds (SVOCs) by EPA Method 8270C

The results from the borrow soil testing will be compared to the EPA Region 9 Preliminary Remediation Goals to determine if it is suitable for backfill material (as shown in Table 3) and TI ambient metals concentrations shown in Table 4

3.4 Project Waste Streams

The project waste streams will consist of soil excavated from the SWDAs. Previous Site 12 removal actions indicate that waste soil within SWDAs that contains visible debris will often contain lead and is likely to be profiled as Class I hazardous waste. Therefore, if areas of significant debris are encountered during excavation activities, the soil will be segregated from other excavated material. All excavated soil will be sampled to confirm profile characteristics. Waste characterization samples may be collected in-place before excavation or from stockpiled soil. Class I hazardous waste will be managed to meet the time limits for accumulation as described in 40 Code of Federal Regulations 262.34.

One four-point composite sample will be collected from every 500 cubic yards of waste soil and analyzed for the following parameters:

- TPH as diesel and motor oil by EPA Method 8015B
- CCR Title 22 Metals by EPA Methods 6010B/7000
- PCBs by EPA Method 8082
- SVOCs by EPA Method 8270C

If necessary, the following analyses will be performed for cost effective disposal:

- Soluble threshold limit concentration (STLC) by California Waste Extraction Test (WET) and EPA Method 6010B
- Toxicity Characteristic Leaching Procedure (TCLP) by EPA Methods 1311/6010B

Changes in analyses or sampling frequency may be made based on disposal facility requirements or at the Shaw Transportation and Disposal Coordinator's request.

Waste soil that exceeds radiological release criteria will be stockpiled separately at Site 6 and will be held pending determination of appropriate disposal protocol.

4.0 Analytical Requirements

The following analytical methods will be used in this project.

The following methods are described in *Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846, Third Edition, Update* III (EPA, 1996), Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, (EPA, 1999) and Manual of Analytical Methods (NIOSH, 2003):

- Confirmation Sampling
  - Lead by EPA Method 6010B
  - PCBs by EPA Method 8082
  - PAHs by EPA Method 8270C SIM
  - VOCs by EPA Methods 8260B
  - Closed system purge and trap EPA Method 5035
  - Dioxins/furans by EPA Method 8290
- Radiological Screening
  - Gamma Spectroscopy by DOE Method 901.1M
- Waste Characterization
  - TPH as diesel and motor oil by EPA Method 8015B
  - SVOCs by EPA Method 8270C
  - CCR Title 22 Metals by EPA Methods 6010B/7000
  - PCBs by EPA 8082
- Ambient Air Monitoring
  - PAHs by EPA Method TO13A
  - Lead by NIOSH 7300
  - PCBs by EPA TO-4A
- Borrow Material
  - TPH as gasoline by EPA Method 8015B
  - TPH as diesel and motor oil by EPA Method 8015B
  - VOCs by EPA Method 8260B
  - SVOCs by EPA Method 8270C
  - CCR Title 22 Metals by EPA Methods 6010B/7000
  - Organochlorine pesticides by EPA Method 8081A

- PCBs by EPA Method 8082
- Closed System purge and trap by EPA Method 5035

Additionally, California Code of Regulations Title 22, 1991 specifies the following methods:

- Waste Characterization
  - STLC by California WET and EPA Method 6010B
  - TCLP by California WET and EPA Method 6010B

Detailed information on methods, calibration criteria, project-required reporting limits, and QC acceptance criteria are presented Section 7.0, "Laboratory Quality Control Program."

4.1 Field Quality Control Samples

Field QC samples will be collected and analyzed during the project to assess the consistency and performance of the sampling program. Field QC samples for this project will include field duplicates, matrix spike/matrix spike duplicate (MS/MSD) samples, and temperature blanks discussed below and shown in Table 6, "Measurement Performance Criteria – Field QC (QAPP Worksheet #12)."

4.1.1 Field Duplicates

Field duplicate pairs consist of two samples of the same matrix (an original and a duplicate) collected at the same time and location to the extent possible, using the same sampling techniques. The purpose of field duplicate samples is to evaluate the variability of the contaminant distribution in the sampled matrix. Field duplicate samples will be collected at a frequency of 10 percent, and will be analyzed for the same analytes as their corresponding original samples. Duplicate samples will not be collected from waste samples or borrow material.

4.1.2 Equipment Rinsate Samples

Equipment rinsate samples are used to evaluate the effectiveness of the decontamination procedure and to identify potential cross-contamination during sampling events. Only disposable sampling equipment will be used for this project, therefore no equipment rinsate samples will be necessary.

4.1.3 Temperature Blanks

Each cooler will be shipped with a temperature blank. A temperature blank is a sample container filled with tap water and stored in the cooler during sample collection and transportation. The laboratory will record the temperature of the temperature blank immediately upon receipt of the samples.

4.1.4 Matrix Spike and Matrix Spike Duplicate

The laboratory will analyze one MS/MSD sample for every 20 soil samples collected for confirmation sampling. Field personnel will designate one sample per every 20 samples collected for MS/MSD analysis on the Chain of Custody (COC) Record. Waste samples will not be submitted as MS/MSD samples.

5.0 Field Methods and Sampling Procedures

This section describes container and preservative requirements; sample collection, decontamination, and management procedures. A summary of field and quality control samples is shown in Table 7, "Field and Quality Control Sample Summary (QAPP Worksheet #20)."

5.1 Sample Containers, Preservatives, and Holding Times

Sample containers for soil will be certified pre-cleaned according to EPA protocols. Table 8, "Sample Containers, Preservatives, and Holding Times (QAPP Worksheet #19)," lists the sample container, preservative and holding time requirements for soil samples.

5.2 Sampling Method Requirements

This section presents field methods, sample handling, and documentation procedures.

5.2.1 Soil Sampling Procedure

Soil samples will be collected using disposable plastic scoops. A new scoop will be used at each location. Soil samples will be collected either directly from the excavations or from the backhoe bucket.

A general description of soil sampling procedures is provided below.

1. Obtain a new (unused) disposable sampling scoop (or other non-disposable decontaminated sampling equipment).
2. Put on a new (unused) pair of sampling gloves and other appropriate personal protective equipment.
3. At the specified sampling location, collect the sample into the appropriate container using a disposable sampling scoop or an Encore sampling device (or equivalent).
4. If the excavation is unsafe for sampling personnel to enter, then direct the backhoe operator to obtain a sample from the desired location. Collect the sample for analysis from the backhoe bucket using a disposable sampling scoop.
5. Place a sample label, completed with the information described in Section 5.4.2, "Sample Labeling," on the sample jar.
6. Place the sample container in a resealable bag.
7. Package and prepare the samples for shipment to the laboratory. Transfer the samples to cold storage after collection.

5.3 Waste Soil Sampling Procedure

Soil samples from excavated soil stockpiles will be collected with disposable plastic sampling scoops. Waste characterization samples may also be collected in-place from excavation areas. The following steps summarize the sampling procedures to be performed:

1. Obtain 8-ounce glass jars.
2. Put on a new, clean, and chemical-resistant pair of disposable gloves.
3. Use a hand auger or shovel to reach desired sample depth. Fill the sample glass jar with soil.
4. Cap the jar. Place a sample label, completed with the information described in Section 5.4.2, on the jar.
5. Place the jar in a resealable bag.
6. Package and prepare the samples for shipment to the laboratory. Transfer the samples to cold storage after collection.

Waste soil will be collected as one four-point composite sample for approximately every 500 cubic yards. The composite will be made by the subcontract laboratory, not in the field.

5.4 Sample Management

The following sections describe sample numbering and labeling requirements.

5.4.1 Sample Numbering

All samples submitted to the analytical laboratory will be uniquely numbered will be uniquely numbered; the numbering will be as follows:

10-####-EF/SW/RS-XXX

Where 10 denotes this CTO 0010, #### indicates the SWDA number (AB, 1207, or 1231), EF indicates excavation floor or SW indicates sidewall or RS indicates radiological screening, and XXX indicates a sequential location number, beginning with 001, within the SWDA.

IDW samples will be numbered with the bin number identification or other appropriate distinguishing location identification.

The sample number will be recorded in the field logbook at the time of sample collection. A complete description of the sample and sampling circumstances will be recorded in the permanently bound field logbook, and referenced to the unique sample identification number.

5.4.2 Sample Labeling

Sample labels will be filled out with indelible ink and affixed to each sample container. If non-waterproof labels are used, then each sample label will be covered with clear tape to keep it dry. Sample containers will be placed in resealable plastic bags to protect the sample from moisture during transportation to the laboratory. At a minimum, each sample container will be labeled with the following:

1. Sample identification number
2. Sample collection date (month/day/year)
3. Time of collection (24-hour clock)
4. Project number (*i.e.*, 122412)
5. Sampler's initials
6. Analyses to be performed
7. Preservation (if any)
8. Location (*i.e.*, Site 12, Treasure Island).

5.4.3 Chain of Custody Record

Each sample will be entered on a COC record as it is collected in the field. All required fields on the COC will be completed. All samples requiring 48-hour turnaround for analysis will be listed on a separate COC in order to facilitate processing by the analytical laboratory. The completed and signed COC will be packaged in the same cooler with the listed samples for shipment; a copy of the COC will be retained in the project files.

5.4.4 Sample Packaging and Shipment

Samples will be shipped to the analytical laboratory by land delivery services according to the U.S. Department of Transportation regulations. The International Air Transportation Association regulations will be adhered to when shipping samples by air courier services. Transportation methods will be selected to assure that the samples arrive at the laboratory in time to permit testing according to established holding times and project schedules. The receiving laboratory will only accept samples with a properly prepared COC Record and properly labeled and sealed shipping container(s).

Upon collection, all glass sample containers will be protected with bubble wrap and each sample will be placed in a resealable bag. A temperature blank will be placed in every cooler with samples.

Ice, double bagged in resealable bags, will be added to the cooler in sufficient quantity to keep the samples cooled to 4 ± 2 degrees Celsius for the duration of the shipment to the laboratory. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage. Saturday deliveries will be coordinated with the laboratory.

If samples are picked up by a laboratory courier service, the COC Record will be completed and signed by the laboratory courier. The cooler will then be released to the courier for transportation to the laboratory.

If a commercial carrier is used, the COC Record will include the airbill number in the "transfers accepted by" column, and will be sealed in a resealable bag. The COC Record will then be taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape, and two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipping. The samples will then be shipped to the analytical laboratory. A copy of the courier airbill will be retained for documentation

6.0 Sample Custody and Documentation

Sampling information will be recorded on a COC Record, in a permanently bound field logbook, and Groundwater Monitoring Data Form. All entries will be legible and recorded in indelible ink.

6.1 Chain of Custody

In addition to providing a custody exchange record for the samples, the COC Record serves as a formal request for sample analyses. The COC Records will be completed, signed, and distributed as follows:

- One copy retained by the sample coordinator for inclusion in the project files
- The original sent to the analytical laboratory with the sample shipment.

After the laboratory receives the samples, the Sample Custodian will inventory each shipment before signing for it, and note on the original COC Record any discrepancy in the number of samples, temperature of the cooler or broken samples. The Project Chemist will be notified immediately of any problems identified with shipped samples. The Project Chemist will notify in turn, the Project QC Manager, and together they will determine the appropriate course of action. The Project Chemist will also notify the Project Manager if the project budget and schedule may be impacted.

The laboratory will initiate an internal COC Record that will track the sample within the various areas of the laboratory. The relinquishing signature of the Sample Custodian and the custody acceptance signature of the laboratory personnel transfer custody of the sample. This procedure is followed each time a sample changes hands. The laboratory will archive the samples and maintain their custody as required by the contract or until further notification from the Project Chemist, at which time the samples will either be returned to the project for disposal, or disposed by the laboratory.

6.2 Field Sample Custody

The COC Record will be the controlling document to assure that sample custody is maintained. Upon collecting a sample, sampling personnel will initiate the COC Record in the field. Each individual who has the sample(s) in his/her possession will sign the COC Record. Each time the sample custody is transferred, the former custodian will sign the COC Record on the "Relinquished by" line, and the new custodian will sign the COC Record on the "Received by" line. The date, time, and name of their project or company affiliation will accompany each signature.

The waybill number or courier name will be recorded on the COC Record when a commercial carrier is used. The shipping container will be secured with two custody seals, thereby allowing shipping personnel to maintain custody until receipt by the laboratory.

If the laboratory sample custodian judges sample custody to be invalid (*e.g.*, custody seals have been broken), the laboratory will initiate a Nonconformance Report. The Project Chemist will be immediately notified. The Project Chemist will notify in turn, the Project Manager and the Project QC Manager. The Project Manager will make a decision, in consultation with the client, as to the fate of the sample(s) in question on a case-by-case basis. The sample(s) will either be processed "as-is" with custody failure noted along with the analytical data, or rejected with re-sampling scheduled, if necessary. The nonconformance associated with the samples will be noted on the appropriate certificate of analysis or case history.

6.3 Field Logbooks

A permanently bound field logbook with consecutively numbered pages will be assigned to this project. All entries will be recorded in indelible ink. Corrections will be made following the procedure described in Section 6.4, "Document Corrections." At the end of each workday, the responsible sampler will sign the logbook pages, and any unused portions of a logbook page will be crossed out, signed, and dated.

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

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

1. Project name and location (on the front page of the log book)
2. Date and time of collection for each sample (in the upper right corner of each page)
3. Sample number
4. Sample location (*i.e.*, soil boring, sampling point, and monitoring well identifications)
5. Sample type (*i.e.*, soil and water)
6. Composite or grab
7. Composite type (the number of grab samples)
8. Depth of sample
9. Weather information (*e.g.*, rain, sunny, approximate temperature, *etc.*)

10. Containers used (*e.g.*, metal liners, glass bottles, *etc.*)

11. Requested analyses

In the graph paper portion of the Field Log Book, the sampler will fill in the following information:

1. A map with sample locations (drawn or paste copy). Each sample location must be clearly identified on the map, as well as quadrant or segment designations within the location. Several sample locations may be presented on one map; however, the page with the map must be referred on each of the individual sample pages.

2. Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments.

3. Descriptions of deviations from this SAP.

4. Problems encountered and corrective action taken.

5. Identification of field QC samples.

6. List of QC activities.

7. Verbal or written instructions from the Navy and Shaw Project QC Manager.

8. Any other events that may affect the samples.

The sampler will cross out the unused portion and sign each page.

6.4 Document Corrections

Changes or corrections on any project documentation will be made by crossing out the item with a single line, initialing by the person performing the correction, and dating the correction. The original item, although erroneous, will remain legible beneath the cross-out. The new information will be written above the crossed out item. Corrections will be written clearly and legibly with indelible ink.

7.0 Laboratory Quality Control Program

This section describes analytical QC procedures, including laboratory qualifications, the QA program, and QC procedures associated with analytical methods. The laboratory QA program will be compliant with the Department of Defense (DoD) *Quality System Manual* (QSM) *for Environmental Laboratories* (DoD, 2006).

7.1 Laboratory Quality Control Checks

The recovery of known additions is a part of laboratory analytical protocols. The use of additives at known concentrations allows detecting the matrix interferences and estimating the impact of these interferences when present. It also allows evaluating the efficiency of extraction procedures and overall accuracy of analysis. Laboratory internal QC checks will include:

- Laboratory control samples (LCS)
- Laboratory control duplicates (LCD)
- Matrix spikes (MS)
- MS duplicates (MSD)
- Laboratory duplicates
- Surrogate standards
- Internal standards
- Method and instrument blanks
- Post-digestion spikes.

7.1.1 Laboratory Control Samples

Laboratory control samples are matrix equivalent QC check samples (*i.e.*, analyte-free water, laboratory sand, or sodium sulfate) spiked with a known quantity of specific analytes that are carried through the entire sample preparation and analysis process. The spiking solution used for laboratory control sample/ laboratory control duplicate (LCS/LCD) preparation is of a source different from the stock that was used to prepare calibration standards.

7.1.2 Laboratory Duplicates

For laboratory sample duplicate (SD) analyses, a sample is prepared and analyzed twice. Laboratory SDs are prepared and analyzed with each batch of samples for most inorganic analyses.

7.1.3 Matrix Spikes

Matrix spikes are QC check samples that measure matrix-specific method performance. An MS sample is prepared by adding a known quantity of target analytes to a sample prior to sample digestion or extraction. In general, for organic compound and metal analyses, an MS/MSD pair

is prepared and analyzed with each preparation batch or for every 20 field samples. The frequency of MS/MSD analysis depends on the project DQOs. For inorganic compound analysis, a single MS and a laboratory SD are often prepared and analyzed with each batch. The LCS results, together with MS results, allow verifying the presence of matrix effects.

7.1.4 Surrogate Standards

Organic compound analyses include the addition, quantitation, and recovery calculation of surrogate standards. Compounds selected to serve as surrogate standards must meet all of the following requirements:

- They are not the target analytes
- They do not interfere with the determination of target analytes
- They are not naturally occurring, yet are chemically similar to the target analytes
- They are compounds exhibiting similar response to target analytes

Surrogate standards are added to every analytical and QC check sample at the beginning of the sample preparation. The surrogate standard recovery is used to monitor matrix effects and losses during sample preparation. Surrogate standard control criteria are applied to all analytical and QC check samples, and if surrogate criteria are not met, re-extraction and re-analysis may be performed.

7.1.5 Internal Standards

Some organic compound analyses include the addition, quantitation, and recovery calculation of internal standards. Internal standards are usually synthetic compounds which are similar in chemical behavior to the target analytes. They are added to sample extracts at the time of instrument analysis, and are used to quantitate results through internal standard calibration procedures. Internal standard recoveries are used to correct for injection and detector variability. Gas chromatography/mass spectrometry (GC/MS) must use internal standards and have acceptability limits for internal standard areas. Use of internal standard quantitation for gas chromatography (GC) methods is optional.

7.1.6 Method Blanks

A method blank is used to monitor the laboratory preparation and analysis systems for interferences and contamination from glassware, reagents, sample manipulations, and the general laboratory environment. A method blank is carried through the entire sample preparation process, and is included with each batch of samples. Some methods of inorganic analysis do not have a distinctive preparation step. For these tests the instrument blank, which contains all reagents used with samples, is considered the method blank.

7.1.7 Instrument Blanks

An instrument blank is used to monitor the cleanliness of the instrument portion of a sample analysis process. Instrument blanks are usually just the solvent or acid solution of the standard used to calibrate the instrument. During metals analyses one instrument blank is usually analyzed for every ten samples. For GC and GC/MS analysis, instrument blanks are analyzed on an as-needed basis for troubleshooting and chromatography column carryover determination purposes.

7.1.8 Post-Digestion Spikes and the Method of Standard Addition

A post-digestion spike is used during metal analysis to assess analytical interferences that may be caused by general matrix effects or high concentrations of analytes present in the sample. A digested sample is spiked with the analyte of interest at a known concentration, and the spike recovery is used to estimate the presence and magnitude of interferences.

If a post-digestion spike recovery fails to meet acceptance criteria, the Method of Standard Addition (MSA) will be used to quantitate the sample result. The MSA technique compensates for a sample constituent that enhances or depresses the analyte signal. To perform the MSA, known amounts of a standard at different concentrations are added to two to three aliquots of digested sample, and each spiked sample and the original unspiked sample are analyzed. The absorbance is then plotted against the concentration, and the resulting line is extrapolated to zero absorbance. The point of interception with the concentration axis is the indigenous concentration of the analyte in the sample.

7.2 Data Quality Indicators

This section defines the data quality indicators and their use for assessment of data quality.

7.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. The following equation illustrates the method for calculating relative percent difference (RPD) to assess a method's precision:

$$\text{Precision as RPD} = \frac{2 \times |\text{Result} - \text{Duplicate Result}|}{\text{Result} + \text{Duplicate Result}} \times 100\%$$

The laboratory uses MS/MSD pairs to assess the precision of analytical procedures, with one MS/MSD pair analyzed for every batch of up to 20 samples. According to the Navy requirements, analytical laboratories perform MS/MSD on the Navy project samples. This allows determining whether matrix interferences may be present.

The laboratory uses LCS/LCD pairs when MSs are not practical due to the nature of sample or analytical method used, and they are prepared and analyzed with each batch of samples instead of MS/MSD. An LCS/LCD may also be prepared in place of an MS/MSD in the case that a sufficient sample volume was not obtained in the field to perform the MS/MSD analysis. For inorganic analyses, analytical precision is usually calculated based on the sample and SD results.

The analytical laboratory will have statistically-based acceptability limits for RPDs established for each method of analysis and sample matrix. The laboratory will review the QC samples to ensure that internal QC data lie within the limits of acceptability. Any suspect trends will be investigated and corrective actions taken.

Field precision of sampling procedures is evaluated by collecting and analyzing "blind" field duplicate samples (field QC samples) at a rate of one for every ten samples. Sampling precision will be evaluated based on the RPD for field duplicate samples.

Field precision will be monitored for evaluation of the sampling techniques and sample handling procedures. Analytical data will not qualify during the data validation process, based on the field precision values.

7.2.2 Accuracy

Accuracy measures the bias of an analytical system by comparing the difference of a measurement with a reference value. The percent recovery of an analyte, which has been added to the environmental samples at a known concentration before extraction and analysis, provides a quantitation tool for analytical accuracy. The spiking solutions used for accuracy determinations are not used for instrument calibrations. The following equation illustrates how accuracy is evaluated:

$$\text{Accuracy as percent recovery} = \frac{\text{Spiked Sample Result} - \text{Sample Result}}{\text{Spike True Value}} \times 100\%$$

Percent recoveries for MS, MSD, and LCS that are analyzed for every batch of up to 20 samples serve as a measure of analytical accuracy. Surrogate standards are added to all samples, blanks, MS, MSD, and LCS analyzed for organic contaminants to evaluate accuracy of the method and help to determine matrix interferences.

As a general rule, the recovery of most compounds spiked into samples is expected to fall within a range of 70 to 130 percent. This range represents the EPA advisory acceptability limits for MS, MSD, and LCS for all organic analysis methods. The surrogate standard advisory acceptability limits are also 70 to 130 percent for all organic analyses with the exception of GC/MS methods, where these limits are specified in the methods for each matrix. Laboratories

may use the advisory limits until the in-house statistically-based control limits are developed for each method of organic analysis and sample matrix. The EPA SW-846 (EPA, 1996) mandates the recovery acceptance limits for metal analysis at 75 to 125 percent.

Control limits are defined as the mean recovery, plus or minus three standard deviations, of the 20 data points, with the warning limits set as the mean, plus or minus two standard deviations. The laboratory will review the QC samples and surrogate standard recoveries for each analysis to ensure that internal QC data lay within the limits of acceptability. The laboratory will investigate any suspect trends and take appropriate corrective actions.

7.2.3 Representativeness

Unlike precision and accuracy, which can be expressed in quantitative terms, representativeness is a qualitative parameter. Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. A qualitative parameter depends on proper design of the sampling program.

Field personnel will be responsible for ensuring that samples are representative of field conditions by collecting and handling samples according to the approved SAP and field standard operating procedure (SOP). Errors in sample collection, packaging, preservation, or COC procedures may result in samples being judged nonrepresentative and may form a basis for rejecting the data.

Data generated by the laboratory must be representative of the laboratory database of accuracy and precision measurements for analytes in different matrices. Laboratory procedures for sample preparation will ensure that aliquots used for analysis are representative of the whole sample. Aliquots to be analyzed for volatile parameters will be removed before the laboratory composites/homogenizes the samples, to avoid losing volatile compounds during mixing.

7.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence where one data set can be compared with another, whether it was generated by a single laboratory or during inter-laboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data.

Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units and standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

7.2.5 Completeness

Completeness is a measure of whether all the data necessary to meet the project have been collected. For the data to be considered complete they must meet all acceptance criteria including accuracy and precision and other criteria specified for an analytical method. The data will be reviewed and/or validated to keep invalid data from being processed through data collection. Completeness is evaluated using the following equation:

$$\text{Completeness} = \frac{\text{Acceptable Results}}{\text{Total Results}} \times 100\%$$

The goal for completeness for all QC parameters, except holding times, will be 90 percent. The goal for holding times will be 100 percent. If these goals are not achieved, the sources of non-conformances will be evaluated to determine whether re-sampling and re-analysis is necessary.

7.3 Project-Required Reporting Limits

Following the Navy requirements (NFESC, 1999), the laboratory will determine the Method Detection Limits (MDL) for each method, instrument, analyte, and matrix by using the procedure described in 40 Code of Federal Regulation Part 136B. The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero.

An MDL study involves preparation/digestion and analysis of seven replicates of a given matrix spiked with target analytes at concentrations two to five times greater than the estimated MDL. The MDLs for metals in soil will be derived from the MDLs for metals in water. At a minimum, the laboratory will conduct annual MDL studies. The laboratory will select the practical quantitation limits (PQL) for all analytes at concentration levels that exceed the calculated MDLs by a factor of two to ten.

Reporting limits for the project are presented in Tables 2, 3 and 4. These limits may be elevated for individual samples if matrix interferences are encountered.

8.0 Laboratory Quality Assurance

The following sections describe the QC and QA procedures the analytical laboratory will follow to generate defensible data of known quality for the project.

8.1 Laboratory Qualifications

The analytical laboratories selected to analyze samples for this project will be certified by the California Department of Health Services through the Environmental Laboratory Accreditation Program for all analytical methods required for the project. In addition, the laboratory will successfully complete the NFESC's Laboratory Evaluation Program prior to sampling activities, and maintain that status throughout the project.

Laboratories selected for the project must be capable of providing the required turnaround times, project QC, and data deliverables required by this SAP.

8.2 Laboratory Quality Assurance and Quality Control Program

The laboratory will comply with the DoD QSM (2006) for the management of quality systems for environmental testing. Quality assurance is a set of operating principles that, if strictly followed during sample collection and analysis, will produce defensible data of known quality. Included in QA are QC and quality assessments. Quality control is a set of measures within a sample analysis methodology to assure that the process is in control. Quality assessment consists of procedures for determining the quality of laboratory measurements by use of data from internal and external QC measures.

A properly designed and executed QC program will result in a measurement system operating in a state of statistical control, which means that errors have been reduced to acceptable levels. An effective QA program includes the following elements:

- Certification of operator competence
- Internal QC checks, such as recovery of known additions through use of surrogate standards, MSs, and LCSs
- Analysis of externally supplied standards
- Analysis of reagent blanks
- Calibration with standards using internal or external standard procedures
- Calibration verification with second source standard

- Analysis of duplicates
- Maintenance of control charts

Strict adherence to Good Laboratory Practices and consistent use of SOPs are also essential for a successful QC program. The laboratory will have the current revisions of the SOPs readily available for all staff. At a minimum, SOPs will be written for the following procedures and methods:

- Sample receipt/control/disposal
- Sample preparation/extraction
- Sample analysis
- Results calculation
- Database management
- Health and safety
- Corrective action.

The analytical laboratory will have written SOPs defining the instrument operation and maintenance, tuning, calibration, MDL determination, QC acceptance criteria, blank requirements, and stepwise procedures for each analytical method. The SOPs will be available to the analysts in the laboratory. Any method that is subcontracted by the laboratory to another laboratory, or sent to another facility of the same network of laboratories, will have a prior approval of the Shaw Project Chemist.

8.3 Calibration

All instruments will be calibrated according to DoD QSM requirements and the calibration acceptance criteria met before samples are analyzed. Calibration standards will be prepared with National Institute for Standards and Testing-traceable standards and analyzed per method requirements. Initial calibration acceptance criteria documented in the laboratory SOPs will meet those of applicable guidance documents. The initial calibration will meet one of the following requirements:

- The lowest concentration of the calibration standard is less than or equal to the PQL based on the final volume of extract or sample.
- For each target analyte, at least one of the calibration standards will be at or below the regulatory limit (action level) as defined by the DQOs.

Before samples are analyzed, initial calibration will be verified with a second source standard prepared at the mid-point of the calibration curve. Initial calibration verification will meet the acceptance criteria, which are expressed in the laboratory SOPs (IT, 2000c).

Daily calibration verification will be conducted at the method-prescribed frequencies, and will meet the acceptance criteria of applicable guidance documents. Daily calibration verification will not be used for quantitation of target analytes.

Calibration data (calibration tables, chromatograms, instrument printouts, and laboratory logbooks) will be clearly labeled to identify the source and preparation of the calibration standard and, therefore, be traceable to the standard preparation records.

8.4 Preventive Maintenance

The primary objective of a preventive maintenance program is to help ensure the timely and effective completion of a measurement effort by minimizing the down time of crucial analytical equipment due to expected or unexpected component failure. In implementing this program, efforts are focused in three primary areas: maintenance responsibilities, maintenance schedules, and adequate inventory of critical spare parts and equipment.

Maintenance responsibilities for laboratory equipment are assigned to the respective laboratory managers. The laboratory managers then establish maintenance procedures and schedules for each major equipment item. These are contained in the maintenance logbooks assigned to each instrument.

The effectiveness of any maintenance program depends, to a large extent, on adherence to specific routine maintenance for each major equipment item. Other maintenance activities may also be identified as requiring attention on an as-needed basis. Manufacturers' recommendations and/or sample throughput provide the basis for the established maintenance schedules, and manufacturers' service contracts provide primary maintenance for many major instruments (*e.g.*, GC/MS instruments, atomic absorption spectrometers, analytical balances, *etc.*). Maintenance activities for each instrument are documented in a maintenance log.

Along with a schedule for maintenance activities, an adequate inventory of spare parts is required to minimize equipment down time. This inventory emphasizes those parts (and supplies), which are subject to frequent failure, have limited useful lifetimes, or cannot be obtained in a timely manner should failure occur.

The respective laboratory managers are responsible for maintaining an adequate inventory of necessary spare parts. Sufficient equipment is on hand to continue analyses in the event that an instrument encounters problems. In addition to backup instrumentation, a supply of spare parts such as GC columns, fittings, and septa; atomic absorption lamps, mirrors, and diaphragms; graphite furnace tubes; and other ancillary equipment is maintained.

8.5 Training

The laboratory will have an established policy and procedure on training and documenting of the analyst's competency. Each staff member that performs sample preparation and analysis will demonstrate their proficiency through preparation and analysis of four LCSs as described in the EPA SW-846 (EPA, 1996). An analyst will be considered proficient if the acceptance criteria for method accuracy and precision are met. The laboratory will maintain all training records on file.

8.6 Supplies and Consumables

The laboratory will inspect supplies and consumables prior to their use in analyses. The materials specifications in the analytical methods will be used as a guideline for establishing the acceptance criteria for these materials. Purity of reagents will be monitored by analysis of method blanks. An inventory and storage system for materials and supplies will assure use before manufacturers' expiration dates and storage under safe and chemically compatible conditions.

8.7 Software Quality Assurance

The generation, compilation, and reporting of electronic data are critical components of laboratory operations. To produce defensible data of known quality, the laboratory will develop a software QA plan or a SOP, which describe activities related to data generation, reduction, and transfer with modern tools of data acquisition, and the policies and procedures for procurement, modification, and use of computer software.

8.7.1 Software Validation

The laboratory will have procedures in place to ensure that all software for data reduction, reporting, and transfer adequately and correctly performs all intended functions, and does not perform any unintended functions.

The laboratory will verify, validate, and document the proper functioning of the software immediately after any new data acquisition and/or management systems have been installed at the laboratory. The baseline verification and validation may include the following actions:

- Comparison of the computer printouts with reduced data and the raw data
- Manual calculations to confirm correctness of all computer calculations
- Comparison of the analytical report to the electronic deliverable files

Baseline software validation will be documented in laboratory QA files. Continuing software verification will take place during sample analysis. To eliminate data entry errors during analytical sequence set-up, as part of data package review, the correctness of results will be

checked by one manual calculation per QC batch during data review. This verification will be documented in the quality assurance/quality control checklist for each data file.

8.7.2 Software Security

Only authorized and trained laboratory personnel will have access to the operating and data management software. Each analyst will be trained in software use for operating different functional areas of the software systems and have a password that allows access to these areas.

8.7.3 Manual Integration

Manual integration is sometimes necessary for proper compound quantitation in cases when there are overlapping or tailing peaks, and sloping baselines. When justified, manual integration can be conducted for standards, samples, and QC check samples.

Manual integration may include valley-to-valley baselines, vertical peak separation, or slope integration. The type of manual integration is a judgment call of an analyst experienced in GC.

If a need for manual integration arises, the analysts performing analysis will select a proper approach based on their professional judgment. Manual integration will then be conducted and documented in the data file. Once an approach has been selected, it will be consistently used for the similarly affected peaks.

Manual integration documentation will include a copy of a computer-integrated chromatogram, a copy of a manually-integrated chromatogram, a brief justification description, and the name of the person who performed the manual integration. The Laboratory Manager will review and approve all manual integrations performed by analysts.

9.0 Laboratory Corrective Action

Laboratory corrective action will compliant with DoD QSM guidelines. Corrective action takes place when a circumstance arises that has a negative impact on the quality of the analytical data generated during sample analysis. For corrective action to be initiated, awareness of a problem must exist. In most instances, the individuals performing laboratory analyses are in the best position to recognize problems that will affect data quality. Keen awareness on their part can frequently detect minor instrument changes, drifts, or malfunctions, which can then be corrected, thus preventing a major breakdown in the QC system in place. If major problems arise, they are in the best position to recommend the proper corrective action and initiate it immediately, thus minimizing data loss. Therefore, the laboratory personnel will have a prime responsibility for recognizing a nonconformance and the need for implementing and documenting the corrective action. If a situation arises requiring corrective action, the following closed-loop corrective action process will be used:

1. Define the problem
2. Assign responsibility for investigating the problem
3. Investigate and determine the cause of the problem
4. Determine corrective action course to eliminate the problem
5. Assign responsibility for implementing the corrective action
6. Determine the effectiveness of the corrective action and implement the correction
7. Verify that the corrective action has eliminated the problem
8. If not completely successful, return to Step 1

The personnel identifying or originating a nonconformance will document it to include the following items:

- Identification of the individual(s) identifying or originating the nonconformance
- Description of the nonconformance
- Any required approval signatures
- Method(s) for corrective action or description of the variance granted
- Schedule for completing corrective action

All affected project samples will be listed on a Nonconformance/Corrective Action Report. The Laboratory Project Manager will notify the Shaw Project Chemist of any laboratory nonconformance affecting the samples. Nonconformance/Corrective Action Reports will be submitted to Shaw as part of data packages.

9.1 Batch Corrective Action

Analytical laboratory processes are batch processes, and the batch is a basic unit for the frequency of some QC elements. A batch is a group of samples of similar matrix that behave similarly with respect to the procedures being employed. The following three types of batches can be identified at the analytical laboratory:

- Preparation batch
- Instrument batch
- Sample delivery group (SDG)

A preparation batch is a group of up to 20 field samples, which are prepared (*e.g.*, extracted or digested) simultaneously or sequentially without interruption. Samples in each batch are of similar matrix (*e.g.*, soil, sludge, liquid waste, and water), are treated in a similar manner, and are processed with the same lots of reagents. For organic compound analyses, each batch will contain a method blank, an LCS, and an MS/MSD pair. For inorganic compound analyses, each batch will contain a method blank, an LCS, an MS, and a SD. These QC check samples are not counted into the maximum batch size of 20.

An instrument batch is a group of samples, which are analyzed within the same analytical run sequence. If the continuous operation of an instrument is interrupted (*e.g.*, shut down for maintenance, *etc.*), a new instrument batch must be started. The instrument batch includes an instrument blank, calibration check standards, extracts/digestates of the field samples, and QC check samples. The number of samples in the analytical batch is not limited, but the frequency of the calibration check standard and instrument blank analysis is mandated in each particular method.

For VOC analyses by GC or GC/MS, the preparation and instrument batch are the same, since the sample preparation (purge and trap) is performed as part of the instrument analysis. For these analyses, a batch is defined as a group of up to 20 field samples that are sequentially loaded on the instrument and analyzed as a single analytical run sequence. Laboratory QC check samples (*i.e.*, method blank, an LCS, and an MS/MSD pair) will be analyzed as part of the batch in addition to 20 field samples, as well as the calibration standard per method requirements.

For Contract Laboratory Program analyses, an SDG is defined as a group of 20 or fewer samples within a project that are received over a period of 14 days or less. An SDG is primarily a reporting format and is not limited to sample receipt groups, preparation batches, or analytical batches.

Method QC acceptance criteria determine whether a method is performing within acceptable limits of precision and accuracy. There is a method component and a “matrix” component to this

determination. The method component measures the performance of the laboratory analytical processes during the sample analyses. The matrix component measures the method performance on a specific matrix. Some QC elements uniquely measure the laboratory component of method performance, but all QC elements measuring the matrix component, contain the method component.

Method blanks and LCSs uniquely measure the method performance. Matrix spikes, MSDs, laboratory SDs, surrogate standards, and post-digestion spikes measure the matrix component of method performance.

9.2 Method Blank

The method blank measures laboratory-introduced contamination for the sample batch and batch corrective action is initiated when contamination is found. It may include re-analysis of the blank; re-analysis of the samples; re-preparation and re-analysis of the blank, QC, and samples; and assessment of the impact of the contamination on batch sample data. Although it is a goal to have no detected target analytes in the method blanks, analytes may be periodically detected in blanks due to the nature of the analysis or the reporting limit for the analyte. For example, methylene chloride, acetone, and 2-butanone may sometimes be found in blanks for VOC analyses and the phthalate esters may sometimes be found in the blanks for SVOC analyses.

A method blank will be considered acceptable where target analytes are present at concentrations where the conditions are less than the following:

- One half of the PQLs
- 5 percent of the regulatory limits for these analytes
- 5 percent of the sample results for these analytes.

If the method blank results do not meet these acceptance criteria, the laboratory will initiate corrective action.

The first step of corrective action is to assess the effect on the samples. For example, if an analyte is found only in the blank, but not in any of the associated samples, or if the target analyte in the blank is less than one twentieth the value in the sample, no corrective action is necessary.

If corrective action is required, the method blank and any samples containing the same contaminant will be re-analyzed. If the contamination remains, the contaminated samples of the batch would be re-extracted and re-analyzed with a new method blank and QC check samples.

9.3 Laboratory Control Sample

An LCS must meet the accuracy acceptance criteria for target analytes for the batch to be considered acceptable. If the target analytes are outside of the acceptance limits, corrective action will be initiated. Laboratory control limits for LCS samples may follow the DoD Development of Department of Defense Laboratory Sample Control Limits (DoD, 2004) guideline or statistically in-house derived control limits.

Corrective action will include re-extraction and re-analysis of the whole batch, including method blanks, samples, and QC check samples.

If MSs are not conducted, an LCS/LCD pair will be analyzed with each batch of samples. If the LCS/LCD are outside method acceptance criteria for accuracy and precision, the whole batch will be re-extracted and re-analyzed, including method blanks, samples, and QC check samples.

9.4 Matrix Spike and Matrix Spike Duplicate

An MS/MSD pair is included with each batch of samples for organic compound analyses and MS and laboratory SDs are included with each batch of samples for inorganic compound analysis. These QC check samples allow evaluating the accuracy and precision of analysis and the influence of matrix effects.

Matrix spike data evaluation is more complex than blank or LCS data evaluation since MSs measure matrix effects in addition to sample preparation and analysis effects. Sample heterogeneity, lithological composition of soil, and presence of interfering chemical compounds often negatively affect precision and accuracy of analysis. If the native concentration of target analytes in the sample chosen for spiking is high relative to the spiking concentration, the differences in the native concentration between the unspiked sample and the spiked samples may contribute a significant error in the precision and accuracy. The accuracy and precision in this case are not representative of the true method and matrix performance.

If the accuracy of MS/MSD analysis is outside the acceptability limits for any target analyte, the LCS will be evaluated. If the LCS accuracy limits are met, the MS/MSD recovery problem will be identified as matrix effect and no further action will be required. If the LCS accuracy limits are not met, corrective action will be implemented, and the affected samples and associated QC samples will be re-prepared and re-analyzed.

If the MS/MSD or sample/SD pair fail in precision due to observed matrix interferences, sample heterogeneity or the nature of the contaminant, corrective action will not be required, and the laboratory will make an appropriate notation in the case narrative.

9.5 Individual Sample Corrective Action

In addition to batch corrective action, individual samples within a batch may also require corrective action. Re-extraction and re-analysis of individual samples will take place in the following situations:

- Surrogate standard recoveries are outside acceptability limits
- Internal standard areas for GC/MS analyses are outside acceptability limits

Errors have been made during sample preparation, and results of analysis are not conclusive.

10.0 Data Management

This section describes the data management procedures for data review, verification, reporting, and validation.

10.1 Data Reduction, Verification, and Reporting

All analytical data generated by the laboratory in support of this project will be reviewed prior to reporting to assure the validity of reported data. This internal laboratory data review process will consist of data reduction, three levels of documented review, and reporting. Review processes will be documented using appropriate checklist forms, or logbooks, that will be signed and dated by the reviewer.

10.1.1 Data Reduction

Data reduction involves the mathematical or statistical calculations used by the laboratory to convert raw data to the reported data. The laboratory will perform reduction of analytical data as specified in each of the appropriate analytical methods and laboratory SOPs. For each method, all raw data results will be recorded using method-specific forms or a standardized output from each of the various instruments.

All data calculations will be verified and initialed by personnel both generating and approving them. All raw and electronic data, notebook references, supporting documentation, and correspondence will be assembled, packaged, and stored for a minimum of ten years for future use. All reports will be held client confidential. If the laboratory is unable to store project-related data for ten years, then it is the responsibility of the laboratory to contact Shaw to make alternative arrangements.

10.1.2 Laboratory Data Verification and Review

The laboratory analyst who generates the analytical data will have the primary responsibility for the correctness and completeness of data. Each step of this verification and review process will involve the evaluation of data quality based on both the results of the QC data and the professional judgment of those conducting the review. This application of technical knowledge and experience to the evaluation of data is essential in ensuring that data of known quality are generated consistently. All data generated and reduced will follow well-documented in-house protocols.

10.1.2.1 Level 1. Technical (Peer) Data Review

Analysts will review the quality of their work based on an established set of guidelines, including the QC criteria established in each method, in this SAP, and as stated within the laboratory

QA Manual. This review will, at a minimum, ensure that the following conditions have been met:

- Sample preparation information is correct and complete
- Analysis information is correct and complete
- Appropriate SOPs have been followed
- Calculations are verified
- There are no data transposition errors
- Analytical results are correct and complete
- QC samples are within established control limits
- Blanks and LCSs are within appropriate QC limits
- Special sample preparation and analytical requirements have been met

Documentation is complete, for example, any anomalies and holding times have been documented and forms have been completed.

10.1.2.2 Level 2. Technical Data Review

A supervisor or data review specialist whose function is to provide an independent review of data packages will perform this review. This review will also be conducted according to an established set of guidelines and will be structured to verify the following finding of Level 1 data review:

- All appropriate laboratory SOPs have been followed
- Calibration data are scientifically sound, appropriate to the method, and completely documented
- QC samples are within established guidelines
- Qualitative identification of contaminants is correct
- Manual integrations are justified and properly documented
- Quantitative results and calculations are correct
- Data are qualified correctly
- Documentation is complete, for example, any anomalies and holding times have been documented and appropriate forms have been completed
- Data are ready for incorporation into the final report
- The data package is complete and complies with contract requirements

The Level 2 review will be structured so that all calibration data and QC sample results are reviewed and all of the analytical results from at least 10 percent of the samples are checked

back to the sample preparation and analytical bench sheets. If no problems are found with the data package, the review will be considered complete.

If any problems are found with the data package, an additional 10 percent of the sample results will be checked back to the sample preparatory and analytical bench sheets. This cycle will then be repeated either until no errors are found in the checked data set or until all data has been checked. All errors and corrections noted will be documented.

10.1.2.3 Level 3. Administrative Quality Assurance Data Review

The Laboratory QA Manager will review 10 percent of all data packages. This review should be similar to the review as provided in Level 2, except that it will provide a total overview of the data package to ensure its consistency and compliance with project requirements. All errors noted will be corrected and documented.

10.1.3 Data Reporting

This section details the requirements for data reporting and data package formats that will be provided by the laboratory.

10.1.3.1 Hard Copy Deliverables

All relevant raw data and documentation, including (but not limited to) logbooks, data sheets, electronic files, and final reports, will be maintained by the laboratory for at least ten years. The laboratory will notify Shaw 30 days before disposal of any relevant laboratory records.

Shaw will maintain copies of all COC Records until receipt of the laboratory report. Laboratory reports will be logged in upon receipt and filed in chronological order. If necessary based on project DQOs, the second copy of the report will be sent for third-party data validation.

Data packages will be prepared to meet the requirements for data package contents that are presented in Table 9, "Data Deliverables Package Requirements." The data deliverable requirements for this project will be 90 percent EPA Level III and 10 percent EPA Level IV (Navy SWDIV, 2001a). Data packages for waste characterization samples will require a standard laboratory package. One copy of all COCs and final laboratory data packages will be submitted to the Navy Administrative Record.

10.1.3.2 Electronic Deliverables

The electronic data deliverable (EDD) will be in ASCII format. The analytical laboratory will follow the requirements stated in the Laboratory Interface Document for the Analytical Laboratory EDD for ShawView. After data have been validated, Shaw will submit all analytical data to the Naval Installation Restoration Information Solutions (NIRIS) in the Naval Electronic Data Deliverables (NEDD) format. As the project progresses, Shaw will submit EDD files and a

sample tracking log file to TtEMI to have data incorporated into TI database. Waste samples results will not be submitted to the Naval Electronics Data Deliverable/Naval Installation Restoration Information Solution database.

The laboratory will certify that the EDD and the hard copy reports are identical. Both the EDD and the hard copy will present results to two or three significant figures. For inorganic results, two significant figures will be used for results that are less than 10, and three significant figures will be used for results that are greater than 10. For organic results, one significant figure will be used for results that are less than 10, and two significant figures will be used for results that are greater than 10. The EDD for each SDG will be due at the same time as the hard copy; 14 days after the last sample of the SDG has been delivered to the laboratory.

Field information (*e.g.*, date and time collected, sample identification, *etc.*) will be entered directly into the main database from the COC Record or uploaded from electronic files generated in the field.

10.2 Data Validation

All samples with the exception of waste characterization samples will be validated. Data will be validated at 90 percent EPA Level III and 10 percent EPA Level IV by an independent data validation company. The validation will be in accordance with the EPA *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA, 2002), the EPA *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA, 1999b), and the QC criteria specified in the DoD QSM. Data will be validated and flagged with data qualifiers shown below:

Data will be validated and flagged with the following data qualifiers:

- *J qualifier* denotes the analyte was positively identified, but the associated numerical value is estimated.
- *U qualifier* denotes the analyte was analyzed for, but not detected. The associated numerical value is at or below the reporting limit.
- *R qualifier* denotes the data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.

10.3 Data Review

The Project Chemist will review the laboratory data packages for waste samples to establish that holding times for extraction and analysis, calibration, and internal QC check requirements have been met and to establish data usability.

10.4 Data Quality Assessment Report

Based on data validation/review, the Project Chemist will determine if the project DQOs have been met, and will calculate data completeness. To reconcile the collected data with project DQOs and to establish and document data usability, the Project Chemist will prepare a Data Quality Assessment Report (DQAR). The DQAR will cover the following topics:

- Implementation of sampling design and analysis according to the approved SAP (or sample completeness and representativeness)
- Proper frequency of field QC samples and the adequacy of field decontamination procedures
- Accuracy and precision of the data collected
- Data comparability, if appropriate
- Data usability for project decisions

The DQA report will be included in the Final Project Report. The project documents will be maintained as shown in Table 10, "Project Documents and Records Table (QAPP Worksheet #29)," and verified according to Table 11, "Verification Process Table (QAPP Worksheet #34)."

11.0 Quality Assurance Oversight

The QA oversight for this project will include system audits of field activities and of the laboratory subcontracted by the Navy to perform the analyses.

11.1 Laboratory Assessment and Oversight

Systems and performance audits will be carried out by Shaw as independent assessments of sample collection and analysis procedures. The systems audit is a qualitative review of the overall sampling or measurement system, while the performance audit is a quantitative assessment of a measurement system.

Audit results are used to evaluate if the analytical laboratories are able to produce data that fulfill the objectives established for the program and identify any areas requiring corrective action.

11.1.1 Naval Facilities Engineering Service Center Laboratory Audits

The laboratories will successfully complete a NFESC laboratory audit. A NFESC audit conducted in the past for a different project is an acceptable qualification.

11.1.2 Technical Systems Audits

A technical systems audit is an on-site, qualitative review of the sampling or analytical system to ensure that the activity is being performed in compliance with the SAP specifications, and that the collected data fulfill the project DQOs.

Laboratories performing under this program may be required to have a pre-qualification (or periodic) systems audit performed by Shaw, depending on the scope of services to be provided, past performance, or other factors indicating a need to evaluate quality in this manner. Subsequently, the laboratories will respond to and address any project or technical concerns resulting from the audits. A follow-up audit may be performed to verify resolution of findings and observations, as well as review the corrective measures taken. Laboratories found deficient will not be used on a project until the deficiencies are corrected and the laboratory accepted. Laboratories previously qualified for the types of testing to be performed on the project will not require pre-qualification. That is, if pre-qualification has been within the past year and the work performed has been acceptable.

The laboratory systems audit results will be used to review laboratory operations and to ensure that any outstanding corrective actions have been addressed. A laboratory systems audit will include the following critical areas:

- Sample custody procedures

- Calibration procedures and documentation
- Completeness of data forms, notebooks, and other reporting requirements
- Data review procedures
- Storage, filing, and record keeping procedures
- QC procedures and documentation
- Operating conditions of facilities and equipment
- Documentation of training and maintenance activities
- Systems and operations overview
- Security of laboratory automated systems

After the audit, a debriefing session will be held for all participants to discuss the preliminary audit results. The auditor will then complete the audit evaluation and submit to the Project Manager and the laboratory, an audit report including observations of the deficiencies and the necessary recommendations for corrective actions. Follow-up audits will be performed prior to completion of the project to ensure corrective actions have been taken.

11.1.3 Performance Evaluation Audits

Performance audits quantitatively assess the data produced by a measurement system. A performance audit involves submitting project-specific performance evaluation samples for analysis for each analytical method used in the project. The performance audit answers questions about whether the measurement system is operating within control limits and whether the data produced will meet the project DQOs. If there is a concern about the laboratory performance, or per the Navy request, Shaw will administer performance evaluation samples for the target analytes.

Review of performance evaluation results include the following elements:

- Correct identification and quantitation of the performance evaluation sample analytes
- Accurate and complete reporting of the results
- Measurement system operation within established acceptance limits for accuracy

The concentrations reported for the performance evaluation samples will be compared to the known or expected concentrations spiked in the samples. The percent recovery will be calculated and the results assessed according to the acceptance limits, which are based on inter-laboratory studies. If the accuracy criteria are not met, the cause of the discrepancy will be investigated, and a second performance evaluation sample will be submitted. The performance evaluation sample results review will be documented in a report to the Project Manager.

11.1.3.1 Performance Evaluation Sample Programs

The off-site laboratory will participate in the EPA performance evaluation Water Supply and Water Pollution Studies programs or equivalent programs for state certifications. Satisfactory

performance in these performance evaluation programs also demonstrates proficiency in methods used to analyze project samples. The laboratory will document the corrective actions to unacceptable performance evaluation results to demonstrate resolution of the problems.

11.1.3.2 Magnetic Tape Audits

Magnetic tape audits involve the examination of the electronic media used in the analytical laboratory to acquire, report, and store data. These audits are used to assess the authenticity of the data generated, and assess the implementation of good automated laboratory practices. Shaw may perform magnetic tape audits of the off-site laboratory when warranted by the project performance evaluation sample results, or by other circumstances.

11.2 Field Audits

The Shaw and the Navy 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 documentations, instrument calibrations, and field measurements.

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

Sampling operations will be reviewed and compared to this SAP and other applicable SOPs (IT, 2000c). 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, that the calibration is done at the appropriate frequency, and that the sensitivity range of the instrument is appropriate for the project.

Audit findings will be documented in a report to the Shaw Program QC Manager and the Project Manager. Corrective action will be implemented as necessary.

11.3 Sampling and Analysis Plan

When circumstances arise that impact the original project DQOs, such as a significant change in work scope, this SAP will be revised or amended. The modification process will be based on EPA guidelines (EPA, 1994), and direction from the Navy and QA Officer.

12.0 References

40 Code of Federal Regulations 262.34

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Figures

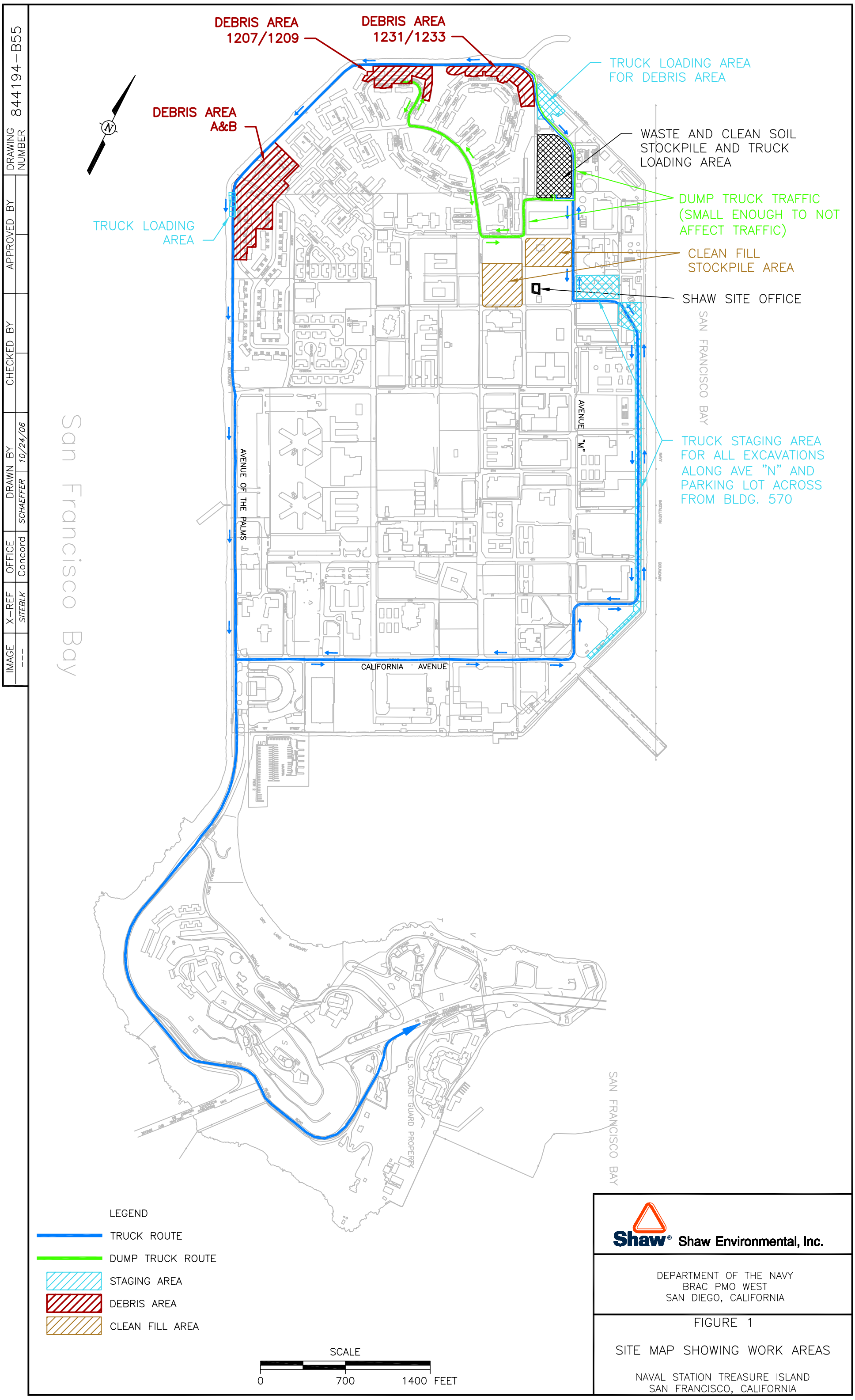

IMAGE	X-REF	OFFICE	DRAWN BY		APPROVED BY	CHECKED BY	DRAWING NUMBER
---	SITEBLK	Concord	SCHAEFFER	10/24/06			844194-B55

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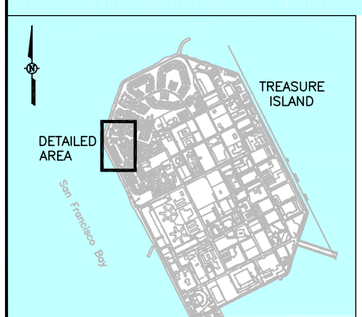
DEPARTMENT OF THE NAVY
BRAC PMO WEST
SAN DIEGO, CALIFORNIA

FIGURE 1

SITE MAP SHOWING WORK AREAS

NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE	X-REF	IMAGE
122412-B11	PB 2/21/07	BM 2/21/07	SJZ 2/21/07	TI	---	---



LEGEND:

- SOLID WASTE DISPOSAL AREAS (BACKYARDS AND COMMON AREAS THAT ARE INCLUDED IN EECA) TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- CARPORT
- TREES, SHRUBS
- PROPOSED BOTTOM SAMPLE LOCATION
- PROPOSED SIDEWALL SAMPLE LOCATION
- PROPOSED BOTTOM SAMPLE GRID
- CURRENT SWDA FENCE CONFIGURATION
- TEMPORARY FENCE LINE
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK
- AREA OF VOC DETECTIONS
- AREA OF METHANE DETECTIONS

SCALE

0 80 160 FEET

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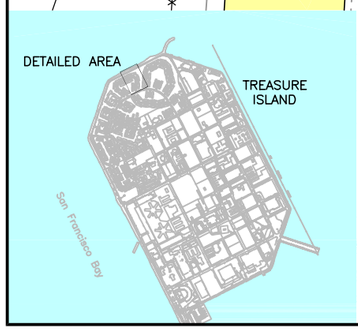
SAN DIEGO, CALIFORNIA

FIGURE 2

SWDA A & B PROPOSED SAMPLE STRATEGY
SITE 12, NAVSTA TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	TI	SJZ 2/21/07	BM 2/21/07	PB 2/21/07	122412-B12



LEGEND:

- SOLID WASTE DISPOSAL AREAS (BACKYARDS AND COMMON AREAS THAT ARE INCLUDED IN EECA) TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- CARPORT
- TREES, SHRUBS
- PROPOSED BOTTOM SAMPLE LOCATION
- PROPOSED SIDEWALL SAMPLE LOCATION
- PROPOSED BOTTOM SAMPLE GRID
- CURRENT SWDA FENCE CONFIGURATION
- TEMPORARY FENCE LINE
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK

SCALE

0 50 100 FEET

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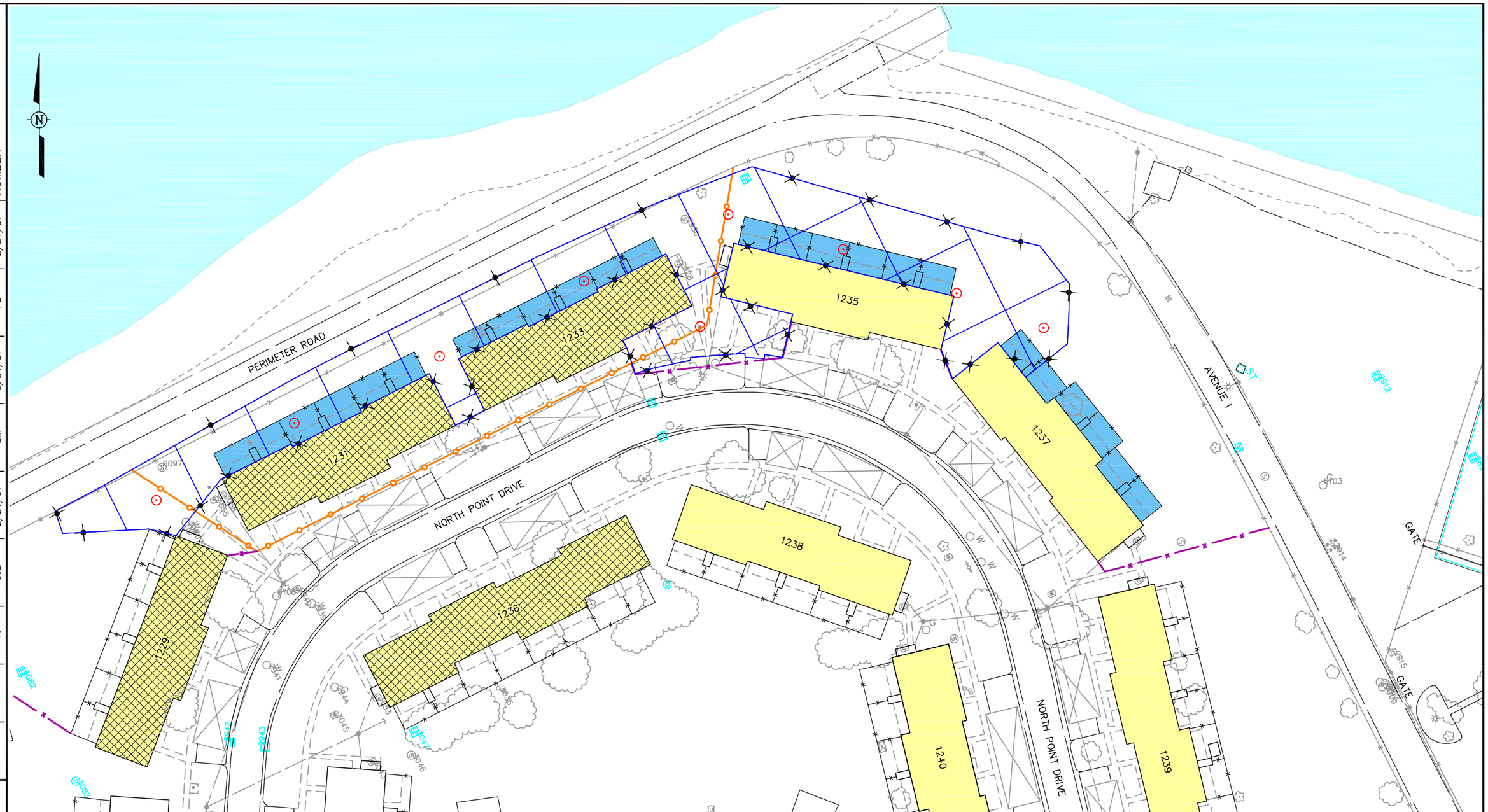
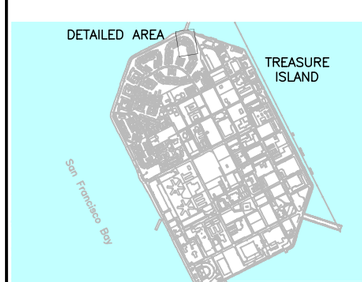
DEPARTMENT OF THE NAVY
BRAC PMO WEST
SAN DIEGO, CALIFORNIA

FIGURE 3
SWDA 1207/1209 PROPOSED SAMPLE STRATEGY
SITE 12, NAVSTA TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	TI	SJZ 2/21/07	BM 2/21/07	PB 2/21/07	122412-B13





LEGEND:

- SOLID WASTE DISPOSAL AREAS (BACKYARDS AND COMMON AREAS THAT ARE INCLUDED IN EECA) TO BE EXCAVATED
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS
- COMMON AREAS
- CARPORT
- TREES, SHRUBS
- PROPOSED BOTTOM SAMPLE LOCATION
- PROPOSED SIDEWALL SAMPLE LOCATION
- PROPOSED BOTTOM SAMPLE GRID
- CURRENT SWDA FENCE CONFIGURATION
- TEMPORARY FENCE LINE
- BACKYARD FENCES
- ROADS (CURBS AND GUTTERS)
- SIDEWALK

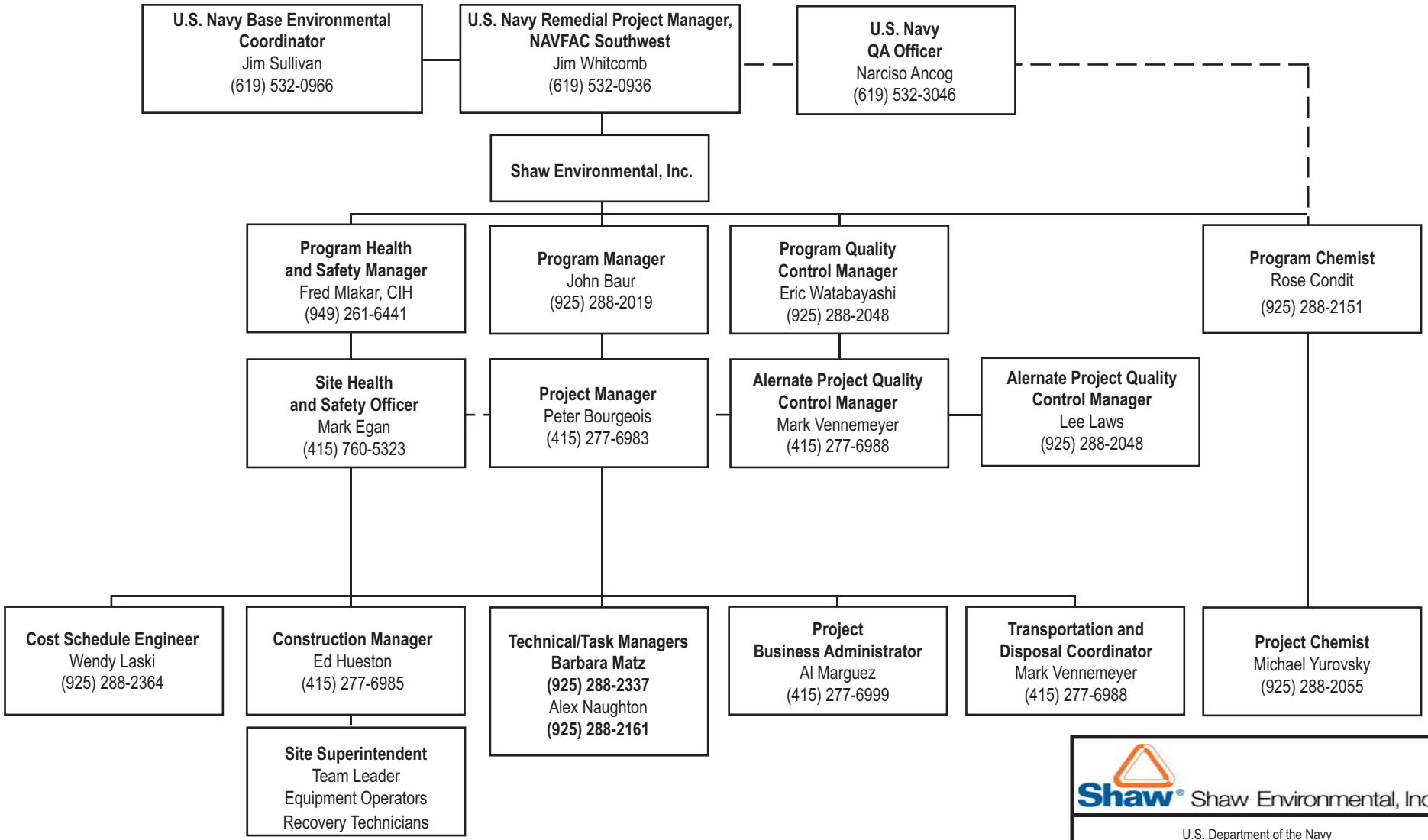
SCALE

0 60 120 FEET

Shaw® Shaw Environmental, Inc.

DEPARTMENT OF THE NAVY
BRAC PMO WEST
SAN DIEGO, CALIFORNIA

FIGURE 4
SWDA 1231/1233 PROPOSED SAMPLE STRATEGY
SITE 12, NAVSTA TREASURE ISLAND



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U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West
San Diego, California

FIGURE 5
CTO 0010 ORGANIZATION CHART
ENVIRONMENTAL REMEDIAL ACTION
CONTRACT NUMBER N62474-01-D-6011

Tables

Table 1
Project Personnel and Chemical Data Collection Responsibilities

Position	Responsibility
U.S. Navy QAO	Provides governmental oversight of the Shaw QA Program. Provides quality-related directives through Contracting Officer's Technical Representative. Provides technical and administrative oversight of Shaw surveillance audit activities. Acts as point of contact for all matters concerning QA and the Navy's Laboratory QA Program. Coordinates training on matters pertaining to generation and maintenance of quality of data. Authorized to suspend project execution if QA requirements are not adequately followed.
Program Chemist	Qualifications- Degree in Chemistry or related field. 10 years or more of environmental laboratory or relevant experience Reviews and approves the SAP. Guides the selection of subcontract analytical laboratories. Conducts field and laboratory audits. Serves as a point of contact for the U.S. Navy QAO. Develops corrective action as required. Serves as a technical advisor to the project.
Project Chemist	Qualifications – Degree in Chemistry or related science. Minimum of 2 years environmental laboratory or relevant project chemistry experience. Develops the project data quality objectives and prepares the SAP. Selects qualified subcontract laboratories. Implements chemical data QC procedures and performs auditing of field performance. Reviews laboratory data prior to use. Coordinates data validation of laboratory data. Reviews data validation report. Prepares the appropriate sections of the report summarizing the project activities.
Field Technician	Performs all sampling in accordance with approved SAP. Ensures that field QC samples are collected as specified in this SAP. Completes field documentation. Coordinates laboratory and field sampling activities. Implements field corrective actions as required.

Table 2
Interim Screening Criteria for Soil (QAPP Worksheet #15)

Analytical Group	CAS No	Analyte	Project Action Limit (mg/kg)	Proposed Project Reporting Limit (mg/kg)	Analytical Method MDLs (mg/kg)
Metals / 6010B	7439-92-1	Lead	400	10	5
PAHs / 8270 SIM	91-20-3	Naphthalene	NA	0.025	0.0125
	91-57-6	2-Methylnaphthalene	NA	0.025	0.0125
	208-96-8	Acenaphthylene	NA	0.025	0.0125
	83-32-9	Acenaphthene	NA	0.025	0.0125
	86-73-7	Fluorene	NA	0.025	0.0125
	85-01-8	Phenanthrene	NA	0.025	0.0125
	120-12-7	Anthracene	NA	0.025	0.0125
	206-44-0	Fluoranthene	NA	0.025	0.0125
	129-00-0	Pyrene	NA	0.025	0.0125
	56-55-3	Benzo(a)anthracene	NA[2]	0.025	0.0125
	218-01-9	Chrysene	NA[2]	0.025	0.0125
	205-99-2	Benzo(b)fluoranthene	NA[2]	0.025	0.0125
	207-08-9	Benzo(k)fluoranthene	NA[2]	0.025	0.0125
	50-32-8	Benzo(a)pyrene	0.62 (equivalent)	0.025	0.0125
	53-70-3	Dibenzo(a,h)anthracene	NA[2]	0.025	0.0125
	191-24-2	Benzo(ghi)perylene	NA[2]	0.025	0.0125
	193-39-5	Indeno(1,2,3-cd)pyrene	NA[2]	0.025	0.0125
PCBs / 8082	12674-11-2	Aroclor-1016	1.0	0.033	0.015
	11104-28-2	Aroclor-1221	1.0	0.033	0.015
	11141-16-5	Aroclor-1232	1.0	0.033	0.015
	53469-21-9	Aroclor-1242	1.0	0.033	0.015
	12672-29-6	Aroclor-1248	1.0	0.033	0.015
	11097-69-1	Aroclor-1254	1.0	0.033	0.015
	11096-82-5	Aroclor-1260	1.0	0.033	0.015

Table 2 (Continued)
Interim Screening Criteria for Soil (QAPP Worksheet #15)

Analytical Group	CAS No	Analyte	Project Action Limit (ng/kg)	Proposed Project Quantitation Limit[3] (ng/kg)	Analytical Method MDLs (ng/kg)
Dioxins/Furans	1746-01-6	2,3,7,8-TCDD	3.9	2	1
	57117-31-4	1,2,3,7,8-PeCDD	NA	5	2.5
	34465-46-8	1,2,3,4,7,8-HxCDD	NA	5	2.5
	57653-85-7	1,2,3,6,7,8-HxCDD	NA	5	2.5
	19408-74-3	1,2,3,7,8,9-HxCDD	NA	5	2.5
	35822-46-9	1,2,3,4,6,7,8-HpCDD	NA	5	2.5
	3268-87-9	OCDD	NA	10	5
	51207-31-9	2,3,7,8-TCDF	NA	2	1
	57117-41-6	1,2,3,7,8-PeCDF	NA	5	2.5
	57117-31-4	2,3,4,7,8-PeCDF	NA	5	2.5
	70648-26-9	1,2,3,4,7,8-HxCDF	NA	5	2.5
	57117-44-9	1,2,3,6,7,8-HxCDF	NA	5	2.5
	72918-21-9	1,2,3,7,8,9-HxCDF	NA	5	2.5
	60851-34-5	2,3,4,6,7,8-HxCDF	NA	5	2.5
	67562-39-4	1,2,3,4,6,7,8-HpCDF	NA	5	2.5
	55673-89-7	1,2,3,4,7,8,9-HpCDF	NA	5	2.5
	39001-02-0	OCDF	NA	10	5

1Analytical MDLs will be dependent on subcontract laboratory experimental MDLs. The PQL will be a minimum of 2 to 5 times the MDL value.

ng/g denotes nanograms per kilogram

2 Compound contributing to benzo(a)pyrene toxic equivalent quotient calculation.

3 RLs for EPA Method 8290 are sample specific and are dependent upon volume extracted and/or potential matrix interferences.

Table 3
Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil	Residential PRG, Soil
Polychlorinated Biphenyls, mg/kg				
AROCLOR 1016	12674-11-2	0.015	0.033	3.9
AROCLOR 1221	11104-28-2	0.034	0.067	0.22
AROCLOR 1232	11141-16-5	0.015	0.033	0.22
AROCLOR 1242	53469-21-9	0.015	0.033	0.22
AROCLOR 1248	12672-29-6	0.015	0.033	0.22
AROCLOR 1254	11097-69-1	0.015	0.033	0.22
AROCLOR 1260	11096-82-5	0.015	0.033	0.22
Organochlorine Pesticides, mg/kg				
Chlordane	57-74-9	0.05	0.1	1.6
DDD	72-54-8	0.0017	0.0033	2.4
DDE	72-55-9	0.0017	0.0033	1.7
DDT	50-29-3	0.0017	0.0033	1.7
alpha-BHC	319-84-6	0.0009	0.0017	0.09
beta-BHC	319-85-7	0.0009	0.0017	0.32
gamma-BHC (Lindane)	58-89-9	0.0009	0.0017	0.44
Heptachlor	76-44-8	0.0009	0.0017	0.11
Aldrin	309-00-2	0.0009	0.0017	0.029
Heptachlor Epoxide	1024-57-3	0.0009	0.0017	0.053

Table 3 (Continued)
Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil	Residential PRG, Soil
Endosulfan	959-98-8	0.0009	0.0017	370
Dieldrin	60-57-1	0.0017	0.0033	0.03
Endrin	72-20-8	0.0017	0.0033	18
Methoxychlor	72-43-5	0.009	0.017	310
Toxaphene	8001-35-2	0.05	0.1	0.44
Metals, mg/kg				
Antimony	7440-36-0	0.5	1.0	31
Arsenic	7440-38-2	0.5	1.0	0.062 [1]
Barium	7440-39-3	0.5	1.0	5400
Beryllium	7440-41-7	0.5	1.0	150
Cadmium	7440-43-9	0.5	1.0	37
Chromium	7440-47-3	0.05	1.0	210
Cobalt	7440-48-4	0.05	1.0	900
Copper	7440-50-8	0.05	1.0	3100
Lead	7439-92-1	0.05	1.0	150 [1]
Mercury	7439-97-6	0.1	0.2	23
Molybdenum	7439-98-7	0.05	1.0	390
Nickel	7440-02-0	0.05	1.0	1600
Selenium	7782-49-2	0.05	1.0	390

Table 3 (Continued)
Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil	Residential PRG, Soil
Silver	7440-22-4	0.05	1.0	390
Thallium	7440-28-0	0.05	1.0	5.2
Vanadium	7440-62-2	0.05	1.0	78
Zinc	7440-66-6	1.0	2.0	23000
Volatile Organic Compounds, mg/kg				
Acetone	67-64-1	0.025	0.050	14000
Benzene	74-43-2	0.0025	0.005	0.64
Bromobenzene	108-86-1	0.0025	0.005	28
Bromodichloromethane	75-27-4	0.0025	0.005	0.82
Bromoform	75-25-2	0.05	0.010	62
Bromomethane	74-83-9	0.0025	0.005	3.9
2-Butanone	78-93-3	0.025	0.050	22000
n-Butylbenzene	104-51-8	0.0025	0.005	240
sec-Butylbenzene	135-98-8	0.0025	0.005	220
tert-Butylbenzene	98-06-6	0.0025	0.005	390
Carbon Disulfide	75-15-0	0.0025	0.005	360
Carbon Tetrachloride	56-23-5	0.0025	0.005	0.25
Chlorobenzene	108-90-7	0.0025	0.005	150
Dibromochloromethane	124-48-1	0.0025	0.005	1.1
Chloroethane	75-00-3	0.050	0.010	3.0

Table 3 (Continued)
Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil	Residential PRG, Soil
Chloroform	67-66-3	0.0025	0.005	0.94 [1]
Chloromethane	74-87-3	0.05	0.010	47
4-Chlorotoluene	106-43-4	0.0025	0.005	160
1,2-Dibromo-3-Chloropropane	96-12-8	0.0025	0.005	0.03 [1]
1,2-Dibromoethane (EDB)	106-93-4	0.0025	0.005	0.032
1,2-Dichlorobenzene	95-50-1	0.0025	0.005	600
1,3-Dichlorobenzene	541-73-1	0.0025	0.005	530
1,4-Dichlorobenzene	106-46-7	0.0025	0.005	3.4
Dichlorodifluoromethane	75-71-8	0.05	0.010	94
1,1-Dichloroethane	75-34-3	0.0025	0.005	2.8 [1]
1,2-Dichloroethane	107-06-2	0.0025	0.005	0.28
1,1-Dichloroethene	75-35-4	0.0025	0.005	120
cis-1,2-Dichloroethene	156-59-2	0.0025	0.005	43
trans-1,2-Dichloroethene	156-60-5	0.0025	0.005	69
1,2-Dichloropropane	78-87-5	0.0025	0.005	0.34
1,3-Dichloropropane	142-28-9	0.0025	0.005	100
Ethyl benzene	100-41-4	0.0025	0.005	400
Hexachlorobutadiene	87-68-3	0.0025	0.005	6.2
Isopropylbenzene (Cumene)	98-82-8	0.0025	0.005	160
Methylene Chloride	75-09-2	0.0025	0.005	9.1

Table 3 (Continued)
Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil	Residential PRG, Soil
Methyl isobutyl ketone (MIBK)	108-10-1	0.025	0.050	5300
Methyl tertiary butyl ether (MTBE)	1634-04-4	0.0025	0.005	17 [1]
Naphthalene	91-20-3	0.0025	0.005	1.7
n-Propylbenzene	106-65-1	0.0025	0.005	240
Styrene	100-42-5	0.0025	0.005	1700
1,1,1,2-Tetrachloroethane	630-20-6	0.0025	0.005	3.2
1,1,2,2-Tetrachloroethane	79-34-5	0.0025	0.005	0.41
Tetrachloroethene	127-18-4	0.0025	0.005	0.48
Toluene	108-88-3	0.0025	0.005	520
1,2,4-Trichlorobenzene	120-82-1	0.0025	0.005	62
1,1,1-Trichloroethane	71-55-6	0.0025	0.005	1200
1,1,2-Trichloroethane	79-00-5	0.0025	0.005	0.73
Trichloroethene	79-01-6	0.0025	0.005	2.9 [1]
Trichlorofluoromethane	75-69-4	0.0025	0.005	390
1,2,3-Trichloropropane	96-18-4	0.0025	0.005	0.034
1,2,4-Trimethylbenzene	95-63-6	0.0025	0.005	52
1,3,5-Trimethylbenzene	108-67-8	0.0025	0.005	21
Vinyl Chloride	75-01-4	0.05	0.010	0.079
Xylene (Total)	1330-20-7 95-47-6	0.0025	0.005	270

Table 3 (Continued)
Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil	Residential PRG, Soil
Semivolatile Organic Compounds, mg/kg				
Acenaphthene	83-32-9	0.17	0.33	3700
Anthracene	120-12-7	0.17	0.33	22000
Benz(a)anthracene	56-55-3	0.17	0.33	0.62
Benzo(a)pyrene	50-32-8	0.17	0.33 [2]	0.062
Benzo(b)fluoranthene	205-99-2	0.17	0.33	0.62
Benzo(k)fluoranthene	207-08-9	0.17	0.33	0.38 [1]
Bis(2-Chloroethyl) Ether	111-44-4	0.17	0.33 [2]	0.22
Benzoic Acid	65-85-0	0.85	1.7	100000
Bis(2-Chloroisopropyl) Ether	108-60-1	0.17	0.33	2.9
Bis(2-Ethylhexyl) Phthalate	117-81-7	0.17	0.33	35
Butyl Benzyl Phthalate	85-68-7	0.17	0.33	12000
4-Chloroaniline	107-47-8	0.17	0.33	240
2-Chloronaphthalene	91-58-7	0.17	0.33	4900
2-Chlorophenol	95-57-8	0.17	0.33	63
Chrysene	218-01-9	0.17	0.33	3.8 [1]
Di-n-Octyl Phthalate (DOP)	117-84-0	0.17	0.33	2400
Dibenz(a,h)anthracene	53-70-3	0.17	0.33 [2]	0.062
Dibenzofuran	132-64-9	0.17	0.33	150
1,2-Dichlorobenzene	95-50-1	0.17	0.33	600

Table 3 (Continued)
Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil	Residential PRG, Soil
1,3-Dichlorobenzene	541-73-1	0.17	0.33	530
1,4-Dichlorobenzene	106-46-7	0.17	0.33	3.4
3,3'-Dichlorobenzidine	91-94-1	0.33	0.66	1.1
2,4-Dichlorophenol	120-83-2	0.17	0.33	180
Diethyl Phthalate (DEP)	84-66-2	0.17	0.33	49000
Di-N-butyl Phthalate	84-74-2	0.17	0.33	6100
Dimethyl Phthalate (DMP)	131-11-3	0.17	0.33	100000
2,4-Dimethylphenol	105-67-9	0.17	0.33	1200
Semivolatile Organic Compounds, mg/kg				
2,4-Dinitrophenol	51-28-5	0.85	1.7	120
2,4-Dinitrotoluene	121-14-2	0.17	0.33	120
2,6-Dinitrotoluene	606-20-2	0.17	0.33	61
Fluoranthene	206-44-0	0.17	0.33	2300
Fluorene	86-73-7	0.17	0.33	2700
Hexachlorobenzene	118-74-1	0.17	0.33 [2]	0.3
Hexachlorobutadiene	87-68-3	0.17	0.33	6.2
Hexachlorocyclopentadiene	77-47-4	0.17	0.33	370
Hexachloroethane	67-72-1	0.17	0.33	35
Indeno(1,2,3-cd)pyrene	193-39-5	0.17	0.33	0.62
Isophorone	78-59-1	0.17	0.33	510

Table 3 (Continued)
Borrow Material Analytical Requirements, EPA Region 9 Preliminary Remediation Goals, Residential Soil, 2004

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil	Residential PRG, Soil
3/4-Methylphenol (m/p-Cresol)	1319-77-3	0.17	0.33	310
2-Methylphenol (o-Cresol)	95-48-7	0.17	0.33	3100
Naphthalene	91-20-3	0.17	0.33	1.7
2-Nitroaniline	88-74-4	0.85	1.7	180
3-Nitroaniline	99-09-2	0.85	1.7	18
4-Nitroaniline	100-01-6	0.85	1.7	23
Nitrobenzene	98-95-3	0.17	0.33	20
N-Nitroso-Di-n-Propylamine	621-64-7	0.17	0.33 [2]	0.069
N-Nitrosodimethylamine	62-75-9	0.17	0.33[2]	0.0095
N-Nitrosodiphenylamine	86-30-6	0.17	0.33	99
Pentachlorophenol (PCP)	87-86-5	0.85	1.7	3.0
Phenol	108-95-2	0.17	0.33	18000
Pyrene	129-00-0	0.17	0.33	2300
1,2,4-Trichlorobenzene	120-82-1	0.17	0.33	62
2,4,5-Trichlorophenol	95-95-4	0.85	1.7	6100
2,4,6-Trichlorophenol	88-06-2	0.17	0.33	6.9 [1]
Total Petroleum Hydrocarbons				
TPH as gasoline and jet fuel	8006-61-9	0.25	0.5	NA
TPH as diesel and motor oil	68334-30-5	5	10	NA

Notes

[1] California-modified PRG

[2] Reporting Limit for standard analytical method is higher than the PRG. Analyte is not expected to be present in sample, and usage of special analytical method is not feasible. The MDL for the analyte is less than Reporting Limit and any detection above MDL will be reported by analytical laboratory. In these instances, the MDL will be used as the screening criteria.

Table 4
Borrow Material Analytical Requirements Compared to Ambient Metals Concentrations in Artificial Fill, Treasure Island

Analyte Name	CAS No	Proposed MDL	Proposed Reporting Limit, Soil (6020) (mg/kg)	Ambient Concentration, 95th percentile (mg/kg)
Antimony	7440-36-0	0.5	1.0	2.9
Arsenic	7440-38-2	0.5	1.0	10
Barium	7440-39-3	0.5	1.0	260
Beryllium	7440-41-7	0.5	1.0	0.12
Cadmium	7440-43-9	0.5	1.0	1.4
Chromium	7440-47-3	0.5	1.0	75
Cobalt	7440-48-4	0.5	1.0	16
Copper	7440-50-8	0.5	1.0	85
Lead	7439-92-1	0.5	1.0	100
Mercury (7471A)	7439-97-6	0.1	0.2	0.51
Molybdenum	7439-98-7	0.5	1.0	2.0
Nickel	7440-02-0	0.5	1.0	133
Selenium	7782-49-2	0.5	1.0	0.5
Silver	7440-22-4	0.5	1.0	0.45
Thallium	7440-28-0	0.5	1.0	0.71
Vanadium	7440-62-2	0.5	1.0	33
Zinc	7440-66-6	1.0	2.0	94

Table 5
Summary of Field Sampling and Analysis Sampling Locations/IDs, Samples Depths, Sample Analyses and Sampling Procedures (QAPP Worksheet #18)

Sampling Location/ID Number	Matrix	Depth (feet)	Analytical Group	SAP Section Reference
10-AB-EF-001 to -029 (estimated) Bottom – 29	Soil	4	6010B, 8270C SIM, 8082, 8290, 8260B	3.2.4 and 5.2.1
10-AB-SW-001 to -086 (estimated) Sidewall – 86	Soil	2	6010B, 8270C SIM, 8082, 8290, 8260B	3.2.4 and 5.2.1
10-AB-RS-001 to -80 Radiological screening confirmation	Soil	0, 1, 2, 3, 4	On-Site Mobile Radiological Screening Lab, 901.1M	3.2.3 and 5.2.1
10-1207-EF-001 to -16 (estimated) Bottom – 16	Soil	4	6010B, 8270C SIM, 8082, 8290	3.2.4 and 5.2.1
10-1207-SW-001 to -035 (estimated) Sidewall – 35	Soil	2	6010B, 8270C SIM, 8082, 8290	3.2.4 and 5.2.1
10-1207-RS-001 to -80 Radiological screening confirmation	Soil	0, 1, 2, 3, 4	On-Site Mobile Radiological Screening Lab, 901.1M	3.2.3 and 5.2.1
10-1231-EF-001 to -09 (estimated) Bottom – 9	Soil	4	6010B, 8270C SIM, 8082, 8290	3.2.4 and 5.2.1
10-1231-SW-001 to -038 (estimated) Sidewall – 38	Soil	2	6010B, 8270C SIM, 8082, 8290	3.2.4 and 5.2.1
10-1231-RS-001 to -80 Radiological screening confirmation	Soil	0, 1, 2, 3, 4	On-Site Mobile Radiological Screening Lab, 901.1M	3.2.3 and 5.2.1

Table 5 (Continued)
Summary of Field Sampling and Analysis Sampling Locations/IDs, Samples Depths, Sample Analyses and Sampling Procedures (QAPP Worksheet #18)

Sampling Location/ID Number	Matrix	Depth (feet)	Analytical Group	SAP Section Reference
Borrow Material-001 through –004	Soil	NA	TPH as gasoline (EPA 5035/8015B) TPH as diesel and motor oil (EPA 8015B) VOCs (EPA 5035/8260B) SVOCs (EPA 8270C) PCBs (EPA 8082) Organochlorine pesticides (EPA 8081A) CCR Title 22 Metals (EPA 6010B/7000)	3.3
Project Waste Disposal Profile	Soil	NA	TPH as diesel and motor oil (EPA 8015B) PCBs (EPA 8082) SVOC (EPA 8270C) CCR Title 22 Metals (EPA 6010B/7000) STLC or TCLP	3.4 and 5.3

Table 6
Measurement Performance Criteria – Field QC (QAPP Worksheet #12)

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicates	Lead (EPA 6010B) PCB (EPA 8082) PAH (EPA 8270-SIM) VOCs (EPA 5035/8260B) Dioxin/Furans (EPA 8290)	10 %	Precision	50% - Soil	S&A
Rinse Blanks	Lead (EPA 6010B) PCB (EPA 8082) PAH (EPA 8270-SIM) Dioxin/Furans (EPA 8290)	None – disposable sampling equipment only	Representativeness	Analytes not detected	S
Matrix Spikes	Lead (EPA 6010B) PCB (EPA 8082) VOCs (EPA 5035/8260B) PAH (EPA 8270-SIM) Dioxin/Furans (EPA 8290)	5 %	Precision and Accuracy	Laboratory statistically derived control limits	A

Table 6 (Continued)
Measurement Performance Criteria – Field QC (QAPP Worksheet #12)

QC Sample	Analytical Group[1]	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Temperature Blanks	Lead (EPA 6010B) PCB (EPA 8082) VOCs (EPA 5035/8260B) PAH (EPA 8270-SIM) Dioxin/Furans (EPA 8290)	Every cooler shipped to the laboratory	Representativeness	4 ± 2°C	S

Table 7
Field and Quality Control Sample Summary (QAPP Worksheet #20)

Matrix	Analytical Group	Sample Collection Reference[1]	# of Primary Sampling Locations[2]	# of Field Duplicates	# of MS/MSDs	# of Field Blanks	# of Equipment Rinsates	# of Trip Blanks	Total # of Samples to Lab
Soil	6010B	SAP Section 5.2.1	approx. 213	22	11	None	None	None	246
Soil	8270C SIM	SAP Section 5.2.1	approx 171	17	8	None	None	None	196
Soil	8082	SAP Section 5.2.1	approx 171	17	8	None	None	None	196
Soil	8290	SAP Section 5.2.1	approx 53	6	3	None	None	None	62
Soil	5035/8260B	SAP Section 5.2.1	approx. 10	1	1	None	None	None	12
Soil	901.1M	SAP Section 5.2.1	approx 48	None	None	None	None	None	48

Table 8
Sample Containers, Preservatives, and Holding Times (QAPP Worksheet #19)

Analytes	Method	Container[a]	Preservative	Holding Time Limit
		Soil Samples		
Metals	Preparation: EPA 3050B _____ Analysis: EPA 6010B/7000	4 or 8 ounce glass jar with Teflon®-lined lid	Cool at 4±2°C	180 days for all metals except mercury 28 days for mercury
Dioxins and Furans	Preparation: EPA 3540C Analysis: EPA 8290	8 ounce glass jar with Teflon®-lined lid	Cool at 4±2°C	30 days for extraction and 45 days for analysis
TPH as diesel and motor oil	Preparation: EPA 3540C _____ Analysis: EPA 8015B	4 or 8 ounce glass jar with Teflon®-lined lid	Cool at 4±2°C	14 days for extraction and 40 days for analysis
TPH as gasoline	Preparation: EPA 5035 _____ Analysis: EPA 8015B	2 En Core® devices or equivalent	Cool at 4±2°C	48 hours for unpreserved 14 days for preserved
Pesticides and PCBs	Preparation: EPA 3540C _____ Analysis: EPA 8081A and 8082	4 or 8 ounce glass jar with Teflon®-lined lid	Cool at 4±2°C	14 days for extraction and 40 days for analysis
SVOCs/PAHs	Preparation: EPA 3540C _____ Analysis: EPA 8270C	4 or 8 ounce glass jar with Teflon®-lined lid	Cool at 4±2°C	14 days for extraction and 40 days for analysis
VOCs	Preparation: EPA 5035 _____ Analysis: EPA 8260B	3 En Core® devices or equivalent	Cool at 4±2°C	48 hours for unpreserved 14 days for preserved

Table 8 (Continued)
Sample Containers, Preservatives, and Holding Times (QAPP Worksheet #19)

Analytes	Method	Container[a]	Preservative	Holding Time Limit
Soil Samples				
Gamma Emitting Radionuclides	EPA 901.1M	4 or 8 ounce glass jar with Teflon®-lined lid	Cool at 4±2°C	Not applicable

Notes

(a) Additional sample containers will be provided for MS/MSD analyses.

Table 9
Data Deliverables Package Requirements

Process	Deliverable Requirement	CLP-like Package, Level IV	SW-846 Package, Level III
Sample Login	Case Narrative	X	X
	Corrective Action Report(s)	X	X
	Cross-reference of field sample numbers, laboratory IDs, and analytical QC batches	X	X
	Chain-of-Custody Form, Cooler Receipt Form	X	X
	Sample log-in sheet	X	
Sample and QC Results	Data summary for each blank and sample	X	X
	Initial and continuing calibration blank – Metals	X	X
	Method blank summary	X	
	Surrogate recovery report (including concentration spiked, percent recovered, and percent recovery acceptance limits)-*GC and GC/MS*	X	X
	Internal standard areas and retention time reports (including acceptance limits and out-of-control flags) – *GC and GC/MS*	X	X
	LCS/LCD report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	X	X
	MS/MSD report (including concentration spiked, percent recovered, percent recovery acceptance limits, RPD, and RPD acceptance limits)	X	X
	Post-digestion spike recovery – *Metals*	X	X
	Duplicate sample report – *Inorganic analyses*	X	X
Calibration And Raw Data	Instrument performance check (tuning) report –*GC/MS*	X	X
	Initial calibration data (including acceptance limits)	X	X (summary only)
	Continuing calibration data (including acceptance limits)	X	X (summary only)
	Reconstructed ion chromatogram for each sample and rerun, blank, spike, duplicate, and standard –*GC/MS*	X	
	Instrument quantitation report–*GC and GC/MS*	X	
	Chromatogram for each sample and rerun, blank, spike, duplicate, and standard –*GC*	X	If requested for fuel analyses
	Raw and background subtracted mass spectra for each target analyte found–*GC/MS*	X	
	Mass spectra of TICs with library spectra of five best-fit matches –*GC/MS*	X	
	ICP interference check sample report – *Metals*	X	X
	Standard addition results – *Metals*	X	X
	ICP serial dilution results – *Metals*	X	
	Data and instrument print outs – *Metals*	X	

Table 9 (Continued)
Data Deliverables Package Requirements

Process	Deliverable Requirement	CLP-like Package, Level IV	SW-846 Package, Level III
	ICP inter-element correction factors – *Metals*	X	X
Sample preparation	Sample preparation bench sheets	X	X
	Gel permeation chromatography clean-up logs	X	
	Standard preparation logs	X	
	Analysis run logs	X	X
	Percent moisture	X	X
	pH	X	
	Contract required detection limit standard report	X	

Notes:

°C denotes degrees Celsius

ICP denotes inductively coupled plasma

TIC denotes tentatively identified compunds

Table 10
Project Documents and Records Table (QAPP Worksheet #29)

Document	Where Maintained
Field notes/logbook	Project file
Chain of custody forms	Project file/ NAVFAC Administrative Records
Laboratory raw data package	Project file / NAVFAC Administrative Records
Audit/assessment checklists/reports	Project file and laboratory
Corrective action forms/reports	Project file and laboratory
Laboratory equipment calibration logs	Laboratory
Sample preparation logs	Laboratory
Run logs	Laboratory
Sample disposal records	Laboratory
Validated data	Project file

Table 11
Verification Process Table (QAPP Worksheet #34)

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Chain of Custody forms	Chain-of-custody forms will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody should be initialed by the reviewer, a copy of the chain-of-custody retained in the project file, and the original and remaining copies taped inside the cooler for shipment.	I	Field team leader (consultant)
Audit reports	Upon report completion, a copy of all audit reports will be placed in the project file. If corrective actions are required, a copy of the documented corrective action taken will be attached to the appropriate audit report in the project file. At the beginning of each week, and at the completion of the site work, project file audit reports will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the project manager will be notified to ensure action is taken.	I	Project/task manager (consultant)
Field notes/logbook	Field notes will be reviewed internally and placed in the project file. A copy of the field notes will be attached to the final report.	I	Field team leader (consultant)
Laboratory data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified externally according to the data validation procedures specified in Section 9.0 of the SAP.	I, E	Laboratory and data validators

Appendix G
Site 12 Quality Control Plan

FINAL

QUALITY CONTROL PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

Environmental Multiple Award Contract
Contract Number. N68711-01-D-6011
Contract Task Order 0010

Document Control Number NAV010-002-H
Revision 0

February 26, 2007

Submitted to:

U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West
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Submitted by:

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Concord, California 94520-1120

FINAL

QUALITY CONTROL PLAN
Site 12 Final Remedy Removal Action
Treasure Island
San Francisco, California

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February 26, 2007

Approved by:

_____ Date: February 26, 2007
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Acronyms and Abbreviations

EMAC	Environmental Multiple Award Contract
NAVFAC	Naval Facilities Engineering Command
QC	Quality Control
QCD	Quality Control Directive
QCP	Quality Control Plan

1.0 Introduction

Shaw Environmental, Inc. (hereinafter referred to as Shaw) prepared this Quality Control Plan (QCP) for the U.S. Department of the Navy, Naval Facilities Engineering Command (NAVFAC), under Environmental Multiple Award Contract (EMAC) N68711-01-D-6011, Contract Task Order (CTO) 0010. The QCP supports all field activities for this task order and provides a comprehensive approach for environmental compliance and monitoring activities for non-time critical removal action of three Solid Waste Disposal Areas at Installation Restoration Site 12 at Naval Station Treasure Island.

This QCP provides project specific guidelines for EMAC CTO 0010.

2.0 Quality Control Organization

The QC Project Organization Chart is presented as Attachment 1.

3.0 QC Personnel Names and Qualifications

The QC Manager and Alternate QC Manager resumes are contained in Attachment 2.

4.0 QC Personnel Duties, Responsibility, and Authority

The QC Staff duties and responsibilities are described in Attachment 3.

Quality Control Directive (QCD) 3.1 (IT Corporation, 2002), *QC Personnel Duties, Responsibility, and Authority*, provides a description of duties, qualifications, responsibilities, and authority for the QC Manager, Alternate QC Manager, QC Specialists, Safety Specialist, and Submittal Reviewers.

The QC Manager and Alternate QC Manager have the authority to stop work that is not in compliance with the contract.

Shaw will notify the U.S. Department of the Navy of changes in QC organization personnel.

5.0 Outside Organizations

A list of outside organizations and descriptions of services to be provided is presented in Attachment 4.

6.0 QC Manager Appointment Letters

The QC Manager and Alternate QC Manager Letters of Designation are contained in Attachment 5. The QC Manager shall issue letters of direction to all other QC Specialists outlining their duties, authorities, and responsibilities. Copies of these letters shall be included in this QCP.

7.0 Submittal Procedures and Initial Submittal Register

The Submittal Register for this project is presented in Attachment 6. Contractor Quality Control Report Certifications, Invoice Certifications, and Completion Certifications will be executed and submitted in accordance with QCD 6.1, *QC Certifications* (IT Corporation, 2002).

8.0 Testing Laboratory Information

A copy of the Certificate of Accreditation for both Curtis & Thompkins Ltd. and Air Toxics Ltd, who will be providing environmental laboratory services, are contained in Attachment 7. QCD 7.1, *Construction Materials Testing* (IT Corporation, 2002), provides Laboratory Accreditation Requirements.

9.0 Testing Plan and Log

The Testing Plan and Log is provided in Attachment 8. The Testing Plan and Log includes the tests required (referenced by the specification paragraph number that requires the test), the frequency, and the person responsible for each test.

QCD 8.1, *Test Results* (IT Corporation, 2002), describes how Shaw will review and submit construction materials test reports, and will notify the NAVFAC Contracting Officer immediately if the item fails to conform.

Test reports shall be signed and certified by the authorized laboratory representative. The QC Manager or designate will furnish the signed reports, certifications, and other documentation to the NAVFAC Contracting Officer. The QC Manager or designate shall furnish the signed reports, certifications, and a summary report of field tests for construction materials testing at the end of each month to the NAVFAC Contracting Officer. Shaw will attach a copy of the summary report to the last Daily Quality Control Report of each month.

10.0 Rework Items

The Rework Items List that will be used on this project is included in Attachment 9.

QCD 9.1, *Rework Items List* (IT Corporation, 2002), describes how the QC Manager or designate will identify, document, and track rework items that do not comply with the contract.

The QC Manager or designate will attach a copy of the Rework Items List to the last Daily Quality Control Report of each month. Items identified by the NAVFAC Contracting Officer will be included.

11.0 Documentation Procedures

QCD 10.1, *Daily Production Reports* (IT Corporation, 2002) and QCD 10.2, *Daily Quality Control Reports* (IT Corporation, 2002), provide detailed instructions and guidelines for these reports. A Daily Production Report sheet is provided in Attachment 10, and a Daily Quality Control Report sheet is provided in Attachment 11.

QCD 10.3, *QC Specialist Reports* (IT Corporation, 2002), describes requirements for QC Specialist Reports, which shall be attached to the Daily Quality Control Report.

The QC Manager or designate is required to ensure the as-built drawings are managed in accordance with QCD 10.4, *As-Built Drawings* (IT Corporation, 2002). Upon completion of work, the QC Manager or designate shall furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the NAVFAC Contracting Officer.

QCD 10.5, *Quality Control Validation* (IT Corporation, 2002), outlines requirements for organizing and maintaining on-site QC documentation.

QCD 10.6, *Quality Control Deliverables* (IT Corporation, 2002), describes procedures for submitting QC deliverables (*e.g.*, Daily Production Report, Daily Quality Control Report, Preparatory Phase Checklist, Initial Phase Checklist, QC Specialist Reports, Field Test Reports, Monthly Summary Report of Tests, Testing Plan and Log, Rework Items List, QC Meeting Minutes, and QC Certifications).

12.0 List of Definable Features

The Definable Features of Work Matrix is located in Attachment 12. A definable feature of work is a task that is separate and distinct from other tasks and requires separate quality control requirements.

QCD 11.1, *Definable Features of Work Matrix* (IT Corporation, 2002) provides guidelines for defining a feature of work.

Section 13.0 describes the inspection procedures that will be implemented for each definable feature of work listed in Attachment 12.

13.0 Procedures for Performing the Three Phases of Control

Preparatory, Initial, and Follow-Up Inspection checklists, which will be used to inspect each definable feature of work, are contained in Attachments 13, 14, and 15, respectively.

Preparatory Meeting and Inspections are defined and performed in accordance with QCD 12.1, *Preparatory Phase Inspections* (IT Corporation, 2002). Initial Phase Inspections are defined and performed in accordance with QCD 12.2, *Inspection Phase Inspections* (IT Corporation, 2002). Follow-Up Phase Inspections are defined and performed in accordance with QCD 12.3, *Follow-Up Phase Inspections* (IT Corporation, 2002).

Inspection results are documented on the checklists and attached to the Daily Quality Control Report.

Quality Control Meetings will be conducted weekly in accordance with QCD 12.4, *Quality Control Meetings* (IT Corporation, 2002).

14.0 Personnel Matrix

A Personnel Matrix, which shows who will review and approve submittals, who will perform and document the three phases of control, and who will perform and document the testing for each section of the specification is presented in Attachment 16.

15.0 Procedures for Completion Inspections

Procedures for Completion Inspections (*i.e.*, Punch-Out Inspection, Pre-Final Inspection, and Final Acceptance Inspection) are described in QCD 14.1, *Completion Inspections* (IT Corporation, 2002).

16.0 References

IT Corporation, 2002, QCD 3.1, *QC Personnel Duties, Responsibility, and Authority*

IT Corporation, 2002, QCD 6.1, *QC Certification*

IT Corporation, 2002, QCD, 7.1, *Construction Materials Testing*

IT Corporation, 2002, QCD, 8.1, *Test Results*

IT Corporation, 2002, QCD, 9.1, *Rework Items List*

IT Corporation, 2002, QCD, 10.1, *Daily Production Reports*

IT Corporation, 2002, QCD, 10.2, *Daily QC Reports*

IT Corporation, 2002, QCD, 10.3, *QC Specialist Reports*

IT Corporation, 2002, QCD, 10.4, *As-Built Drawings*

IT Corporation, 2002, QCD, 10.5, *QC Validation*

IT Corporation, 2002, QCD, 10.6, *QC Deliverables*

IT Corporation, 2002, QCD, 11.1, *Definable Features of Work Matrix*

IT Corporation, 2002, QCD, 12.1, *Preparatory Phase Inspections*

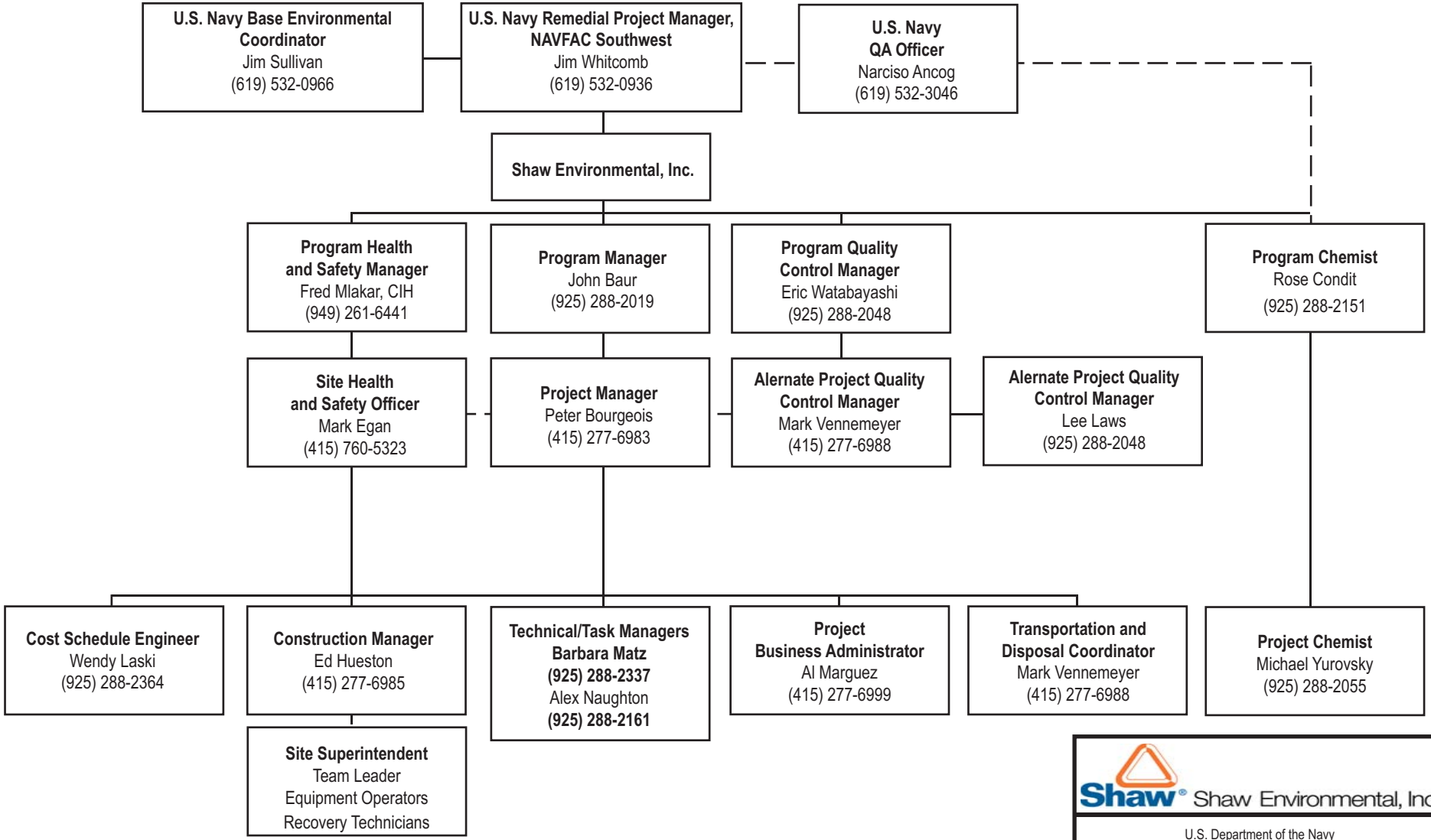
IT Corporation, 2002, QCD, 12.2, *Inspection Phase Inspections*

IT Corporation, 2002, QCD, 12.3, *Follow-Up Phase Inspections*

IT Corporation, 2002, QCD, 12.4, *Quality Control Meetings*

IT Corporation, 2002, QCD, 14.1, *Completion Inspections*

Attachment 1
Project Organization Chart



Shaw® Shaw Environmental, Inc.

U.S. Department of the Navy
Base Realignment and Closure
Program Management Office West
San Diego, California

ATTACHMENT 1
CTO 0010 ORGANIZATION CHART
ENVIRONMENTAL REMEDIAL ACTION
CONTRACT NUMBER N62474-01-D-6011

Attachment 2
QC Staff Resumes

Last Updated: 02 Jun 2006

Eric M. Watabayashi

Professional Qualifications

Mr. Watabayashi has 28 years of diverse management experience in the areas of QA/QC, production and safety. Throughout his career he has directed and supported QA/QC programs and projects, most recently, those of remedial actions contracts with the U.S. Navy and U.S. Army Corps of Engineers. These contracts have encompassed all phases of CERCLA removal and remediation actions, Superfund and National Priority List (NPL) sites, and petroleum cleanups at federal facilities, including industrial and residential properties. He has also been Project Superintendent on small remedial projects.

As a commissioned officer in the U.S. Navy, he implemented the nuclear weapons surety program. He was also responsible for the quality of maintenance and repair of mechanical, hydraulic, electrical, and electronic systems. Serving as Site Health and Safety Specialist for remedial construction projects and a ships' Safety Officer, he enforced their safety programs.

Education

Bachelor of Arts, Applied Mathematics, University of California Berkeley, Berkeley, California, 1978

Additional Training/Continuing Education

OSHA HAZWOPER Refresher 8 Hours per 29 CFR 1910.120, Concord, CA, 2006
Competent Person: Drilling Oversight (CPDO), Concord, CA, 2006
Site Safety Officer, Irvine, CA, 2005
OSHA 10-Hour Construction Safety, Irvine, CA, 2005
Supervision of Hazardous Waste Operations per OSHA 29 CFR 1910.120, Irvine, CA, 2005
Excavation Competent Person Training, Irvine, CA, 2005
Confined Space - Entry Supervisor (Ent. & Attn.), Irvine, CA, 2005
Uniform Federal Policy for Quality Assurance Project Plans, San Diego, CA, 2005
Medic First Aid, Concord, CA, 2004
U.S. Army Corps of Engineers Construction Quality Management for Contractors, Sacramento, CA, 2004
Air Shipping Dangerous Goods by IATA per HM-126 and IATA, Martinez, CA, 2000
Lead-Based Paint Supervision and Monitoring, Richmond, CA, 1997
Hazards & Protection Waste Operations 40 Hours per 29 CFR 1910.120, Martinez, CA, 1994
U.S. Navy Total Quality Management, San Diego, CA, 1993
U.S. Navy Instructor Training, San Diego, CA, 1993
U.S. Navy Quality Control Inspector, San Diego, CA, 1992
U.S. Navy Safety Officer, Pearl Harbor, CA, 1986

Experience and Background

05/2005 - Present
Program QC Manager on Naval Facilites Engineering Command Southwest (NAVFAC SW) Environmental Multiple Award Contract, Shaw Environmental & Infrastructure, Inc., Federal QA/QC, Concord, California

Mr. Watabayashi is responsible for overseeing the QC program. He assists in establishing and maintaining Program Management Office requirements and procedures. He trains, assigns and supervises Contractor QC System Managers. Routine duties include approving Project QC Plans. Additionally, he writes plans, in support of program and project activities.

05/2005 - Present

QC Supervisor on U.S. Army Corps of Engineers (USACE) Total Environmental Remediation Contract (TERC), Shaw Environmental & Infrastructure, Inc., Federal QA/QC, Concord, California

Mr. Watabayashi is responsible for overseeing the QC program. He assists in establishing and maintaining Program Management Office requirements and procedures. He trains, assigns and supervises Contractor QC System Managers. Routine duties include approving Project QC Plans. Additionally, he writes plans, in support of program and project activities.

03/2005 - Present
Program QC Manager on Navy Engineering Field Activity (EFA) West, Remedial Action Contract (RAC), Shaw Environmental & Infrastructure, Inc., Federal QA/QC, Concord, California

Mr. Watabayashi is responsible for overseeing the QC program. He assists in establishing and maintaining Program Management Office requirements and procedures. He has teamed with U.S. Navy personnel, resolving key program level issues, basing his input on over ten years of experience with RAC contracts. He trains, assigns and supervises Project QC Managers. Routine duties include approving Project QC Plans. Additionally, he writes plans, procedures and reports, normally done by the technical staff, in support of program and project activities.

05/2002 - Present
Project QC Manager, Shaw Environmental & Infrastructure, Inc., Federal QA/QC, Concord, California

Mr. Watabayashi is responsible for the maintenance and administration of the quality program in field projects. Routine tasks include: inspecting work for compliance with project plans, specifications and permits; identifying and tracking work variances, non-conforming work, and rework items; reviewing as-built drawings; chairing QC meetings with the client; reviewing and approving administrative and technical submittals; and producing daily reports to the client. For the past four years as the Alameda Point Installation QC Manager, he has overseen fifteen projects, some directly and others managing a Project QC Manager. He is currently solely responsible the quality of three projects operating concurrently in the field.

The following is a summary of key projects:
Project QC Manager, Petroleum Fuel Corrective Actions, 843778, U. S. Navy, Alameda, California, 07/2001 - Present
Project value $10.7 million. Dual vacuum extraction and biosparging systems at seven petroleum hydrocarbon contaminated soil and groundwater remediation sites. Activities include hydropunch groundwater sampling, direct push soil sampling, CPT, well installation and development, soil excavation and backfilling, storm sewer system repair, and AST and UST removal. Ensures systems are constructed and tested per plans and operations and maintenance is conducted per instructions, schedules and permits. Writes work variances and field acitity reports.

Awards/Client Commendations:
Shaw Environmental and Infrastructure, Inc. President's Award

Project QC Manager, In-Situ Chemical Oxidation, 844918, U.S. Navy, Alameda, California, $7,500,000.00, 07/2001 - Present
In-situ chemical oxidation at five sites contaminated with dissolved-phase chlorinated and aromatic hydrocarbons, using a modified Fenton?s approach. Activities include hydropunch groundwater sampling, direct push soil sampling, CPT, and well installation and development. Ensures proper chemical injections and monitoring. Coordinates field activities with commercial tenants.

Project was modified to include a time-critical removal action to minimize the risk of PAH exposure at an elementary school and child development center. Removal and restoration were accomplished in close quarters and while children were present. He wrote the Work Plan and Final Report for this removal action.

Awards/Client Commendations:
Shaw Environmental and Infrastructure, Inc. President's Award

Project QC Manager, Six-Phase Heating, 108816, U.S. Navy, Alameda, California, 07/2001 - Present

Project value $12.7 million. Pilot test and full-scale six-phase heating of DNAPL and dissolved source. System includes high voltage electrical power, transformer panel assembly, power supply and control wiring, piping, pumps, blowers, security alarm system, sheet piling, well installation, hydropunch groundwater sampling, soil coring, CPT, and DNAPL extraction. Ensures proper construction and operation and maintenance of the six-phase heating system is per design. Oversees electrical, pneumatic, and six-phase heating system testing, and operation and maintenance.

Project has much DTSC interest.

Awards/Client Commendations:
Shaw Environmental and Infrastructure, Inc. President's Award

Project QC Manager, Basewide Groundwater Monitoring, 843780, U.S. Navy, Alameda, California, $3,400,000.00, 04/2003 - 01/2005
Base-wide quarterly groundwater monitoring. Activities included groundwater sampling in 220 monitoring wells, CPT, sonic drilling well installation, well abandonment, down hole video logging, UXO clearance, and radiological survey.

Awards/Client Commendations:
Shaw Environmental and Infrastructure, Inc. President's Award

Project QC Manager, Closure of IWTPs 25 and 32, 101643, U.S. Navy, Alameda, California, $1,500,000.00, 02/2004 - 07/2004
Demolished two IWTPs. Activities included demolition, groundwater sampling, and direct push soil sampling.

Awards/Client Commendations:
Shaw Environmental and Infrastructure, Inc. President's Award

05/2002 - 03/2005
Deputy Program QC Manager on the Navy Engineering Field Activity (EFA) West, Remedial Action Contract (RAC), Shaw Environmental & Infrastructure, Inc., Federal QA/QC, Concord, California

Mr. Watabayashi was responsible for assisting the Program Quality Control Manager in overseeing the QC program. He assisted in establishing and maintaining Program Management Office requirements and procedures. He teamed with U.S. Navy personnel, resolving key program level issues, basing his input on over ten years of experience with RAC contracts. He trained, assigned and supervised Project QC Managers. Routine duties included approving Project QC Plans. Additionally, he wrote plans, procedures and reports, normally done by the technical staff, in support of program and project activities.

11/1997 - 05/2002
Deputy Program QC Manager on the Navy Engineering Field Activity (EFA) West, Remedial Action Contract (RAC), IT Corporation, QA/QC, Concord/Martinez, California

Mr. Watabayashi was responsible for assisting the Program Quality Control Manager in overseeing the QC program. He assisted in establishing and maintaining Program Management Office requirements and procedures. He teamed with U.S. Navy personnel, resolving key program level issues, basing his input on over ten years of experience with RAC contracts. He trained, assigned and supervised Project QC Managers. Routine duties included approving Project QC Plans. Additionally, he wrote plans, procedures and reports, normally done by the technical staff, in support of program and project activities.

08/1994 - 05/2002
Project QC Manager, IT Corporation, QA/QC, Concord/Martinez, California

Mr. Watabayashi is responsible for the maintenance and administration of the quality program in field projects. Routine tasks include: inspecting work for compliance with project plans, specifications and permits; identifying and tracking work variances, non-conforming work, and rework items; reviewing as-built drawings; chairing QC

meetings with the client; reviewing and approving administrative and technical submittals; and producing daily reports to the client. For the past four years as the Alameda Point Installation QC Manager, he has overseen fifteen projects, some directly and others managing a Project QC Manager. He is currently solely responsible the quality of three projects operating concurrently in the field.

The following is a summary of key projects:

Project Superintendent, Project QC Manager, Site Health and Safety Specialist, UST Site Closure, 830722, U.S. Navy, Stockton, California, $170,000.00, 03/2002 - 03/2002

Served as Project QC Manager, Project Superintendent, and Site Health and Safety Specialist for a project, involving investigation, remediation, and closure of former UST sites. Scheduled and supervised field work, including asbestos-containing material and lead-based paint abatement, building demolition, excavation, backfilling, compaction, and soil and hydropunch groundwater sampling. Directed backfill compaction field testing. Wrote project final report.

Project QC Manager, Investigation and Remediation of Various Sites, 800063, U.S. Navy, Crows Landing, California, $8,000,000.00, 10/1999 - 07/2001

Investigation and remediation of various sites. Included were soil vapor extraction and aquifer testing; ARCH rig well installation and abandonment; geophysical, unexploded ordnance, and sewer pipe video surveys; and quarterly groundwater sampling. Ensured the accuracy of test measurements used to determine remediation designs. Acquired required permits and ensured compliance. Wrote field activity report.

Contractor QC Manager, UST Cluster 1 Remediation, , U.S. Navy, Crows Landing, California, $1,000,000.00, 05/1998 - 04/1999

Bioventing and biosparging treatment system construction. Directed QC activities in the construction, checkout and startup. Reviewed and approved technical submittals, and ensured that the construction of mechanical, pneumatic, electrical, electronic, and structural systems were per project specifications and drawings, and applicable building codes. Tested the systems in accordance with test plans and wrote test reports. Updated red-lined drawings. Acquired required permits and ensured compliance. Wrote project final report.

Contractor QC Manager, UST/Pipeline Removal, , U.S. Navy, Alameda, California, $8,000,000.00, 09/1997 - 03/1998

UST and underground fuel pipeline removal. Assured that 13 miles of pipe and five USTs were removed per the Navy?s and various agencies? requirements. QC activities involved trenching; soil backfilling, compacting and testing; concrete and asphalt paving and testing; soil and water sampling, and field and fixed laboratory analyses; asbestos and lead-based paint abatement; pipe hydro blasting and pressure grouting; building demolition; hazardous waste manifesting and disposal; confined space entry; air monitoring; and hydro seeding. Project finished ahead of schedule.

Contractor QC Manager, Sites 1 and 2 Landfill Consolidation and Cap, , U.S. Navy, Moffett Field, California, $3,000,000.00, 04/1997 - 09/1997

Landfill consolidation and cap. 20,000 cubic yards of waste from a five acre landfill were consolidated into a 12 acre landfill which was subsequently capped. Assured that 75,000 cubic yards of earthwork and installation of synthetic liners, including extensive soil testing and land surveying, met stringent specifications requirements. Inspected the successful installation of monitoring and landfill gas migration wells; gas vents; groundwater extraction and gas venting trenches; a maintenance road; a storm drain catch basin, drainage ditches, swales, and culverts; and permanent fences. Also inspected soil and water sampling, de-watering, and hydro seeding.

Contractor QC Manager, Site 18 - Storm Drain System, , U.S. Navy, Alameda, California, $2,000,000.00, 07/1996 - 03/1997

Cleaned twelve miles of storm sewer lines. Work included water jetting and video taping sewer pipes up to 48 inches in diameter, and construction and operation of a water filter system. Responsible for determining visual acceptable cleanliness of sewer pipes. Tracked progress of line cleaning and video taping. Ensured water filter system was constructed per design. Received letter of appreciation from the Navy for accomplishing the work under challenges, including working around occupied housing and during the rainy season.

Accomplishments:

U.S. Navy Letter of Appreciation

Contractor QC Manager, Cleanup of Hangars 400A and 11, , U.S. Navy, Alameda, California, $1,000,000.00, 07/1995 - 09/1995
Removed heavy metal contamination in two former aircraft maintenance hangars. Removal was done, using high pressure water from 90-foot man lifts. Responsible for visually determining acceptable cleanliness of surfaces. Project was accomplished in half of the scheduled three months.

Accomplishments:
U.S. Navy Letter of Commendation for finishing under budget and one month ahead of schedule

Contractor QC Manager, Treatment System Construction, U.S. Navy, Moffett Field, California, 12/1994 - 07/1995
Three remedial construction projects, involving sanitary sewer liners, biovent and soil vapor extraction systems, and installation of a storm drain water treatment system. Assured that systems were installed per contract and delivery order specifications. Inspected field work, approved technical and administrative submittals to the government, chaired QC meetings, updated red-line drawings, and researched and generated field changes.

Contractor QC Manager, UST Closure, , U.S. Navy, Fairfield, California, $2,000,000.00, 08/1994 - 12/1994
UST removal. Inspected excavation activities, UST removal and disposal, soil sampling, hazardous waste manifesting and disposal, earthwork and compaction, confined space entry, and air and noise monitoring. Wrote sections of the UST closure report.

12/1994 - 07/2001
Site Health and Safety Officer on the Navy Engineering Field Activity (EFA) West, Remedial Action Contract (RAC), IT Corporation, H&S, Concord/Martinez, California

Mr. Watabayashi was responsible for the maintenance and administration of the Health and Safety Program in field projects. Additionally, he assisted in writing plans and procedures in support of program and project activities.

The following is a summary of key projects:
Site Health and Safety Specialist, Investigation and Remediation of Various Sites, 800063, U.S. Navy, Crows Landing, California, $8,000,000.00, 10/1999 - 07/2001
Investigation and remediation of various sites. Health and safety oversite for periods as long as one month. Soil vapor extraction and aquifer testing; well installation and abandonment; geophysical, unexploded ordnance, and sewer pipe video surveys; and quarterly groundwater sampling.

Awards/Client Commendations:
U.S. Navy Letter of Commendation for 62,863 accident-free work hours.

Site Health and Safety Officer, UST Installation, U.S. Navy, Fairfield, California, 12/1994 - 01/1995
UST installation. Administered the Health and Safety programs during excavation activities, including air and noise monitoring.

06/1978 - 09/1994
Surface Warfare Officer, U.S. Navy, San Diego, California

Mr. Watabayashi served in various management positions in ships and shore commands in the Surface Warfare community. Primary positions included the areas of QA/QC of facilities and equipment maintenance (9 years); ordnance maintenance, handling, and storage (6 years); safety (3 years); training (4 years).

? As the Nuclear Weapons Officer aboard two different Navy ships, enhanced the safety and surety of weapons handling, maintenance, and storage under absolutely stringent rules for 3 1/2 years. Managed the program for monitoring radiation exposure. "Molded an inexperienced group of men into a proficient team," achieving the "highest recorded grade" in training.

? As ships' Department Head, planned and directed four extensive departmental facilities and equipment maintenance periods, overseeing one as the Quality Control Inspector. Coordinated a $100,000 foreign contracted preservation project.

? Responsible for the exterior preservation of a Navy aircraft carrier, Budgeted for $300,000 worth of paint annually. Controlled paint issue and disposal, and maintenance and instruction on use of personnel protective equipment. Implemented, trained workers on, and enforced new EPA requirements within the organization.

? As the Ship's Safety Officer aboard two different Navy ships, wrote the Safety Plan, and administered and enforced the Safety Program. Transformed the organizations' apathetic attitude to that of awareness. His ships had no work days lost throughout the 3 years that he was in charge of the program.

? As Assistant Department Head in a large Navy training command, designed and executed the reorganization of his major department. Determined the best organization structure, measured the skills of 230 supervisors, instructors, and schedulers. Completed the reorganization, including a move into a new facility, in a month without customer service interruption.

Awards/Honors

Meritorious Service Medal, U.S. Navy, 1991

Eric M. Watabayashi

Title: QA Specialist 4
Employee Number: 442055
Location: Concord, CA
Location2: N/A
Business Unit: Quality Services
Company: Shaw Environmental, Inc

Contact Information

Work Phone: (925) 288-2048
Cell Phone: (925) 383-2597

Skills

Group: CONSTRUCTION/REMEDIATION SPECIALTIES
Category: CONSTRUCTION/REMEDIATION
Skill/Experience Level: Backfilling : Fundamental Knowledge
Skill/Experience Level: Caps/Cover Systems/Liners : Fundamental Knowledge
Skill/Experience Level: Civil Construction : Fundamental Knowledge
Skill/Experience Level: Clean Construction : Fundamental Knowledge
Skill/Experience Level: Compaction : Fundamental Knowledge
Skill/Experience Level: Concrete : Fundamental Knowledge
Skill/Experience Level: Construction Management : Fundamental Knowledge
Skill/Experience Level: Contaminated Sediments Management : Fundamental Knowledge
Skill/Experience Level: Demolition : Fundamental Knowledge
Skill/Experience Level: Excavation : Fundamental Knowledge
Skill/Experience Level: Field Inspection : Fundamental Knowledge
Skill/Experience Level: General Construction : Fundamental Knowledge
Skill/Experience Level: HDPE Pipe Welding/Installation : Fundamental Knowledge
Skill/Experience Level: Landfill Closure (Hazardous Waste) : Fundamental Knowledge
Skill/Experience Level: Lead-Based Paint Abatement : Fundamental Knowledge
Skill/Experience Level: Operation/Maintenance : Fundamental Knowledge
Skill/Experience Level: Oversight : Fundamental Knowledge
Skill/Experience Level: Piping : Fundamental Knowledge
Skill/Experience Level: Sheet Piling : Fundamental Knowledge
Skill/Experience Level: Site Remediation : Fundamental Knowledge
Skill/Experience Level: Soil Handling/Testing : Fundamental Knowledge
Skill/Experience Level: System Dismantling : Fundamental Knowledge
Skill/Experience Level: System Installation : Fundamental Knowledge
Skill/Experience Level: Thermal Treatment : Fundamental Knowledge
Skill/Experience Level: Transportation and Disposal : Fundamental Knowledge
Skill/Experience Level: Trenching : Fundamental Knowledge
Skill/Experience Level: Unexploded Ordnance Disposal (UXO) : Fundamental Knowledge
Skill/Experience Level: Wastewater Treatment Plant Construction : Fundamental Knowledge

Group: CONSULTING SPECIALTIES
Category: AUDITS
Skill/Experience Level: Audits : Fundamental Knowledge
Skill/Experience Level: Health & Safety : Fundamental Knowledge
Skill/Experience Level: Quality Assurance : Fundamental Knowledge

Group: ENVIRONMENTAL SPECIALTIES
Category: AIR

Skill/Experience Level: Permitting : Fundamental Knowledge
Category: ANALYTICAL
Skill/Experience Level: Geotechnical Testing : Fundamental Knowledge

Group: FIELD SERVICES SPECIALTIES
Category: ABOVEGROUND STORAGE TANKS
Skill/Experience Level: Removal : Fundamental Knowledge
Category: DRILLING
Skill/Experience Level: Borings : Fundamental Knowledge
Skill/Experience Level: Drilling : Fundamental Knowledge
Skill/Experience Level: Geoprobe : Fundamental Knowledge
Skill/Experience Level: Monitoring Well Installation : Fundamental Knowledge
Category: OPERATIONS AND MAINTENANCE
Skill/Experience Level: Bioremediation Systems : Fundamental Knowledge
Skill/Experience Level: Full-Scale Process Operation : Fundamental Knowledge
Skill/Experience Level: Groundwater Treatment Plant Operations : Fundamental Knowledge
Skill/Experience Level: Manuals/Procedures : Fundamental Knowledge
Skill/Experience Level: Pilot-Plant Operations : Fundamental Knowledge
Skill/Experience Level: Soil Vapor Extraction Systems : Fundamental Knowledge
Skill/Experience Level: Start-up : Fundamental Knowledge
Skill/Experience Level: Thermal Treatment/Incineration Systems : Fundamental Knowledge
Category: SAMPLING
Skill/Experience Level: Air : Fundamental Knowledge
Skill/Experience Level: Sampling : Fundamental Knowledge
Skill/Experience Level: Soil : Fundamental Knowledge
Category: SURVEY
Skill/Experience Level: General Surveying : Fundamental Knowledge
Skill/Experience Level: Utility Locates : Fundamental Knowledge
Skill/Experience Level: Well Monitoring : Fundamental Knowledge
Category: UNDERGROUND STORAGE TANKS
Skill/Experience Level: Removal : Fundamental Knowledge

Group: PROJECT MANAGEMENT SPECIALTIES
Category: PROJECT MANAGEMENT
Skill/Experience Level: Plan Development : Fundamental Knowledge
Skill/Experience Level: Program Development/Management : Fundamental Knowledge
Skill/Experience Level: Site Management : Fundamental Knowledge
Skill/Experience Level: Technical/Report Writing : Fundamental Knowledge

Group: TECHNICAL SPECIALTIES
Category: HEALTH AND SAFETY
Skill/Experience Level: Construction : Fundamental Knowledge
Skill/Experience Level: Manuals/Procedures : Fundamental Knowledge
Skill/Experience Level: Site Safety/Health Officer : Fundamental Knowledge
Category: QUALITY ASSURANCE
Skill/Experience Level: Analytical/Chemical Quality : Fundamental Knowledge
Skill/Experience Level: Auditing : Fundamental Knowledge
Skill/Experience Level: Construction : Fundamental Knowledge
Skill/Experience Level: Engineering : Fundamental Knowledge
Skill/Experience Level: Manuals/Procedures : Fundamental Knowledge
Skill/Experience Level: Plan Preparation : Fundamental Knowledge
Skill/Experience Level: Quality Control : Fundamental Knowledge
Category: TREATMENT/REMEDIATION
Skill/Experience Level: Air Sparging : Fundamental Knowledge
Skill/Experience Level: Chemical Oxidation : Fundamental Knowledge
Skill/Experience Level: Decontamination : Fundamental Knowledge

Skill/Experience Level: Demolition : Fundamental Knowledge
Skill/Experience Level: Excavation : Fundamental Knowledge
Skill/Experience Level: Hazardous Waste Transportation : Fundamental Knowledge
Skill/Experience Level: Soil Vapor Extraction : Fundamental Knowledge

Other Information

Languages
Language: Speak Read Write
English: Fluent, Fluent, Fluent

Years of Experience
Previous Employers: 16.00
Shaw: 12
Total of 28.00 year(s) experience

Industry Experience
Environmental

Military Experience
US Navy, Lieutenant Commander, 1978-1994

Citizenship Information
United States

Last Updated: 13 Jul 2005

Mark J. Vennemeyer

Professional Qualifications

Mr. Vennemeyer has performed waste management activities for twelve (12) years for a variety of clients. At present, he is a Construction Quality Control Manager and has served as Transportation and Disposal Coordinator for Shaw's Government Services division in California. He is responsible for ensuring quality standards of workmanship on various projects, inspection of activities and adherence with contractual requirements, waste characterization/classification, packaging, scheduling, regulatory oversight, providing technical assistance to the Procurement department in matters of Waste Transportation and Disposal Subcontracts, waste sampling, coordination and management of resources necessary to perform off-site transportation and disposal, preparation of waste profiles and shipping papers, and tracking waste shipments to ensure compliance with all applicable regulations.

Mr. Vennemeyer is experienced in "unknown" identification, Treatment Technology requirements, Federal and State (California) waste regulations, and database management. He has been involved in a multitude of waste shipments covering a wide variety of waste streams.

Education

Bachelor of Science, Chemistry, University of California, Irvine, Irvine, California, 1992

Additional Training/Continuing Education

Construction Quality Management for Contractors, Sacramento, CA, 2005
Shipping Hazardous Materials by UPS, San Jose, CA, 2005
Hazardous Waste Manifesting, Alameda, CA, 2002
First Aid / CPR, San Jose, CA, 2000
Cyanide Training, Richmond, CA, 1998
Hazardous Waste Supervisor, Richmond, CA, 1998
IATA Dangerous Goods Shipment, Emeryville, CA, 1997
Hazard Categorization, San Jose, CA, 1995
Emergency Response Training, San Jose, CA, 1995
Radiation Worker 2, Lawrence Livermore National Lab, 1994
40-Hour Hazardous Waste Operations, Sacramento, CA, 1992

Experience and Background

02/2005 - present
Construction Quality Control Manager, Shaw Environmental & Infrastructure, Inc., Government Services, Concord, California

Responsibilities include support of client projects as quality control manager. Also responsible for interaction with client's technical representatives, preparing portions of reports, oversight of field work, inspection of materials and work performed.

The following is a summary of key projects:
Quality Control Manager, Crow's Landing Flight Facility, 836557, 100358, 101454, U.S. Navy, Crow's Landing Flight Facility, 02/2005 - Present
Quality Control manager for Crow's Landing Flight Facility in Crow's Landing, CA. The project involved several contract task orders (CTOs) to perform different remedial actions. The highlights included:
Removal action of waste soil and debris at former waste pits. Investigation of potential Munitions and Explosives of Concern sites using non-intrusive geophysical surveys and exploratory trenching.

Awards/Client Commendations:
President's Safety Award

05/2002 - 02/2005
Transportation and Disposal Coordinator, Shaw Environmental & Infrastructure, Inc., Government Technical Services, Concord, California

Responsibilities include providing technical support for clients as a transportation and disposal coordinator. Also responsible for waste characterization, profiling, manifesting, coordination of subcontractors and disposal facilties for remedial actions, waste tracking and technical documentation of removal / disposal actions.

The following is a summary of key projects:
T&D Coordinator, Carmel Valley Manor, , JM Electric, Carmel, CA, $20,000.00, 03/2005 - 03/2005
Removal and disposal of aged transformers and electrical equipment. Tasks included sampling, characterizing, profiling, manifesting, packaging of equipment according to all applicable federal, state and local regulations.

Transportation and Disposal Coordinator, Hunters Point Shipyard, various, U.S. Navy, San Francisco, CA, 02/2002 - 02/2005
Transport and Disposal Coordinator for various projects at Hunters Point. Responsible for waste sampling, characterization, profiling, manifesting, coordination of waste shipments and technical documentation of disposal activities.
During the span of the project, over 20,000 tons of waste was removed from site and sent to various permitted treatment/disposal facilties.

Transportation and Disposal Coordinator, Alameda Point, former Alameda Naval Air Station, various, U.S. Navy, Alameda, CA, 02/2002 - 02/2005
Coordination of disposal activities for various remedial projects at the Former Alameda Naval Air Station. Tasks included Investigation Derived and Treatment by-product Waste sampling, characterization, profiling, manifesting and coordination of disposal.

Awards/Client Commendations:
President's Safety Award

Transport and Disposal Coordinator, ORC - Cyril, 100735, US EPA, Cyril, OK, $6,000,000.00, 09/2003 - 06/2004
Demolition of a shut-down oil refinery. Disposal of all wastes associated with the facility including petroleum by-products, chemical catalysts, construction demolition debris, abandoned drummed wastes and "laboratory size" chemical bottles.
Much of the structure was recycled as scrap metal, but the area was cleared of Asbestos prior to any demolition activites starting.

Transport and Disposal Coordinator, Hamilton Army Airfield, US Army Corp of Engineers, Novato, CA, 05/2002 - 12/2002
This project was the removal from site and disposal of several thousand tons of waste excavated soil that was staged on site at an Army Airfield that was in closure. Tasks included classification of waste based on analytical results of samples, profiling of waste to seleceted TSDFs, tracking of waste shipments (using the manifest shipping documents) and confirmation of costs associated with transportation and disposal of waste.

12/2000 - 02/2002
Transportation and Disposal Coordinator, IT Corporation (The Shaw Group Inc. acquired substantially all of the operating assets of The IT Group, Inc., on May 23, 2002), Government Services, Concord, California

Responsibilities included providing technical support to client projects as Transport and Disposal coordinator. Also responsible for field support of waste disposal operations, support of business development activities and composition of certain technical sections of reporting documents.

Mark J. Vennemeyer

Title: Scientist 3
Employee Number: 442247
Location: Concord, CA
Location2: N/A
Business Unit: Concord AS&E
Company: Shaw Environmental, Inc

Contact Information

Work Phone: 925-288-2383
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Skills

Group: BUSINESS ADMINISTRATION SPECIALTIES
Category: LEGAL
Skill/Experience Level: Environmental Law : Fundamental Knowledge
Category: PROPOSALS
Skill/Experience Level: Letter Proposals : Fundamental Knowledge
Skill/Experience Level: Project Descriptions : Fundamental Knowledge
Skill/Experience Level: Resumes : Fundamental Knowledge
Skill/Experience Level: Scope of Work Analysis : Fundamental Knowledge
Skill/Experience Level: Technical Writing : Fundamental Knowledge

Group: COMPUTER/INFORMATION TECHNOLOGY SPECIALTIES
Category: COMPUTER APPLICATIONS (User)
Skill/Experience Level: Adobe Acrobat : Fundamental Knowledge
Skill/Experience Level: DOS : Fundamental Knowledge
Skill/Experience Level: Internet : Working Knowledge
Skill/Experience Level: Lotus 1-2-3 : Fundamental Knowledge
Skill/Experience Level: ManageIT : Senior
Skill/Experience Level: Microsoft Excel : Working Knowledge
Skill/Experience Level: Microsoft Word : Working Knowledge
Skill/Experience Level: Win 95 : Fundamental Knowledge
Skill/Experience Level: Windows 3.x : Fundamental Knowledge
Skill/Experience Level: Windows 98 : Fundamental Knowledge
Skill/Experience Level: Windows XP : Fundamental Knowledge
Category: COMPUTER/GENERAL
Skill/Experience Level: Computers (desktops/laptops) : Fundamental Knowledge

Group: CONSULTING SPECIALTIES
Category: ASSESSMENT/EVALUATION
Skill/Experience Level: Radiological Surveys : Fundamental Knowledge
Skill/Experience Level: RCRA Facility Assessment : Fundamental Knowledge
Skill/Experience Level: Waste Characterization : Expert
Category: AUDITS
Skill/Experience Level: Health & Safety : Fundamental Knowledge
Skill/Experience Level: Quality Assurance : Fundamental Knowledge
Category: HOMELAND SECURITY
Skill/Experience Level: Contaminated Waste Disposal : Senior
Skill/Experience Level: Hazardous Substance Characterization : Working Knowledge
Category: PLANNING
Skill/Experience Level: Regulatory Compliance : Working Knowledge

Category: TRAINING (Provided to Client)
Skill/Experience Level: Emergency Response to Hazardous Substance Releases : Working Knowledge
Skill/Experience Level: Environmental Regulations Course : Working Knowledge
Skill/Experience Level: Hazard Communication : Working Knowledge
Skill/Experience Level: Hazardous Waste Operations : Senior
Skill/Experience Level: Project Management : Fundamental Knowledge
Skill/Experience Level: Quality Assurance/Quality Control : Fundamental Knowledge
Skill/Experience Level: Regulatory : Working Knowledge

Group: ENVIRONMENTAL SPECIALTIES
Category: ANALYTICAL
Skill/Experience Level: Field Analytical Methods : Fundamental Knowledge
Skill/Experience Level: Laboratory Analytical Methods : Fundamental Knowledge
Category: REGULATORY
Skill/Experience Level: CERCLA : Fundamental Knowledge
Skill/Experience Level: Code of Federal Regulations : Working Knowledge
Skill/Experience Level: Hazardous Waste Evaluation : Senior
Skill/Experience Level: RCRA Compliance : Fundamental Knowledge
Skill/Experience Level: TSCA : Fundamental Knowledge

Group: FACILITY MANAGEMENT-SRM/MISSION SUPPORT SERVICES SPECIALTIES
Category: BUSINESS OPERATIONS
Skill/Experience Level: Procurement : Fundamental Knowledge
Skill/Experience Level: Quality Control : Fundamental Knowledge
Category: ENVIRONMENTAL SERVICES
Skill/Experience Level: Hazardous Waste Handling, Storage & Disposal : Expert
Skill/Experience Level: Laboratory Services : Fundamental Knowledge
Category: JOC/IDIQ/SUSTAINABILITY, RELIABILITY, MAINTENANCE (SRM) CONSTRUCTION
Skill/Experience Level: Project Management : Fundamental Knowledge
Skill/Experience Level: Quality Control : Fundamental Knowledge

Group: FIELD SERVICES SPECIALTIES
Category: DRUMS
Skill/Experience Level: Cleaning : Fundamental Knowledge
Skill/Experience Level: Crushing/Disposal : Working Knowledge
Skill/Experience Level: Drums : Senior
Skill/Experience Level: Removal : Fundamental Knowledge
Skill/Experience Level: Waste Characterization : Senior
Skill/Experience Level: Waste Disposal & Shipping : Expert
Category: SAMPLING
Skill/Experience Level: Drums : Fundamental Knowledge
Skill/Experience Level: Sampling : Working Knowledge
Skill/Experience Level: Soil : Fundamental Knowledge

Group: TECHNICAL SPECIALTIES
Category: MIXED WASTE
Skill/Experience Level: Characterization : Fundamental Knowledge
Skill/Experience Level: Mixed Waste : Fundamental Knowledge
Category: NUCLEAR/RADIOLOGY
Skill/Experience Level: Radioactive Waste Management : Fundamental Knowledge
Category: TREATMENT/REMEDIATION
Skill/Experience Level: Hazardous Materials Cleanup : Working Knowledge
Skill/Experience Level: Hazardous Waste Transportation : Senior

Last Updated: 06 Jun 2006

Lee H. Laws

Professional Qualifications

Mr. Laws has more than 14 years of QA/QC experience with IT Corporation and The Shaw Group (May 2002 - Present), functioning since 1996, as Project QC Manager on the Navy EFA West Remedial Action Contract (RAC). This project experience has encompassed all phases of CERCLA Removal and Remedial Action cleanups, Superfund and National Priority List (NPL) sites, and numerous petroleum cleanups (e.g., USTs, ASTs) at federal facilities, industrial and residential properties under contracts from the U.S. Navy, U.S. Army Corps of Engineers (USACE), and U.S. Department of Energy (DOE).

Since 1999, Mr. Laws has served as the Lead QC Manager at Naval Station Treasure Island/Yerba Buena Island, which is a top priority Base Realignment and Closure (BRAC) base on the $250M Navy EFA West RAC. During this time period, the project backlog has grown to 16 environmental cleanup Contract Task Orders (CTO's 006, 012, 016, 036, 039, 040, 043, 045, 046, 089, 099, 102, 105, 106, 131, 134) with a total budget of over $37M, including a current backlog of over $20M. Treasure Island CERCLA, RCRA and petroleum cleanup projects have been executed with a high degree of involvement and oversight from the Navy, City of San Francisco, State and County regulatory agencies and local citizen groups who occupy the impacted property.

In support of this growing basewide cleanup program, Mr. Laws has prepared all CTO QC plans, provided ongoing project team and subcontractor coordination of task-specific QC inspections (including interface with two Government QA Resident Officers in Charge of Construction), and maintained all project QC documentation in a cost-effective MS-Access database. Mr. Laws produces project deliverables, including QC records and technical reports, in Adobe (pdf) format on CD-ROM, which substantially reduces project cost. Navy EFA West RAC six-month performance evaluations have consistently rated the Treasure Island QC Program "Level 1 - Outstanding," which has translated into an additional $1,664,316 of award fee profit (to-date) to IT Corporation and The Shaw Group

Education

High School Diploma/GED, General Education, Pittsburg High Schol, Pittsburg, California, 1983

Additional Training/Continuing Education

USACE CQM Training, Sacramento, 2004
DHS Lead Supervisor/Monitor, UC Berkeley, 2000

Experience and Background

05/2002 - Present
Project QC Manager, Shaw Environmental & Infrastructure, Inc., Quality, Concord, California

2002 Present IT Corporation/Shaw Environmental & Infrastructure, Concord, California.
Project QC Manager on the Navy Engineering Field Activity (EFA) West, Remedial Action Contract (RAC)

Naval Station Treasure Island, San Francisco, California.

Currently serve as the Lead QC Manager. Responsible for the planning, development and project team implementation of Project QC Plans and documentation on 10 environmental cleanup contract task orders with a total budget of over $37M. Projects involve the design, construction, operation, optimization and maintenance of remediation action systems (e.g., Soil Vapor Extraction); soil sampling, analysis, excavation, treatment, transportation and disposal; and site restoration in sensitive public housing areas. Mr. Laws effectively plans,

coordinates and verifies task-specific QC inspections with Task Leaders, the Site Health & Safety Officer, Navy Resident Officers in Charge of Construction (ROICCs) and subcontractors. Mr. Laws also performs independent quality assurance audits, surveillances, and inspections of laboratories and field project activities to verify compliance with established QA program requirements

10/1996 - 05/2002
Project QC Manager, IT Corporation, Martinez, California

1996 2002 IT Corporation/Shaw Environmental & Infrastructure, Concord, California.
Project QC Manager on the Navy Engineering Field Activity (EFA) West, Remedial Action Contract (RAC)

Naval Station Treasure Island, San Francisco, California.

Currently serve as the Lead QC Manager. Responsible for the planning, development and project team implementation of Project QC Plans and documentation on 10 environmental cleanup contract task orders with a total budget of over $37M. Projects involve the design, construction, operation, optimization and maintenance of remediation action systems (e.g., Soil Vapor Extraction); soil sampling, analysis, excavation, treatment, transportation and disposal; and site restoration in sensitive public housing areas. Mr. Laws effectively plans, coordinates and verifies task-specific QC inspections with Task Leaders, the Site Health & Safety Officer, Navy Resident Officers in Charge of Construction (ROICCs) and subcontractors. Mr. Laws also performs independent quality assurance audits, surveillances, and inspections of laboratories and field project activities to verify compliance with established QA program requirements.

China Lake Naval Air Weapons Station, Ridgecrest, California.
Served as the Project QC Manager. Responsible for the implementation of the site specific work plans and the quality control plans. Also responsible for daily field inspections to ensure that all work was performed in accordance with the work plan, specifications and requirements based on the program contract. Responsibilities also included performing reviews of documentation and the preparation of daily CQC reports that were submitted to the Navy on the next business morning.

Naval Communication Station, Stockton, California.
Served as the Site Health and Safety Officer. Responsible for providing independent surveillance of the routine implementation of the site safety and health plan. Conducted daily Tailgate Safety Meetings, verified personnel had necessary training and medical clearance to enter work area, performed daily equipment calibrations, monitored personnel for compliance with site safety and health plans, and performed monthly safety inspections.

Yerba Buena Island Housing, Yerba Buena, California.
Served as the Project QC Manager for Lead Base Paint Abatement. Responsible for the implementation of the site specific work plans and the quality control plans. Also responsible for daily field inspections to ensure that all work was performed in accordance with the work plan specifications and requirements based on the program contract. Responsibilities included performing reviews of documentation and the preparation of daily CQC reports, which were submitted to the Navy on the next business morning.

Alameda Naval air Station, Alameda, California.
Served as the Project QC Manager and Site Superintendent. Responsibilities included implementation of the site specific work and quality control plans. Also responsible for daily field inspections to ensure that all work was performed in accordance with the work plan specifications and requirements based on the program contract. Also performed reviews of documentation and prepared daily CQC reports, which were submitted to the Navy on the next business morning. My responsibilities as Site Superintendent included daily production, scheduling activities, ordering equipment and site safety.

Department of Defense Housing, Novato, California.
Served as the Project QC Manager. Responsible for the implementation of the site specific work and quality control plans, as well as daily field inspections to ensure that all work was performed in accordance with the work plan specifications and requirements based on the program contract. Responsibilities included performing reviews of documentation and the preparation of daily CQC reports that were submitted to the Navy on the next business

morning.

Naval Medical Center, Oakland, California.
Served as the Project QC Manager. Responsible for the implementation of the site specific work and quality control plans in addition to daily field inspections to ensure that all work was performed in accordance with the work plan specifications and requirements, which were based on the program contract. Responsibilities included performing reviews of documentation and the preparation of daily CQC reports which were submitted to the Navy on the next business

08/1995 - 10/1996
Quality Control Coordinator, IT Corporation, San Jose, California

1995 1996 IT Corporation, San Jose, California
Quality Control Coordinator, Engineers Services
Responsible for field QC activities, ensuring that fieldwork was being performed in accordance with the requirements written in the project work plans and procedures. Specific project experience and responsibilities included:

Hamilton Army Air Field, Novato, California.
Served as a Quality Control Inspector for the QC group. Responsible for daily field inspections and the preparation of daily QC reports. Performed reviews of documentation and other duties designated by the Program QC Manager.

07/1993 - 08/1995
Field Analytical Specialist II, IT Corporation, Field Analytical Services, Martines, California

1993 1995 IT Corporation, Martinez, California
Field Analytical Specialist II, Field Analytical and Sampling (FAS)
Responsible for organizing and participating in field analytical and sampling activities. Ensured sample protocols were followed, and coordinated between field and laboratory to meet project needs. Specific project experience and responsibilities included the following:

IBM, San Jose, California.
Served as a "lead man" for a demolition crew of three to six employees. Responsible for guidance and inspection of crew?s work. Insured health and safety around work area.

MCAGCC, Twenty Nine Palms, California.
Served as the sample coordinator working with the Jacobs Engineers Group Navy/Clean program at this DOE Superfund site. Acted as Liaison between the field and the laboratory: ordering glassware, coordinating sampling, documenting sampling, and maintaining the field database.

03/1989 - 07/1993
Assistant Field Analytical Specialist, IT Corporation, Martinez, California

1989 1993 IT Corporation, Martinez, California
Assistant Field Analytical Specialist, Field Analytical and Sampling (FAS)
Responsible for environmental monitoring on various RI/FS projects in the Western United States. Primary responsibilities were groundwater compliance, soil organic vapor sampling, and soil sampling. Some specific experience include the following:

Mather Air Force Base, Rancho Cordova, California.
Served as a sample team leader in the areas of SOV, soil, and groundwater sample collection. Trained new employees in proper sampling and documentation procedures. Responsible for providing instruction and performing tasks in the areas of monitoring well development, dedicated pump and packer installation, and proper operation of such equipment. Gained experience with sample collection around drill rigs and a clearance for work on military flight lines. Acted as liaison between the field and analytical laboratory. Fulfilled the Sample

Coordinator's position in his absence.

Castle Air Force Base, Merced, California.
Served as Assistant Sample Coordina¬tor during this major RI/FS project. Acted as liaison between the field operations and the office. Helped supervise the groundwater sampling and pump installation phases of the project.

Lee H. Laws

Title: QA Specialist 2
Employee Number: 442318
Location: Concord, CA
Location2: N/A
Business Unit: Quality Services
Company: Shaw Environmental, Inc

Contact Information

Work Phone: (415) 277-6988
Cell Phone: (925) 383-2597

Skills

Group: COMPUTER/INFORMATION TECHNOLOGY SPECIALTIES
Category: COMPUTER/GENERAL
Skill/Experience Level: Computers (desktops/laptops) : Working Knowledge

Group: CONSTRUCTION/REMEDIATION SPECIALTIES
Category: CONSTRUCTION/REMEDIATION
Skill/Experience Level: Backfilling : Working Knowledge
Skill/Experience Level: Caps/Cover Systems/Liners : Fundamental Knowledge
Skill/Experience Level: Clean Construction : Fundamental Knowledge
Skill/Experience Level: Compaction : Working Knowledge
Skill/Experience Level: Construction Management : Working Knowledge
Skill/Experience Level: Demolition : Fundamental Knowledge
Skill/Experience Level: Excavation : Fundamental Knowledge
Skill/Experience Level: Field Inspection : Fundamental Knowledge
Skill/Experience Level: Lead-Based Paint Abatement : Working Knowledge
Skill/Experience Level: Sheet Piling : Fundamental Knowledge
Skill/Experience Level: Site Remediation : Fundamental Knowledge
Skill/Experience Level: Soil Handling/Testing : Senior
Skill/Experience Level: Transportation and Disposal : Fundamental Knowledge
Skill/Experience Level: Trenching : Fundamental Knowledge

Group: ENVIRONMENTAL SPECIALTIES
Category: ANALYTICAL
Skill/Experience Level: Field Analytical Methods : Fundamental Knowledge

Group: FIELD SERVICES SPECIALTIES
Category: SAMPLING
Skill/Experience Level: Drilling : Working Knowledge
Skill/Experience Level: Sampling : Senior

Group: PROJECT MANAGEMENT SPECIALTIES
Category: PROJECT MANAGEMENT
Skill/Experience Level: Site Management : Working Knowledge

Group: TECHNICAL SPECIALTIES
Category: QUALITY ASSURANCE
Skill/Experience Level: Manuals/Procedures : Fundamental Knowledge
Skill/Experience Level: Plan Preparation : Working Knowledge
Skill/Experience Level: Quality Control : Senior

Other Information

Languages
Language: Speak Read Write
English: Fluent, Fluent, Fluent

Years of Experience
Previous Employers: 16.00
Shaw: 19
Total of 35.00 year(s) experience

Citizenship Information
United States

Attachment 3
QC Staff Duties and Responsibilities

QC Staff Duties and Responsibilities

Action	Responsibility	QC Plan Section	QCD	QC Plan Attachment
Post Contract Task Order (CTO) Award/Pre-Construction Phase				
Establish Project QC Organization	QC Manager or Designate	2.0	N/A	1
Obtain QC Resumes	QC Manager or Designate	3.0	N/A	2
Assign QC Duties	QC Manager or Designate	4.0	3.1	3, 16
Identify Outside Organizations	QC Manager or Designate	5.0	N/A	4
Prepare QC Appointment Letters	QC Manager or Designate	6.0	N/A	5
Prepare Submittal Register	QC Manager or Designate	7.0	6.1	6
Prepare Personnel Matrix	QC Manager or Designate	14.0	N/A	16
Submit Laboratory Information	QC Manager or Designate	8.0	7.1	7
Prepare Testing Plan and Log	QC Manager or Designate	9.0	8.1	8
Prepare Rework Items List	QC Manager or Designate	10.0	9.1	9
Assemble QC Forms/Records System	QC Manager or Designate	11.0	10.1 to 10.6	10, 11
List Definable Features of Work	QC Manager or Designate	12.0	11.1	12
Attend Training, if Required	QC Manager or Designate	N/A	1.2	N/A
Conduct Coordination Meeting	QC Manager or Designate	N/A	1.1	N/A
Construction Phase (QC Procedures for Each Definable Feature of Work)				
Review QC Deliverable Requirements	QC Manager or Designate	11.0	10.6	6
Review Definable Features of Work	QC Manager or Designate	12.0	11.1	12
Conduct Preparatory Meeting	QC Manager or Designate	13.0	12.1	13
Conduct Preparatory Inspection	QC Manager or Designate	13.0	12.1	13
Conduct Initial Inspection	QC Manager or Designate	13.0	12.2	14
Conduct Follow-Up Inspection	QC Manager or Designate	13.0	12.3	15
Conduct Completion Inspections	QC Manager or Designate	15.0	14.1	N/A

* *Note:*

The QC Manager may assign the Lead for Preparatory Meetings, Preparatory Inspections, Initial Inspections, Follow-Up Inspections, and Completion Inspections to the Technical Task Leader (e.g., Project Engineer) or Operational Task Leader (e.g., Site Superintendent) as described in this PQCP.

Attachment 4
List of Outside Organizations

Outside Organizations

Organization Name/Address/Phone	Description of Services
To Be Determined	Environmental Analytical Services
To Be Determined	Analytical Data Validation Services
New World Technology 448 Commerce Way Livermore, CA94551 925-443-7967	Radiological Soil Screening Services
To Be Determined	Waste Transport and Disposal Services
Hertz 2815 N Sam Houston Parkway E Houston, TX 77052 888-777-3500	Heavy Equipment Rental Services
Baker Tank Inc. *3020 Old Ranch Parkway* *Seal Beach, CA 90740* *562-430-6262*	Storage Tank Rental Services
To Be Determined	Surveying
Turnkey or other Construction company 313 Lincoln Street Roseville, CA 95678 415-671-0148	Building Renovation

* *Note:*

Outside Organizations are subject to change pending final contracting, procurement activities and scheduling.

Attachment 5
Letters of Designation

Shaw Environmental, Inc.
4005 Port Chicago Highway
Concord, California 94520-1120

QC MANAGER
LETTER OF DESIGNATION

Mr. Mark Vennemeyer,

This letter will serve to assign you as the Shaw Environmental, Inc. Quality Control (QC) Manager for Contract Number N68711-01-D-6011, CTO 0010. In the event that you are not able to perform the QC Manager's duties, Mr. Lee Laws will serve as your Alternate QC Manager. In the role of QC Manager you have the duties, responsibilities, and stop work authority described in the QCP Section 3.0, and QCD 3.1. You are granted the authority to approve Shaw submittals that have been certified by qualified submittal reviewers, as identified in the Project Organization Chart for this CTO. You are also authorized to ensure the quality of work and direct the removal and/or replacement of nonconforming materials or work. In this capacity, you will report directly to me and will administer the established requirements of the CTO 0010 QCP.

If you have any questions or require additional information, please contact me at (510) 748-6042.

Sincerely,

Eric Watabayashi
EMAC Program QC Manager
Shaw Environmental, Inc.

Shaw Environmental, Inc.
4005 Port Chicago Highway
Concord, California 94520-1120

ALTERNATE QC MANAGER
LETTER OF DESIGNATION

Mr. Lee Laws,

This letter will serve to assign you as the Shaw Environmental, Inc. Alternate Quality Control (QC) Manager for Contract Number N68711-01-D-6011, CTO 0010. In the case where the designated QC Manager, Mr. Mark Vennemeyer, is unable to perform the QC Manager's duties, you will serve in that capacity. In the role of Project QC Manager you have the duties, responsibilities, and stop work authority described in the Project QC Plan Section 3.0, and QCD 3.1. You are granted the authority to approve Shaw submittals that have been certified by qualified submittal reviewers, as identified in the Project Organization Chart for this CTO. You are also authorized to ensure the quality of work and direct the removal and/or replacement of nonconforming materials or work. In this capacity, you will report directly to me and will administer the established requirements of the CTO 0010 QCP.

If you have any questions or require additional information, please contact me at (510) 748-6042.

Sincerely,

Eric Watabayashi
EMAC Program QC Manager
Shaw Environmental, Inc.

Attachment 6
Submittal Register

SUBMITTAL REGISTER	CONTRACT NUMBER N68711-01-D-6011 CTO 0010
TITLE AND LOCATION: Non-Time Critical Removal Action for Three Solid Waste Disposal Areas IRP-Site-12, Treasure Island, San Francisco, California	CONTRACTOR Shaw Environmental, Inc. / SPECIFICATION SECTION Scope of Work

TRANS-MITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NO.	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL									CLASSI-FICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		REMARKS
				DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	INFORMATION ONLY	GOVERNMENT APPROVED		SUB-MIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y
	001	Section 6	Internal Draft Project Plans, SD-08					X						X										
	002	Section 6	Draft Project Plans, SD-08					X						X										14 days after Navy comments
	003	Section 6	Draft Final Project Plans, SD-08					X						X										14 days after agency comments
	004	Section 6	Final Project Plans, SD-08					X						X										14 days after Navy comments
	005	Section 6	Internal Draft Removal Action Completion Report, SD-18									X		X										
	006	Section 6	Draft Removal Action Completion Report, SD-18									X		X										14 days after Navy comments
	007	Section 6	Draft Final Removal Action Completion Action Report, SD-18									X		X										14 days after agency comments
	008	Section 6	Final Removal Action									X		X										14 days after

SUBMITTAL REGISTER	CONTRACT NUMBER N68711-01-D-6011 CTO 0010
TITLE AND LOCATION: Non-Time Critical Removal Action for Three Solid Waste Disposal Areas IRP-Site-12, Treasure Island, San Francisco, California	CONTRACTOR Shaw Environmental, Inc. / SPECIFICATION SECTION Scope of Work

TRANS-MITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NO.	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL									CLASSI-FICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		REMARKS
				DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	INFORMATION ONLY	GOVERNMENT APPROVED		SUB-MIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERN-MENT	CODE	DATE	
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y
			Completion Report, SD-18																					Navy comments
	009	Section 6	Internal Project Meeting Agendas, SD-18										X											48 hours prior to meeting
	010	Section 6	Internal Project Meeting Minutes, SD-18										X											14 days after meeting
	011	Section 6	Meeting Minutes, SD-18									X	X											14 days after meeting

bmb

Attachment 7
Testing Laboratory Information

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

NELAP - RECOGNIZED

ACCREDITATION

Is hereby granted to

AIR TOXICS LTD.

180 BLUE RAVINE ROAD, SUITE B

FOLSOM, CA 95630

Scope of accreditation is limited to the
"NELAP Fields of Accreditation"
which accompanies this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **02110CA**

Expiration Date: **06/30/2007**

Effective Date: **06/30/2006**

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED

Fields of Accreditation

AIR TOXICS LTD.

Lab Phone (916) 985-1000

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630

Certificate No: 02110CA **Renew Date: 06/30/2007**

116 - Volatile Organic Chemistry of Hazardous Waste

116.080	001	EPA 8260B	Acetone
116.080	004	EPA 8260B	Acrylonitrile
116.080	007	EPA 8260B	Benzene
116.080	010	EPA 8260B	Bromochloromethane
116.080	011	EPA 8260B	Bromodichloromethane
116.080	012	EPA 8260B	Bromoform
116.080	013	EPA 8260B	Bromomethane
116.080	015	EPA 8260B	Carbon Disulfide
116.080	016	EPA 8260B	Carbon Tetrachloride
116.080	018	EPA 8260B	Chlorobenzene
116.080	019	EPA 8260B	Chloroethane
116.080	021	EPA 8260B	Chloroform
116.080	022	EPA 8260B	Chloromethane
116.080	026	EPA 8260B	Dibromochloromethane
116.080	028	EPA 8260B	1,2-Dibromoethane
116.080	030	EPA 8260B	Dibromomethane
116.080	031	EPA 8260B	1,2-Dichlorobenzene
116.080	032	EPA 8260B	1,3-Dichlorobenzene
116.080	033	EPA 8260B	1,4-Dichlorobenzene
116.080	034	EPA 8260B	cis-1,4-Dichloro-2-butene
116.080	035	EPA 8260B	trans-1,4-Dichloro-2-butene
116.080	036	EPA 8260B	Dichlorodifluoromethane
116.080	037	EPA 8260B	1,1-Dichloroethane
116.080	038	EPA 8260B	1,2-Dichloroethane
116.080	039	EPA 8260B	1,1-Dichloroethene
116.080	040	EPA 8260B	trans-1,2-Dichloroethene
116.080	041	EPA 8260B	cis-1,2-Dichloroethene
116.080	042	EPA 8260B	1,2-Dichloropropane
116.080	043	EPA 8260B	1,3-Dichloropropane
116.080	044	EPA 8260B	2,2-Dichloropropane
116.080	045	EPA 8260B	1,1-Dichloropropene
116.080	046	EPA 8260B	cis-1,3-Dichloropropene
116.080	047	EPA 8260B	trans-1,3-Dichloropropene
116.080	053	EPA 8260B	Ethylbenzene

As of 06/26/2006, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

116.080	056	EPA 8260B	Hexachlorobutadiene
116.080	058	EPA 8260B	2-Hexanone (MBK)
116.080	059	EPA 8260B	Iodomethane
116.080	064	EPA 8260B	Methyl tert-butyl Ether (MTBE)
116.080	065	EPA 8260B	Methylene Chloride
116.080	068	EPA 8260B	4-Methyl-2-pentanone (MIBK)
116.080	069	EPA 8260B	Naphthalene
116.080	081	EPA 8260B	1,1,1,2-Tetrachloroethane
116.080	082	EPA 8260B	1,1,2,2-Tetrachloroethane
116.080	083	EPA 8260B	Tetrachloroethene
116.080	084	EPA 8260B	Toluene
116.080	086	EPA 8260B	1,2,3-Trichlorobenzene
116.080	087	EPA 8260B	1,2,4-Trichlorobenzene
116.080	088	EPA 8260B	1,1,1-Trichloroethane
116.080	089	EPA 8260B	1,1,2-Trichloroethane
116.080	090	EPA 8260B	Trichloroethene
116.080	091	EPA 8260B	Trichlorofluoromethane
116.080	092	EPA 8260B	1,2,3-Trichloropropane
116.080	093	EPA 8260B	Vinyl Acetate
116.080	094	EPA 8260B	Vinyl Chloride
116.080	095	EPA 8260B	Xylenes, Total
116.080	099	EPA 8260B	Bromobenzene
116.080	100	EPA 8260B	n-Butylbenzene
116.080	101	EPA 8260B	sec-Butylbenzene
116.080	102	EPA 8260B	tert-Butylbenzene
116.080	103	EPA 8260B	2-Chlorotoluene
116.080	104	EPA 8260B	4-Chlorotoluene
116.080	105	EPA 8260B	Isopropylbenzene
116.080	106	EPA 8260B	N-propylbenzene
116.080	107	EPA 8260B	Styrene
116.080	108	EPA 8260B	1,2,4-Trimethylbenzene
116.080	109	EPA 8260B	1,3,5-Trimethylbenzene

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

NELAP - RECOGNIZED

ACCREDITATION

Is hereby granted to

CURTIS & TOMPKINS, LTD.

2323 FIFTH STREET

BERKELEY, CA 94710

Scope of accreditation is limited to the
"NELAP Fields of Accreditation"
which accompanies this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **01107CA**

Expiration Date: **01/31/2008**

Effective Date: **01/31/2007**

Richmond, California
subject to forfeiture or revocation

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED

Fields of Accreditation

CURTIS & TOMPKINS, LTD. **Lab Phone** (510) 486-0900

2323 FIFTH STREET
BERKELEY, CA 94710

Certificate No: 01107CA Renew Date: 01/31/2008

102 - Inorganic Chemistry of Drinking Water

102.030	003	EPA 300.0	Chloride
102.030	005	EPA 300.0	Fluoride
102.030	006	EPA 300.0	Nitrate
102.030	007	EPA 300.0	Nitrite
102.030	010	EPA 300.0	Sulfate
102.045	001	EPA 314.0	Perchlorate
102.100	001	SM2320B	Alkalinity

103 - Toxic Chemical Elements of Drinking Water

103.130	001	EPA 200.7	Aluminum
103.130	003	EPA 200.7	Barium
103.130	004	EPA 200.7	Beryllium
103.130	005	EPA 200.7	Cadmium
103.130	007	EPA 200.7	Chromium
103.130	008	EPA 200.7	Copper
103.130	009	EPA 200.7	Iron
103.130	012	EPA 200.7	Nickel
103.130	015	EPA 200.7	Silver
103.130	017	EPA 200.7	Zinc

108 - Inorganic Chemistry of Wastewater

108.020	001	EPA 120.1	Conductivity
108.050	001	EPA 150.1	pH
108.060	001	EPA 160.1	Residue, Filterable
108.070	001	EPA 160.2	Residue, Non-filterable
108.110	001	EPA 180.1	Turbidity
108.112	001	EPA 200.7	Boron
108.112	002	EPA 200.7	Calcium
108.112	004	EPA 200.7	Magnesium
108.112	005	EPA 200.7	Potassium
108.112	007	EPA 200.7	Sodium
108.120	002	EPA 300.0	Chloride
108.120	003	EPA 300.0	Fluoride
108.120	004	EPA 300.0	Nitrate
108.120	005	EPA 300.0	Nitrite

108.120	008	EPA 300.0	Sulfate
108.140	001	EPA 310.1	Alkalinity
108.174	001	EPA 330.5	Chlorine Residual, Total
108.181	001	EPA 335.2	Cyanide, Total
108.202	001	EPA 350.3	Ammonia
108.262	001	EPA 365.2	Phosphate, Ortho
108.263	001	EPA 365.2	Phosphorus, Total
108.270	001	EPA 370.1	Dissolved Silica
108.290	001	EPA 376.1	Sulfide
108.310	001	EPA 405.1	Biochemical Oxygen Demand
108.320	001	EPA 410.1	Chemical Oxygen Demand
108.360	001	EPA 420.1	Phenols, Total
108.370	001	EPA 425.1	Surfactants
108.380	001	EPA 1664	Oil and Grease
108.420	001	SM2340B	Hardness (calc.)
108.611	001	SM5310C	Total Organic Carbon

109 - Toxic Chemical Elements of Wastewater

109.010	002	EPA 200.7	Antimony
109.010	003	EPA 200.7	Arsenic
109.010	004	EPA 200.7	Barium
109.010	005	EPA 200.7	Beryllium
109.010	007	EPA 200.7	Cadmium
109.010	009	EPA 200.7	Chromium
109.010	010	EPA 200.7	Cobalt
109.010	011	EPA 200.7	Copper
109.010	012	EPA 200.7	Iron
109.010	013	EPA 200.7	Lead
109.010	015	EPA 200.7	Manganese
109.010	016	EPA 200.7	Molybdenum
109.010	017	EPA 200.7	Nickel
109.010	019	EPA 200.7	Selenium
109.010	021	EPA 200.7	Silver
109.010	023	EPA 200.7	Thallium
109.010	024	EPA 200.7	Tin
109.010	026	EPA 200.7	Vanadium
109.010	027	EPA 200.7	Zinc
109.190	001	EPA 245.1	Mercury
109.811	001	SM3500-Cr D	Chromium (VI)

114 - Inorganic Chemistry of Hazardous Waste

114.010	001	EPA 6010B	Antimony
114.010	002	EPA 6010B	Arsenic

114.010	003	EPA 6010B	Barium
114.010	004	EPA 6010B	Beryllium
114.010	005	EPA 6010B	Cadmium
114.010	006	EPA 6010B	Chromium
114.010	007	EPA 6010B	Cobalt
114.010	008	EPA 6010B	Copper
114.010	009	EPA 6010B	Lead
114.010	010	EPA 6010B	Molybdenum
114.010	011	EPA 6010B	Nickel
114.010	012	EPA 6010B	Selenium
114.010	013	EPA 6010B	Silver
114.010	014	EPA 6010B	Thallium
114.010	015	EPA 6010B	Vanadium
114.010	016	EPA 6010B	Zinc
114.020	001	EPA 6020	Antimony
114.020	002	EPA 6020	Arsenic
114.020	003	EPA 6020	Barium
114.020	004	EPA 6020	Beryllium
114.020	005	EPA 6020	Cadmium
114.020	006	EPA 6020	Chromium
114.020	007	EPA 6020	Cobalt
114.020	008	EPA 6020	Copper
114.020	009	EPA 6020	Lead
114.020	010	EPA 6020	Molybdenum
114.020	011	EPA 6020	Nickel
114.020	012	EPA 6020	Selenium
114.020	013	EPA 6020	Silver
114.020	014	EPA 6020	Thallium
114.020	015	EPA 6020	Vanadium
114.020	016	EPA 6020	Zinc
114.103	001	EPA 7196A	Chromium (VI)
114.140	001	EPA 7470A	Mercury
114.141	001	EPA 7471A	Mercury
114.222	001	EPA 9014	Cyanide
114.230	001	EPA 9034	Sulfides, Total
114.240	001	EPA 9040	pH
114.241	001	EPA 9045	pH

115 - Extraction Test of Hazardous Waste

115.020	001	EPA 1311	Toxicity Characteristic Leaching Procedure (TCLP)
115.030	001	CCR Chapter11, Article 5, Appendix II	Waste Extraction Test (WET)

116 - Volatile Organic Chemistry of Hazardous Waste

116.030	001	EPA 8015B	Gasoline-range Organics
116.040	002	EPA 8021B	Benzene
116.040	039	EPA 8021B	Ethylbenzene
116.040	041	EPA 8021B	Methyl tert-butyl Ether (MTBE)
116.040	047	EPA 8021B	Toluene
116.040	056	EPA 8021B	Xylenes, Total
116.080	001	EPA 8260B	Acetone
116.080	007	EPA 8260B	Benzene
116.080	010	EPA 8260B	Bromochloromethane
116.080	011	EPA 8260B	Bromodichloromethane
116.080	012	EPA 8260B	Bromoform
116.080	013	EPA 8260B	Bromomethane
116.080	015	EPA 8260B	Carbon Disulfide
116.080	016	EPA 8260B	Carbon Tetrachloride
116.080	018	EPA 8260B	Chlorobenzene
116.080	019	EPA 8260B	Chloroethane
116.080	020	EPA 8260B	2-Chloroethyl Vinyl Ether
116.080	021	EPA 8260B	Chloroform
116.080	022	EPA 8260B	Chloromethane
116.080	026	EPA 8260B	Dibromochloromethane
116.080	027	EPA 8260B	Dibromochloropropane
116.080	028	EPA 8260B	1,2-Dibromoethane
116.080	030	EPA 8260B	Dibromomethane
116.080	031	EPA 8260B	1,2-Dichlorobenzene
116.080	032	EPA 8260B	1,3-Dichlorobenzene
116.080	033	EPA 8260B	1,4-Dichlorobenzene
116.080	036	EPA 8260B	Dichlorodifluoromethane
116.080	037	EPA 8260B	1,1-Dichloroethane
116.080	038	EPA 8260B	1,2-Dichloroethane
116.080	039	EPA 8260B	1,1-Dichloroethene
116.080	040	EPA 8260B	trans-1,2-Dichloroethene
116.080	041	EPA 8260B	cis-1,2-Dichloroethene
116.080	042	EPA 8260B	1,2-Dichloropropane
116.080	043	EPA 8260B	1,3-Dichloropropane
116.080	044	EPA 8260B	2,2-Dichloropropane
116.080	045	EPA 8260B	1,1-Dichloropropene
116.080	046	EPA 8260B	cis-1,3-Dichloropropene
116.080	047	EPA 8260B	trans-1,3-Dichloropropene
116.080	053	EPA 8260B	Ethylbenzene
116.080	056	EPA 8260B	Hexachlorobutadiene
116.080	058	EPA 8260B	2-Hexanone (MBK)

116.080	064	EPA 8260B	Methyl tert-butyl Ether (MTBE)
116.080	065	EPA 8260B	Methylene Chloride
116.080	066	EPA 8260B	Methyl Ethyl Ketone
116.080	068	EPA 8260B	4-Methyl-2-pentanone (MIBK)
116.080	069	EPA 8260B	Naphthalene
116.080	081	EPA 8260B	1,1,1,2-Tetrachloroethane
116.080	082	EPA 8260B	1,1,2,2-Tetrachloroethane
116.080	083	EPA 8260B	Tetrachloroethene
116.080	084	EPA 8260B	Toluene
116.080	086	EPA 8260B	1,2,3-Trichlorobenzene
116.080	087	EPA 8260B	1,2,4-Trichlorobenzene
116.080	088	EPA 8260B	1,1,1-Trichloroethane
116.080	089	EPA 8260B	1,1,2-Trichloroethane
116.080	090	EPA 8260B	Trichloroethene
116.080	091	EPA 8260B	Trichlorofluoromethane
116.080	092	EPA 8260B	1,2,3-Trichloropropane
116.080	093	EPA 8260B	Vinyl Acetate
116.080	094	EPA 8260B	Vinyl Chloride
116.080	095	EPA 8260B	Xylenes, Total
116.080	096	EPA 8260B	tert-Amyl Methyl Ether (TAME)
116.080	097	EPA 8260B	tert-Butyl Alcohol (TBA)
116.080	098	EPA 8260B	Ethyl tert-butyl Ether (ETBE)
116.080	099	EPA 8260B	Bromobenzene
116.080	100	EPA 8260B	n-Butylbenzene
116.080	101	EPA 8260B	sec-Butylbenzene
116.080	102	EPA 8260B	tert-Butylbenzene
116.080	103	EPA 8260B	2-Chlorotoluene
116.080	104	EPA 8260B	4-Chlorotoluene
116.080	105	EPA 8260B	Isopropylbenzene
116.080	106	EPA 8260B	N-propylbenzene
116.080	107	EPA 8260B	Styrene
116.080	108	EPA 8260B	1,2,4-Trimethylbenzene
116.080	109	EPA 8260B	1,3,5-Trimethylbenzene

117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	EPA 8015B	Diesel-range Total Petroleum Hydrocarbons
117.110	001	EPA 8270C	Acenaphthene
117.110	002	EPA 8270C	Acenaphthylene
117.110	008	EPA 8270C	Anthracene
117.110	011	EPA 8270C	Benz(a)anthracene
117.110	012	EPA 8270C	Benzo(b)fluoranthene
117.110	013	EPA 8270C	Benzo(k)fluoranthene

117.110	014	EPA 8270C	Benzo(g,h,i)perylene
117.110	015	EPA 8270C	Benzo(a)pyrene
117.110	016	EPA 8270C	Benzoic Acid
117.110	018	EPA 8270C	Benzyl Alcohol
117.110	019	EPA 8270C	Benzyl Butyl Phthalate
117.110	020	EPA 8270C	Bis(2-chloroethoxy)methane
117.110	021	EPA 8270C	Bis(2-chloroethyl) Ether
117.110	022	EPA 8270C	Bis(2-chloroisopropyl) Ether
117.110	023	EPA 8270C	Di(2-ethylhexyl) Phthalate
117.110	024	EPA 8270C	4-Bromophenyl Phenyl Ether
117.110	026	EPA 8270C	4-Chloroaniline
117.110	027	EPA 8270C	4-Chloro-3-methylphenol
117.110	029	EPA 8270C	2-Chloronaphthalene
117.110	030	EPA 8270C	2-Chlorophenol
117.110	031	EPA 8270C	4-Chlorophenyl Phenyl Ether
117.110	032	EPA 8270C	Chrysene
117.110	036	EPA 8270C	Dibenz(a,h)anthracene
117.110	037	EPA 8270C	Dibenzofuran
117.110	039	EPA 8270C	1,2-Dichlorobenzene
117.110	040	EPA 8270C	1,3-Dichlorobenzene
117.110	041	EPA 8270C	1,4-Dichlorobenzene
117.110	042	EPA 8270C	3,3'-Dichlorobenzidine
117.110	043	EPA 8270C	2,4-Dichlorophenol
117.110	045	EPA 8270C	Diethyl Phthalate
117.110	053	EPA 8270C	2,4-Dimethylphenol
117.110	054	EPA 8270C	Dimethyl Phthalate
117.110	055	EPA 8270C	Di-n-butyl phthalate
117.110	056	EPA 8270C	Di-n-octyl phthalate
117.110	060	EPA 8270C	2,4-Dinitrophenol
117.110	061	EPA 8270C	2,4-Dinitrotoluene
117.110	062	EPA 8270C	2,6-Dinitrotoluene
117.110	067	EPA 8270C	Fluoranthene
117.110	068	EPA 8270C	Fluorene
117.110	069	EPA 8270C	Hexachlorobenzene
117.110	070	EPA 8270C	Hexachlorobutadiene
117.110	071	EPA 8270C	Hexachlorocyclopentadiene
117.110	072	EPA 8270C	Hexachloroethane
117.110	075	EPA 8270C	Indeno(1,2,3-c,d)pyrene
117.110	076	EPA 8270C	Isophorone
117.110	080	EPA 8270C	2-Methyl-4,6-dinitrophenol
117.110	083	EPA 8270C	2-Methylnaphthalene

117.110	084	EPA 8270C	2-Methylphenol
117.110	086	EPA 8270C	4-Methylphenol
117.110	087	EPA 8270C	Naphthalene
117.110	092	EPA 8270C	2-Nitroaniline
117.110	093	EPA 8270C	3-Nitroaniline
117.110	094	EPA 8270C	4-Nitroaniline
117.110	095	EPA 8270C	Nitrobenzene
117.110	096	EPA 8270C	2-Nitrophenol
117.110	097	EPA 8270C	4-Nitrophenol
117.110	100	EPA 8270C	N-nitrosodimethylamine
117.110	101	EPA 8270C	N-nitrosodi-n-propylamine
117.110	102	EPA 8270C	N-nitrosodiphenylamine
117.110	110	EPA 8270C	Pentachlorophenol
117.110	112	EPA 8270C	Phenanthrene
117.110	113	EPA 8270C	Phenol
117.110	119	EPA 8270C	Pyrene
117.110	129	EPA 8270C	1,2,4-Trichlorobenzene
117.110	130	EPA 8270C	2,4,5-Trichlorophenol
117.110	131	EPA 8270C	2,4,6-Trichlorophenol
117.140	001	EPA 8310	Acenaphthene
117.140	002	EPA 8310	Acenaphthylene
117.140	003	EPA 8310	Anthracene
117.140	004	EPA 8310	Benz(a)anthracene
117.140	005	EPA 8310	Benzo(a)pyrene
117.140	006	EPA 8310	Benzo(b)fluoranthene
117.140	007	EPA 8310	Benzo(k)fluoranthene
117.140	008	EPA 8310	Benzo(g,h,i)perylene
117.140	009	EPA 8310	Chrysene
117.140	010	EPA 8310	Dibenz(a,h)anthracene
117.140	011	EPA 8310	Fluoranthene
117.140	012	EPA 8310	Fluorene
117.140	013	EPA 8310	Indeno(1,2,3-c,d)pyrene
117.140	014	EPA 8310	Naphthalene
117.140	015	EPA 8310	Phenanthrene
117.140	016	EPA 8310	Pyrene
117.170	001	EPA 8330	4-Amino-2,6-dinitrotoluene
117.170	002	EPA 8330	2-Amino-4,6-dinitrotoluene
117.170	003	EPA 8330	1,3-Dinitrobenzene
117.170	006	EPA 8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
117.170	007	EPA 8330	Methyl-2,4,6-trinitrophenylnitramine
117.170	009	EPA 8330	2-Nitrotoluene

117.170	010	EPA 8330	3-Nitrotoluene
117.170	011	EPA 8330	4-Nitrotoluene
117.170	012	EPA 8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
117.170	013	EPA 8330	1,3,5-Trinitrobenzene
117.170	014	EPA 8330	2,4,6-Trinitrotoluene
117.210	001	EPA 8081A	Aldrin
117.210	002	EPA 8081A	a-BHC
117.210	003	EPA 8081A	b-BHC
117.210	004	EPA 8081A	d-BHC
117.210	005	EPA 8081A	g-BHC (Lindane)
117.210	007	EPA 8081A	a-Chlordane
117.210	008	EPA 8081A	g-Chlordane
117.210	009	EPA 8081A	Chlordane (tech.)
117.210	013	EPA 8081A	4,4'-DDD
117.210	014	EPA 8081A	4,4'-DDE
117.210	015	EPA 8081A	4,4'-DDT
117.210	020	EPA 8081A	Dieldrin
117.210	021	EPA 8081A	Endosulfan I
117.210	022	EPA 8081A	Endosulfan II
117.210	023	EPA 8081A	Endosulfan Sulfate
117.210	024	EPA 8081A	Endrin
117.210	025	EPA 8081A	Endrin Aldehyde
117.210	026	EPA 8081A	Endrin Ketone
117.210	027	EPA 8081A	Heptachlor
117.210	028	EPA 8081A	Heptachlor Epoxide
117.210	033	EPA 8081A	Methoxychlor
117.210	039	EPA 8081A	Toxaphene
117.220	001	EPA 8082	PCB-1016
117.220	002	EPA 8082	PCB-1221
117.220	003	EPA 8082	PCB-1232
117.220	004	EPA 8082	PCB-1242
117.220	005	EPA 8082	PCB-1248
117.220	006	EPA 8082	PCB-1254
117.220	007	EPA 8082	PCB-1260

120 - Physical Properties of Hazardous Waste

120.010	001	EPA 1010	Ignitability
120.030	001	EPA 1110	Corrosivity
120.040	001	Section 7.3 SW-846	Reactive Cyanide
120.050	001	Section 7.3 SW-846	Reactive Sulfide
120.070	001	EPA 9040B	Corrosivity - pH Determination
120.080	001	EPA 9045C	Corrosivity - pH Determination

Attachment 8
Testing Plan and Log

Contract N68711-01-D-6011 CTO.0010			Non-Time Critical Removal Action of Three Solid Waste Disposal Areas, Installation Restoration Site 12 at Former Naval Station Treasure Island *San Francisco, California*							CONTRACTOR Shaw Environmental, Inc.	
SPECIFICATION SECTION AND PARAGRAPH NUMBER	TEST PROCEDURE	TEST NAME	ACCREDITED/ APPROVED LAB YES	NO	SAMPLED BY	LOCATION OF TEST ON SITE/ OFF SITE		FREQUENCY of TEST	DATE COMPLETED	DATE FORWARDED TO CONTR. OFFICER	REMARKS
SAP 3.2	Method 8015M	TPH as Diesel	Yes		Shaw		Off	One-time			
SAP 3.2	Method 8015M	TPH as Gasoline	Yes		Shaw		Off	One-time			
SAP 3.2	Method 8260B	Volatile Organic Compounds	Yes		Shaw		Off	One-time			
SAP 3.2	Method 8270C	Semivolatile Organic Compounds	Yes		Shaw		Off	One-time			
SAP 3.2	Method 6020/7470A	Title 22 Metals	Yes		Shaw		Off	One-time			

Contract N68711-01-D-6011 CTO.0010			Non-Time Critical Removal Action of Three Solid Waste Disposal Areas, Installation Restoration Site 12 at Former Naval Station Treasure Island *San Francisco, California*							CONTRACTOR Shaw Environmental, Inc.	
SPECIFICATION SECTION AND PARAGRAPH NUMBER	TEST PROCEDURE	TEST NAME	ACCREDITED/ APPROVED LAB YES	NO	SAMPLED BY	LOCATION OF TEST ON SITE/ OFF SITE		FREQUENCY of TEST	DATE COMPLETED	DATE FORWARDED TO CONTR. OFFICER	REMARKS
SAP 3.2	Method 8081A/8082	Pesticides/ PCBs	Yes		Shaw		Off	One-time			

BACK MATERIAL BREAK

Attachment 9
Rework Items List

REWORK ITEMS LIST

Treasure Island, Removal Action at Three Solid Waste areas

CTO 0010, Contract N68711-01-D-6011

Item	Date Identified	Date Corrected
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
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18.		
20.		
21.		

Attachment 10
Daily Production Report

DAILY EMAC CONTRACTOR REPORT
PRODUCTION

Contractor: Shaw Environmental, Inc. **Superintendent:** Pete Bourgeois **Report No.**

Contract No. N68711-01-D-6011 **CTO No.** 0010 **Project No.** **Date:**

Title and Location: Non-Time Critical Removal Action of Three Solid Waste Disposal Areas, IRP-Site-12, T

Site Conditions: AM Weather: PM Weather:

Time: 0630 - 1700 Low Temp: degrees F High Temp: degrees F

WORK PERFORMED

Activities/Location	Employee	Employer	Number	Trade	Hours
Management		Shaw		Project Manager	0.00
Management		Shaw		Task Manager	0.00
Management		Shaw		Superintendent	0.00
H&S/Bldg 233		Shaw		SHSS	0.00
QC/Bldg 233		Shaw		PQCM	0.00
Business Admin		Shaw		PBA	0.00
Subtotal					0.00
Subcontractors					
Subcontractors subtotal					0.00

Today's Total Hours	0.00
Previous Hours	0.00
Total Hours To Date	0.00
Subs Total Hours To Date	

SHAW CONSTRUCTION AND PLANT EQUIPMENT ON SITE

EQUIPMENT	ARRIVAL DATE	OFF RENT DATE	ACTUAL DEMOB DATE	HOURS		REASON IDLE
				WORK	IDLE	

`

DAILY EMAC CONTRACTOR REPORT
PRODUCTION (CONT'D)

Report No. 0

Job Safety

Was a Tailgate Safety Meeting held? (If so, attach sheet)	_____	Yes	_____	No
Were there any lost time accidents? (If so, attach accident report)	_____	Yes	_____	No
Was trench, scaffold, HV electrical work done? (If so, attach inspection report of checklist)	_____	Yes	_____	No
Was hazardous waste/material released into the environment? (If so, attach description of incident and proposed action)	_____	Yes	_____	No
Have safety requirements been met?	_____	Yes	_____	No

Materials and Equipment Incorporated into Site

Material	Quantity
none	

Manifested Materials Removed from Job Site

Material	Quantity	Manifest Number
none		

Superintendent's Remarks

See attached field documents

_____ Project Superintendent

_____ Date

Attachment 11
Daily Quality Control Report

DAILY EMAC CONTRACTOR REPORT
QUALITY CONTROL

(Attach additional sheets if necessary)

Report No.

Contract No. N68711-01-D-6011 CTO 0010 Project No. Date:

Summary of Three Phase Inspections Made Today (identify number performed and attach inspection sheets):

Preparatory:

Initial:

Follow-up:

Rework Items Identified Today:

none

Rework Items Corrected Today (from Rework Items List):

none

Contractor QC Manager's Remarks:

On behalf of Shaw E & I, I certify that this report is complete and correct, and that equipment and material used and work performed during this reporting period are in compliance with the contract drawings and specifications, to the best of my knowledge, except as noted in this report.

Project QC Manager Date

GOVERNMENT QUALITY ASSURANCE REPORT

Government's NTR'S/QA representative's remarks and/or exceptions to this report:

Reviewed by NTR/QA Representative Date

Attachment 12
Definable Features of Work Matrix

Definable Features of Work Matrix

Specification Section	Paragraph No.	Feature of Work	Preparatory		Initial		Follow Up		Remarks
			Req.	Date	Req.	Date	Req.	Date	
3.6	1	Utility Clearance	X		X		X		
3.7 & 4.4	1	Site Survey	X		X		X		
4.5	1	Site Preparation	X		X		X		
4.1	1	Radiological Soil Screening	X		X		X		
4.6	1	Excavation, Transport and Disposal	X		X		X		
4.6.5.3	1	Post Excavation Confirmation Soil Sampling	X		X		X		
4.7	1	Site Restoration / Backfill / Compaction	X		X		X		

Attachment 13
Preparatory Phase Inspection

Contractor Quality Control Report Continuation Sheet

(Attach additional sheets if necessary)

Page 1 of

Date:

Contractor: Shaw Environmental Inc. Report No.

Contract No. N68711-01-D-6011 CTO Project No.

PREPARATORY PHASE INSPECTION

Y - yes; N - no; na - not applicable	
Plans and specs have been reviewed	
Submittals have been approved	
Materials comply with approved submittals	
Preliminary work was done correctly	
Testing Plan and Log has been reviewed	
Work method and schedule discussed	

Identify Definable Feature of Work and Location, and List Personnel Present

Task / Location / (see attached attendance list)

SOW:

References:

Submittals:

Materials:

Equipment:

Test results:

Testing Plan & Log:

Preliminary work:

Receipt inspection:

AHAs (including, MSDSs):

Work methods:

Tasks, assignments, etc.

Schedule.

_____ _____

Project QC Manager Date

Attachment 14
Initial Phase Inspection

Contractor Quality Control Report Continuation Sheet

(Attach additional sheets if necessary)

Date:

Contractor: Shaw Environmental Inc. Report No.

Contract No. N68711-01-D-6011 CTO Project No.

INITIAL PHASE INSPECTION

Y - yes; N - no; na - not applicable	
Preliminary work was done correctly	
Sample was prepared and approved	
Workmanship is satisfactory	
Test results are acceptable	
Work is in compliance with the contract	

Identify Definable Feature of Work, Location, and Personnel Present

Testing Performed & Who Performed Test (including number of samples and tests taken)

none

Project QC Manager Date

Attachment 15
Follow-Up Phase Inspection

Contractor Quality Control Report Continuation Sheet

(Attach additional sheets if necessary)

Date:

Contractor: Shaw Environmental Inc. Report No.

Contract No. N68711-01-D-6011 CTO Project No.

FOLLOW-UP PHASE INSPECTION

Y - yes; N - no; na - not applicable	
Work is in compliance with the contract	Y

Identify Definable Feature of Work, Location, and Personnel Present

Testing Performed & Who Performed Test (including number of samples and tests taken)

none

Project QC Manager Date

Attachment 16
Personnel Matrix

Personnel Matrix

Specification			Responsible Individual		
Section	Para.	Description	Submittal Review and Approval	Three Phases of Control	Testing
3.6	1	Utility Clearance	Not Applicable	QC Manager or Designate	Not Applicable
3.7 & 4.4	1	Site Survey	Not Applicable	QC Manager or Designate	Not Applicable
4.5	1	Site Preparation	Not Applicable	QC Manager or Designate	Not Applicable
4.1	1	Radiological Soil Screening	Not Applicable	QC Manager or Designate	Not Applicable
4.6	1	Excavation, Transport and Disposal	Project Manager or Designate	Technical Lead	Not Applicable
4.6.5.3	1	Post-Excavation Soil Sampling	Project Manager or Designate	QC Manager or Designate	Off-Site Laboratory
4.7	1	Site Restoration / Backfill / Compaction	Project Manager or Designate	QC Manager or Designate	Not Applicable

Appendix H
October 12, 2006 Memorandum, Initial Worker Exposure Evaluation for the Site 12 Soil Remediation Project, Naval Station Treasure Island

Shaw Environmental & Infrastructure, Inc.

3347 Michelson Drive, Suite 200
Irvine, CA 92612-1692
949.261.6441
Fax 949.474.8309

Shaw The Shaw Group Inc.™

MEMORANDUM

TO: Peter Bourgeois, Mark Egan

FROM: Fred Mlakar, CIH CSP, Health and Safety Manager

DATE: October 12, 2006

SUBJECT: Initial Worker Exposure Evaluation for Site 12 Soil Remediation Project, Naval Station Treasure Island.

The Cal/OSHA lead standard (Title 8 California Code of Regulations (CCR), Section 1532.1) requires the use of respirators, protective clothing, onsite shower facilities etc. if workers' breathing zone exposures exceed the Permissible Exposure Limit (PEL) of 0.05 milligrams per cubic meter of air (mg/M^3) expressed as an 8-hour time weighted average (TWA) concentration. Blood lead monitoring is required when the TWA Action Level (AL) of 0.03 mg/M^3 is exceeded.

Subsection 1532.1(d)(3)(D) of the Cal/OSHA lead standard states:

> Where the employer has objective data, demonstrating that a particular product or material containing lead or a specific process, operation or activity involving lead cannot result in employee exposure to lead at or above the action level during processing, use, or handling, the employer may rely upon such data instead of implementing initial monitoring.

Site 12 soil data were evaluated with respect to their potential for causing airborne lead exposures to site remediation workers. The following total airborne dust concentrations which were calculated based only on the average lead concentration in those samples that exceeded the EPA PRG Screening Criterion for Residential Soils (400 mg/kg). These calculations contain large margins of safety because all samples with lower than PRG levels were not included.

Cal/OSHA Standard (mg/M^3)	TWA concentration of airborne soil particulates needed to exceed Cal/OSHA standard (mg/M^3)
lead PEL of 0.05	46.25
lead AL of 0.03	27.75

These dust exposures are not likely to be attained under construction site conditions. To put these numbers into perspective, consider that airborne dust levels of 10 mg/M^3 are known to reduce visibility to approximately 20 feet.

Therefore, pursuant to the Cal/OSHA lead standard, the use of Level C protective equipment, onsite shower facilities, and blood lead monitoring will not be required. Airborne dust concentrations will be verified on a daily basis using personal direct-reading dust monitors (PDR).

The Cal/OSHA arsenic standard (Title 8 CCR section 5214) defines inorganic arsenic as:

> Elemental arsenic and all of its inorganic compounds, including copper acetoarsenite (Paris Green), with the exception of arsine. For the purposes and requirements of this section, any substance of a total inorganic arsenic content of 0.02 percent or less, by weight, is excluded from this definition.

The highest arsenic concentration detected in Site 12 soil was 29.6 mg/kg which equates to 0.00296 percent. Therefore, the concentrations of arsenic to in Site 12 soil are too low to present a significant hazard to site workers, and the Cal/OSHA arsenic standard does not apply.

Polychlorinated biphenyls and other metals were also detected in very low concentrations relative to their PELs. Poly aromatic hydrocarbons, and dioxin concentrations were detected in even lower concentrations and no occupational exposure limits have been established for them. These substances also present a minimal risk to site workers.

Nevertheless exposures to contaminated soils will be minimized by:

- application of water and careful handling of soil,
- use of disposable coveralls and booties,
- washing hands before eating or drinking,
- communicating these precautions and the relative hazards of the contaminated soil to all affected workers in tailgate safety meetings
- airborne dust monitoring using direct-reading instruments and using the following site specific action levels which contain large margins of safety and which will trigger additional engineering and work practice dust control measures if exceeded:

Location of PDR reading	Site specific TWA action level (mg/M^3)
Near worker breathing zone	2.5
Perimeter of exclusion zone	1.0

Appendix I
Section 2.4.1.5 of the Scope of Work for Non-Time Critical Removal Action for three Solid Waste Disposal Areas, Treasure Island

2.4.1.5 Restrictions Upon Interrupting Station Operations:

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

Appendix J
Shaw Standard Operating Procedure 6.2, Revision 1, "Drilling, Development, and Heavy Equipment Decontamination" and Shaw Standard Operating Procedure 12.1, "Soil Stockpiling"

DRILLING, DEVELOPMENT, AND HEAVY EQUIPMENT DECONTAMINATION

STANDARD OPERATING PROCEDURE

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines for use by field personnel in the decontamination of drilling, development, and heavy equipment. The details within this SOP are applicable as general requirements for drilling and heavy equipment decontamination, and should also be used in conjunction with project work plans.

2.0 References

2.1 EPA, September 1987, EPA Compendium of Superfund Field Operations Methods, EPA 540/P-87/001a, OSWER 9355.0-14.

2.2 EPA, August 1988, EPA Guidelines for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final OSWER Directive 9355.3-01.

2.3 SQP 4.2 - Records Management

2.4 SOP 6.1 - Sampling Equipment and Well Material Decontamination

3.0 Definitions

3.1 Laboratory Grade Detergent - A standard brand of laboratory-grade detergent, such as "Alconox" or "Liquinox."

3.2 Potable Water - Treated water dispensed from a municipal water system and delivered via a system which has no less then two backflow preventers.

4.0 Procedure

4.1 Responsibilities

4.1.1 Compliance with this procedure is the responsibility of project management and field personnel. This SOP and the project work plans should be reviewed before implementing drilling, development, and heavy equipment decontamination at the project field area.

4.1.2 The Project Manager has the responsibility for ensuring that the decontamination of drilling and heavy equipment is properly performed through staff training and by maintaining quality assurance/quality control (QA/QC).

4.1.3 The Contractor Quality Control Manager (CQCM) has the responsibility for periodic review of procedures and documentation associated with the decontamination of drilling and heavy equipment. If perceived variances occur, the CQCM is also responsible for issuing notices of nonconformances and requesting corrective actions. Additionally, he/she will perform the three phases of inspections and continuous monitoring of the decontamination activities.

4.1.4 The project staff assigned to drilling, development, trenching, or construction activities are responsible for ensuring that subcontractors or equipment operators properly decontaminate the drilling, development, and heavy equipment associated with those tasks. The project staff are also responsible for documenting the decontamination activities on the Field Activity Daily Log (FADL) (Attachment 6.1) and/or appropriate form(s) as specified in the project work plans.

4.2 General

4.2.1 This section provides requirements for the set up of a decontamination facility for drilling, development, and heavy equipment and the decontamination procedures to be followed. The project work plans will provide specific information regarding:

- Types of equipment requiring decontamination under this SOP;
- Location of the decontamination station;

- Types and/or specifications on materials to be used in the fabrication of the decontamination station; and

- Types of materials and additional details on the procedures to be used in the decontamination process.

4.2.2 All field personnel associated with either the fabrication of the decontamination station or the decontamination of drilling or heavy equipment must read both this SOP and the project work plans prior to implementation of related decontamination activities. Information and requirements for the decontamination of any and all equipment used specifically for sampling is presented in SOP 6.1.

4.3 Decontamination Facility

4.3.1 A decontamination station will be set up in an area exclusively for decontamination of drilling, well development, and/or heavy equipment. The location of the decontamination station will be specified in the project work plans. All decontamination of drilling, development, and heavy equipment will be conducted within the station.

4.3.2 At a minimum, the station will be constructed such that all rinsates, liquid spray, soil, debris, and other decontamination wastes are fully contained and may be collected for appropriate waste management and disposal. The station may be as simple as a bermed, impermeable polyethylene sheeting, of sufficient thickness, with an impermeable sump for collecting rinse water. More sophisticated designs involving self-contained metal decontamination pads in combination with bermed polyethylene sheeting may also be used, depending on project-specific requirements. These requirements along with specific equipment and construction specifications for the decontamination station will be provided in the project work plans.

4.4 Decontamination of Downhole Equipment

4.4.1 All downhole drilling and development equipment (including but not limited to drill pipe, drive casing, drill rods, bits, tools, bailers, etc.) will be thoroughly decontaminated before mobilization onto each site and between borings or wells at each site or as required in the project work plans. The

standard procedure will be performed as described below. Decontamination will be performed in accordance with this SOP and the project work plans.

4.4.2 Appropriate personal protective equipment (as specified in the project work plans) must be worn by all personnel involved with the task to limit personal exposure.

4.4.3 Equipment caked with drill cuttings, soil, or other material will initially be scraped or brushed. The scrapings will be containerized and appropriately disposed.

4.4.4 Equipment will then be sprayed with potable water using a hot water, high pressure washer.

4.4.5 Washed equipment will then be rinsed with potable water.

4.4.6 Decontaminated downhole equipment (such as drill pipe, drive casing, bits, tools, bailers, etc.) will be placed on clean plastic sheeting to prevent contact with contaminated soil and allowed to air dry. If equipment is not used immediately, it will be covered or wrapped in plastic sheeting to minimize airborne contamination.

4.4.7 Decontamination activities will be documented by the Site Superintendent, lead geologist, or lead engineer on the FADL and/or appropriate form(s), as specified in the project work plans.

4.5 Decontamination of Heavy Equipment

4.5.1 Heavy equipment (e.g., drill rigs, development rigs, backhoes, and other earthmoving equipment) will be decontaminated between drilling construction sites or inside the contaminant reduction area prior to entering and leaving an exclusion zone. Decontamination will be performed in accordance with the project work plans. The standard procedure will be performed as described below.

4.5.1.1 Appropriate personal protective equipment (as specified in the project work plans) will be worn by all personnel involved in the task, in order to limit personal exposure.

4.5.1.2 Equipment caked with drill cuttings, soil, or other material will be initially scraped or brushed. The scrapings will be containerized and appropriately disposed.

4.5.1.3 Equipment will then be sprayed with potable water using a hot water, high pressure washer.

4.5.1.4 Clean equipment will then be rinsed with potable water.

4.5.2 During the decontamination effort, fluid systems should be inspected for any leaks or problems which might potentially result in an inadvertent release at the site, thereby contributing to the volume of waste or contamination. Any identified problems should be immediately repaired and documented on the FADL. Decontamination should then be completed before moving the equipment onto the site or exclusion zone.

4.5.3 Decontamination activities will be documented by the Site Superintendent, lead geologist, or lead engineer on the FADL and/or appropriate form(s), as specified in the project work plans.

4.5.4 Between boreholes at the same site, the back-end of the drilling rigs will be washed with potable water until surfaces are visibly free of soil buildup.

5.0 Records

Records generated as a result of implementation of this SOP will be controlled and maintained in the project record files in accordance with SQP 4.2.

6.0 Attachments

6.1 Field Activity Daily Log.

SOIL STOCKPILING

STANDARD OPERATING PROCEDURE

1.0 Purpose

This Standard Operating Procedure (SOP) establishes guidelines for stockpiling of excavated soils. The details within this SOP should be used in conjunction with project work plans. The work plans may present additional project-specific requirements and procedures for soil stockpiling.

2.0 References

2.1 SQP 4.2 - Records Management

3.0 Definitions

3.1 None.

4.0 Procedure

4.1 Responsibilities

4.1.1 Compliance with this procedure is the responsibility of project management and field personnel. This SOP and the project work plans should be reviewed by the responsible personnel prior to commencement of soil stockpiling at the field area.

4.1.2 The Project Manager is responsible for assigning project staff to complete soil stockpiling activities, and for ensuring that this and any other appropriate procedures are implemented by project personnel. This will be accomplished through staff training and by maintaining quality assurance/quality control (QA/QC).

4.1.3 The Contractor Quality Control Manager (CQCM) is responsible for the periodic review of field generated documentation associated with soil stockpiling. If perceived variances occur, the CQCM is

also responsible for issuing notices of nonconformance and requests for corrective action. Additionally, he/she will perform the three phases of inspection as required by the CQC Plan.

4.1.4 Field personnel assigned to this task are responsible for performing the task according to this SOP and other appropriate procedures identified in the project work plans. All staff are responsible for reporting deviations from the procedures to the Site Superintendent, Project Manager, or the CQCM.

4.2 General

4.2.1 Stockpiling of soils is overseen by various regulatory agencies. Prior to initiating excavation activities, ensure that the procedures and requirements for compliance with applicable federal, state, and local regulations regarding stockpiling of soils have been reviewed and understood. The standard procedures for short-term and long-term stockpiling are described below. The project work plans will also present the following information pertaining to soil stockpiling:

- Any additional requirements or procedures to be followed
- Equipment to be used
- Stockpile locations.

4.3 Short-term Stockpiling

4.3.1 Upon initiation of excavation activities, soil will be segregated on a site-specific basis. Potentially clean soils will be stored in a separate short-term stockpile at the site. Soil that is suspected or known to be contaminated will be short-term stockpiled at the site separately from the clean soil.

4.3.2 The short-term stockpiles will be placed upon two layers of impermeable sheeting (such as polyvinyl chloride, polyethylene, etc.). For short-term storage, the separated soils may also be placed in bins or drums for subsequent transport to long-term stockpiles, per the project work plans.

4.3.3 Each pile will be covered with impermeable sheeting at the end of each work day. The covering will be secured at both the top and base of the stockpile. Plastic sheeting will be utilized to limit soil aeration and the release of windborne dust and particulates. The cover will also limit access by

rainwater, resulting in possible contamination of surface water runoff from the stockpile. If bins or drums are used for short-term storage, impermeable sheeting should be used to cover the bins and the covers to the drums should be secured and seated at the end of each work day.

4.3.4 Short-term stockpiling activities will be documented by the Site Superintendent, lead geologist, or lead engineer on the Field Activity Daily Log (FADL) (Attachment 6.1) and/or other appropriate form, as specified by the project work plans.

4.4 Long-term Soil Stockpiling

4.4.1 When space and logistics allow, long-term stockpiles will be constructed on a concrete or asphalt base. Two layers of impermeable sheeting will be placed on top of the concrete or asphalt. All sheeting will be folded at joining edges with a three-foot overlap to prevent seepage.

4.4.2 A berm will be erected around each stockpile. Boards or hay bales can be used to construct the berm. The material used to construct the berm will be placed under the two layers of impermeable sheeting to provide containment of any liquids that might leach from the soil.

4.4.3 Soil will be segregated by contaminant type (i.e., separate stockpiles for storage of soils impacted by gasoline, diesel, halogenated hydrocarbons, metals, etc.).

4.4.4 Each stockpile will be visibly labeled.

4.4.5 Covering of each pile with impermeable sheeting will be completed at the end of each work day. The covering will be secured at both the top and base of the stockpile. The sheeting will be utilized to limit soil aeration and the release of windborne dust and particulates. This cover will also limit access by rainwater, resulting in possible contamination of surface water runoff from the stockpile.

4.4.6 Long-term stockpiling activities will be documented by the Site Superintendent, lead geologist, or lead engineer on the FADL and/or other appropriate form, as specified by the project work plans.

5.0 Records

Records generated as a result of implementation of this SOP will be controlled and maintained in the project record files in accordance with SQP 4.2.

6.0 Attachments

6.1 Field Activity Daily Log

Field Work Variance

FIELD WORK VARIANCE

No.	122412-010-001
Date	04/11/2007
Page	Page 1 of 3

Project Name / Number: Treasure Island / 122412 CTO 10 / Site 12

Reference Documents:

1. *Final Removal Action Work Plan / Remedial Design, Non-Time Critical Removal Action, Installation Restoration Site 12, Three Solid Waste Disposal Areas (SWDAs A&B, 1207/1209, and 1231/1233), Treasure Island, San Francisco, California* (Shaw Environmental, Inc.), DCN NAV010-002-H, Revision 0, dated February 26, 2007 (Work Plan)
2. Work Plan Appendix C, *Final Radiological Sampling and Analysis Plan, Site 12 Final Remedy Removal Action, Treasure Island, San Francisco, California*, Revision 1, 26 February 2007 (RSAP)
3. Work Plan Appendix D, *Final Waste Management Plan, Site 12 Final Remedy Removal Action, Treasure Island, San Francisco, California*, Revision 1, 26 February 2007 (WMP)
4. Work Plan Appendix E, *Final Site Health and Safety Plan, Site 12 Final Remedy Removal Action, Treasure Island, San Francisco, California*, Revision 0, 26 February 2007 (SHSP)

Introduction:

The radiological screening and sampling activities described in the reference documents listed above were based on the Historical Radiological Assessment (HRA) which stated that although no radiological materials where known to be present at Site 12, screening was to be performed as a precaution. However, the initial DART radiological survey of the ground surface found that detections above the limit of background plus 3σ were present within all three SWDAs, with confirmed radiological material being present in SWDA A&B and 1231/1233. Hence the survey, sampling, and excavation approaches described in the reference documents must be modified to ensure proper evaluation and handling of radioactively contaminated soil. This document describes each changed work requirement, with reference to the applicable plan section(s).

Plan Reference

Work Plan Section 4.1, Radiological Soil Screening

Variance

Paragraph 1, sentence 5: The number of samples will increase to a minimum of 656 systematic samples, due to a change to Class 1 criteria recommended by NWT and RASO, which increases the number of survey units to two each at SWDAs 1207/1209 and 1231/1233 and four at SWDA A&B (five at the final SWDA A&B excavation extent, to include sidewalls). In addition, biased samples will be collected at locations of elevated DART readings, and hot spot removal confirmation samples will also be collected.

Paragraph 2, throughout: Change to Class 1 criteria, 100% scan survey, 16 random samples per survey unit (instead of each vertical foot), and all 656 samples will be analyzed by gamma spectroscopy. Also note that samples collected from 0, 1, 2, and 3 feet bgs (pre-existing typo omitted 0 and 2) will be analyzed on site.

Page 4-2, first paragraph, change last three sentences: "... and the MARSSIM Class 1 survey unit rationale. Accordingly, one survey unit is defined as an area of no more than 2,000 m^2 (21,527 ft^2) on one excavation surface within one SWDA; therefore there will be ten survey units (two per excavation lift surface) in SWDAs 1207/1209 and 1231/1233, and twenty-one survey units (four per excavation lift surface and five estimated on the 4-foot surface to include the sidewalls) in SWDA A&B. Each survey unit will be field screened over 100% of its surface area and sixteen soil samples will be collected at random locations, using a systematic grid and a random starting point, across the surface of the survey unit. Additionally, biased samples may be taken at elevated reading locations noted during the screening of the surface of the survey unit.

Two New Paragraphs at end of Section 4.1

Following removal of radiological contaminated soil, excavation of the SWDA lift will proceed. As each bucket of soil is removed from the excavation, it will be screened for radiation using a hand-held 2x2 NaI instrument, in accordance with NWT SOPs (Appendix C), before it is cleared to be placed in the truck. Soil will be excavated from the uppermost one foot of soil and may be up to two feet deep in the bucket; however the scooping action of the bucket will turn over the soil to expose the deeper portion of the removed soil. Any readings observed in the bucket survey above background plus three sigma will be verified with a 1-minute static reading. If a bucket of soil does not pass screening, it will be set aside in a radiological exclusion zone within the SWDA for additional screening to locate the source of the elevated reading.

Trucks will be screened for radioactivity prior to entering the work area using a hand-held 2x2 NaI instrument, and smear samples for removable contamination will be analyzed on site. If a truck does not pass the entry screening, it will be rejected for use at the site. If within DOT radiological transport limits, the truck will return to

the vendor. In the event that the truck exceeds DOT limits, it will be quarantined on site and the vendor will be notified. Trucks cleared to enter the work area will be filled with soil that has passed the hand screening. All trucks will remain on the adjacent roadway; no trucks will enter the excavation area. The exterior of the truck will be screened prior to leaving the work area. If any radioactive soil is found on the truck, it will be dry decontaminated by brushing and re-screened until it is cleared to leave the area. If dry decontamination is unsuccessful, the truck will be held on site and the Navy technical experts will be contacted for instructions on how to proceed.

Plan Reference

Work Plan Section 4.3.1, Exclusion Zones

Variance

Add a paragraph: "When hot spot removal is to be conducted, NWT will establish a separate radiological exclusion zone within the SWDA exclusion zone. The boundaries of each hot spot removal location will be determined using a hand-held 2x2 NaI meter. The zone will be demarcated with appropriate radiological signs and barricades. The zone will be of sufficient size to allow NWT to stage supplies and conduct the work, and the boundary will be placed so that heavy equipment can reach into the hot spot without entering the radiological exclusion zone. Completion of hot spot removal is indicated when soil surface readings using a hand-held 2x2 NaI meter are less than background plus 3σ."

Plan Reference

Work Plan Section 4.3.4, Air Monitoring, Paragraph 1

Variance

Additional requirement: "Radiological air sampling will be conducted by NWT within active radiological exclusion zones and at two downwind locations during excavation, as described in Appendix C. Material removed from hot spot locations will be sealed in containers before moving to the waste storage area so air sampling is not required at that location. However, if the soil is re-evaluated or repackaged at the Site 6 waste storage area, then air monitoring will be performed within the containment area and at upwind and downwind locations while the work is being conducted."

Plan Reference

Work Plan Section 4.6, Excavation, Paragraph 1

Variance

Additional requirement: "All pavement materials removed from the surface in the SWDAs will be screened for radioactivity and segregated for disposal based on the results. If soil is adhered to the concrete, it will be removed by dry brushing and the components (concrete and soil) will be screened separately in an effort to reduce waste. All soil locations with confirmed DART readings above background plus 3σ will be removed by Shaw under NWT guidance prior to excavation of the layer, using procedures described in Appendix C. Following removals, all subsequent excavation buckets will be screened by moving a hand-held 2x2 NaI instrument slowly across the soil surface prior to placement in the truck. Soil will be excavated from the uppermost 1 foot of soil and may be up to 2 feet deep in the bucket; however the scooping action of the bucket will turn over the soil to expose the deeper portion of the removed soil. Buckets that do not pass this screening will be set aside in a designated zone for further assessment in accordance with procedures described in Appendix C."

"The area in front of Building 1205 will be removed from 0 to 4 feet at the same time, to minimize the duration of the excavation at that location. All of the soil will be placed to a depth of 1 foot in a designated area within the SWDA 1207/1209 boundary, where it will undergo radiological screening, confirmation sampling, and potential hot spot removal as set forth in Appendix C."

Plan Reference

Final Radiological Sampling and Analysis Plan, Site 12 Final Remedy Removal Action, Treasure Island, San Francisco, California, Revision 1, 26 February 2007 (RSAP)

Variance

In accordance with license and subcontract requirements, NWT has prepared Revision 2 of the above-referenced plan. A copy of the revised plan is attached to this FWV.

Plan Reference

WMP Section 3.1, Waste Accumulation and Storage

Variance

End of first paragraph, add: "All soil removed from areas of DART anomalies will be transported to Site 6, where it will be placed in a separate, fenced and locked area under the control of NWT. The radiological soil

storage area will have appropriate radiological signage and barricades. NWT will make arrangements to allow the low-level radioactive waste (LLRW) transport and disposal broker to access the storage area."
In the associated table, add a line as follows:

Waste	Accumulation Method	Maximum Accumulation Time
Radioactive Material	Bucket, 55-gallon drum, or bin	Not applicable

Plan Reference
WMP, Section 3.4, Waste Manifest, etc.
Variance
Add: "The Navy, or its qualified LLRW contractor, under the direction of RASO and the U.S. Army Joint Munitions Command will make all arrangements for packaging, manifesting, preparation, and shipping of radioactive materials and mixed waste to an appropriate processing and/or disposal facility. The Navy will provide waste profile data that was collected in accordance with Table 3 (Section 3.2), to enable the LLRW broker to determine appropriate disposal of the material."

Impact on Present and Completed Work:
Additional funding for procurement, field work, sample analysis, and transport and disposal will be requested and the site investigation scheduled, once this FWV has been approved by the Navy and RASO.

Plan Reference
SHSP, Section 3.0, Project Hazard Analysis
Variance
Add new Section 3.9, Radiological Materials:
"In the event that radiological materials are discovered in one or more SWDAs, site personnel will follow the health and safety requirements set forth in the Radiological Sampling and Analysis Plan (RSAP) (Appendix C), Section 4.0. All site personnel will undergo radiation awareness training, in accordance with RSAP Section 4.2; however, only qualified subcontractor personnel will work with radiological materials. Shaw personnel will not handle radiological materials. The radiological subcontractor shall follow all applicable health and safety procedures in accordance with regulatory and license requirements, under the direction of their Site Safety Officer."

Requested by: Barbara Matz (Shaw Environmental, Inc.) Technical Manager

APPROVALS

Shaw Approvals

Project Manager	4-11-07 *Date*	*Project QC Manager*	4/11/2007 *Date*

Navy Approval — *RASO Concurrence*

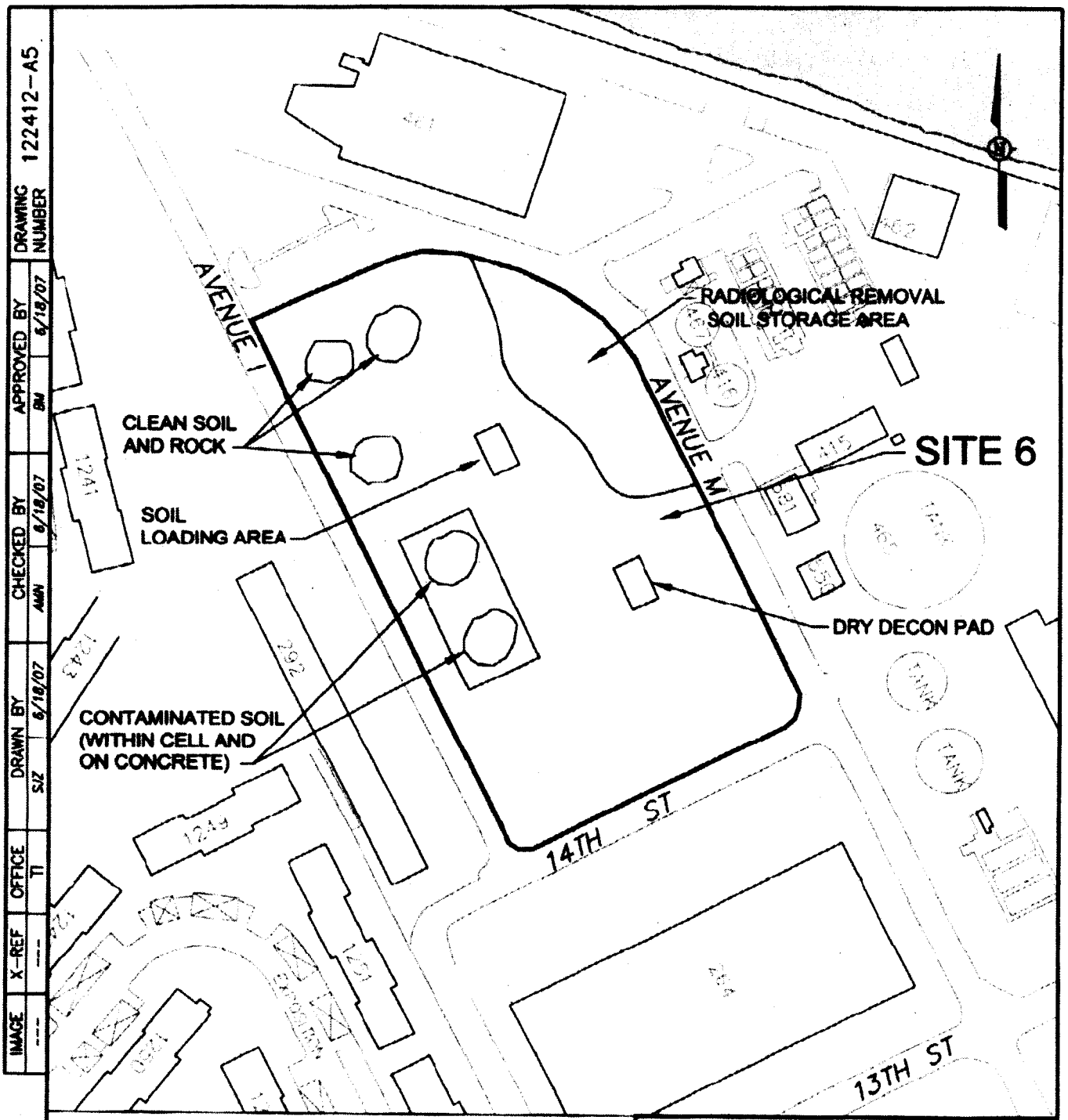
Approved (✓) Rejected ( )

Navy BRAC PMO RPM	4/12/07 *Date*	*RASO Representative*	*Date*

Attachments:

Final Radiological Sampling and Analysis Plan, Site 12 Final Remedy Removal Action, Treasure Island, San Francisco, California, Revision 2, 05 April 2007 (RSAP).

Site 6 Figure, revised to show storage area for radiological removal soil. Note that the storage area is capable of being expanded as needed. The area is bermed and lined with heavy plastic, and surrounded by a chain link temporary fence that is either bolted or locked shut when not in use.



SCALE

0 120 240 FEET

LEGEND:

BUILDING

SITE 6 BOUNDARY

NOTE:
MAP BASED ON ENGINEERING EVALUATION/COST ANALYSIS FOR SITE 12, SulTech, 2006.

Shaw Environmental, Inc.

DEPARTMENT OF THE NAVY
BRAC PMO WEST
SAN DIEGO, CALIFORNIA

FIGURE 10

SITE 6
STOCKPILE LOCATIONS

NAVAL STATION TREASURE ISLAND

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	---	TI	SJZ 6/18/07	AMN 6/18/07	BM 6/18/07	122412-A5

FIELD WORK VARIANCE

No.	122412-010-002
Date	7/30/2007
Page	Page 1 of 2

Project Name / Number: Treasure Island / 122412 CTO 10 / Site 12

Reference Documents:

1. *Final Removal Action Work Plan / Remedial Design, Non-Time Critical Removal Action, Installation Restoration Site 12, Three Solid Waste Disposal Areas (SWDAs A&B, 1207/1209, and 1231/1233), Treasure Island, San Francisco, California* (Shaw Environmental, Inc.), DCN NAV010-002-H, Revision 0, dated February 26, 2007 (Work Plan)
2. Work Plan Appendix C, *Final Radiological Sampling and Analysis Plan, Site 12 Final Remedy Removal Action, Treasure Island, San Francisco, California*, Revision 1, 26 February 2007 (RSAP)
3. *Field Work Variance No. 122412-010-001 (FWV No. 1)*, 14 June 2007

Introduction:

Before the start of radiological survey activities, the RASO-approved RAWP/RD described the radiological soil sampling rationale recommended by New World Technology (NWT) to characterize soil for excavation prior to off site disposal. These "due diligence" soil samples were to be collected from random locations based on the MARSSIM-guidance document at a rate of 16 samples per vertical foot of excavation per SWDA.

Following the identification of radiological impacts within Site 12, the radiological survey and sampling approaches described in the RAWP/RD were modified to comply with MARSSIM Class 1 screening requirements. Accordingly, FWV No. 1 describes the rationale by which additional "biased" samples would be collected at locations where elevated survey readings are noted during radiological screening. In addition, FWV No. 1 includes provisions for the collection of 16 random soil samples within each of the forty-one Site 12 survey units (total of 656 random samples).

Further evaluation of the existing radiological sampling plan indicates that under current conditions, "biased" samples and hot-spot excavation sidewall samples are being obtained from each lift at rates sufficient to partly characterize the excavated soil for disposal. Therefore, it appears that collection of 8 random samples per survey unit of each lift of soil to be excavated, in addition to collection of "biased" samples, will adequately characterize the soil. Thus, the collection of random samples within each survey unit from the ground surface, and from depths of 1 foot below ground surface (bgs), 2 feet bgs, and 3 feet bgs will be reduced from 16 samples to 8 samples. Random sampling in compliance with MARSSIM Class 1 requirements will be performed at depths of 4 feet bgs to document radiological concentrations remaining on site.

This document describes changed work requirements, with reference to the applicable plan section(s).

Plan Reference

Work Plan Section 4.1, Radiological Soil Screening

Variance

Paragraph 1: change to ".... Radiological screening will be performed by New World Technologies (NWT); Within SWDA "lifts" which are scheduled for excavation, NWT will collect soil samples at both "biased" locations (i.e. areas where soil screening indicates the presence of radiological impacts) and from at least 8 random locations per survey unit. Radiological contaminants are not a contaminant of concern and the field tests and samples collected prior to excavation are meant to characterize the soil for disposal; the purpose of bottom sampling is to document remaining radiological soil impacts, if any."

Paragraph 2, sentence 3: change to "At least 8 soil samples will be collected from each vertical foot of excavated soil within each survey unit within each of the three SWDAs"

Paragraph 2, sentence 6: change to "All samples will be analyzed for radiological contamination using gamma spectroscopy."

Page 4-2, first paragraph, change last three sentences: ""Soil samples for radiological contamination will be collected from at least 8 locations from each one foot thickness (i.e. lift) of screened soil per survey unit. Soil screening and sampling will be performed in accordance with the Radiological Sampling and Analysis Plan (Appendix C). Samples from excavation lifts will be collected to confirm soil screening results. Samples will be collected from at least 8 locations of each one foot thickness per survey unit and from "biased" locations where elevated readings are noted during soil screening. Samples from excavation lifts will be collected to

FIELD WORK VARIANCE

No.	122412-010-002
Date	7/30/2007
Page	Page 2 of 2

radiologically characterize the soil for disposal. Excavation bottom samples will be collected in accordance with both the Radiological Sampling and Analysis Plan (Appendix C) and the MARSSIM Class 1 survey-unit rationale. Accordingly, one survey unit is defined as a non-excavated area of no more than 2,000 m2 (21,527 ft2) within one SWDA; therefore, the excavation bottoms and sidewall of SWDAs 1207/1209 and 1231/1233 will each be comprised of two survey units, and the SWDA A&B excavation bottom and sidewalls will be comprised of five survey units . Each survey unit will be field screened over 100% of its surface area and sixteen soil samples will be collected within each un-excavated survey unit to document remaining radiological impacts, if any.

Plan Reference

Work Plan Section 4.6.5.3, Confirmation Sampling and Analysis

Last paragraph, change to: At least 8 soil samples will also be collected will be collected from each vertical foot of excavated soil within each SWDA and analyzed for radiological contamination during this project. Radiological samples will be collected from each vertical foot of excavated soil within each SWDA. Radiological screening and sampling is discussed in Section 4.1.

Requested by: Barbara Metz (Shaw Environmental, Inc.) Technical Manager

APPROVALS

Shaw Approvals			
Project Manager	7-30-07 Date	BMetz Project QC Manager	7/30/2007 Date
Navy Approval		RASO Concurrence	
Approved (✓)	Rejected ( )		
Navy BRAC PMO RPM	7/31/07 Date	RASO Representative	Date

FIELD WORK VARIANCE

No	122412-010-003
Date	8/20/2007
Page	Page 1 of 2

Project Name / Number Treasure Island / 122412 CTO 10 / Site 12

Reference Documents:

1. *Final Removal Action Work Plan / Remedial Design, Non-Time Critical Removal Action, Installation Restoration Site 12, Three Solid Waste Disposal Areas (SWDAs A&B, 1207/1209, and 1231/1233), Treasure Island, San Francisco, California* (Shaw Environmental, Inc.), DCN NAV010-002-H, Revision 0, dated February 26, 2007 (Work Plan)
2. Work Plan Appendix C, *Final Radiological Sampling and Analysis Plan, Site 12 Final Remedy Removal Action, Treasure Island, San Francisco, California*, Revision 1, 26 February 2007 (RSAP)

Introduction.

On-going excavations within low-lying parts of Site 12 have encountered groundwater present at depths of 2 feet below ground surface (bgs). The presence of the groundwater at these shallow depths is related to the site's proximity to the San Francisco Bay and is referred to herein as "tidally-influenced groundwater."

Current soil radiological screening protocols require use of DART equipment to screen 100% of soil before it is excavated. DART equipment, however, is not effective in wet to saturated soils such as those that have been / will be encountered in the tidally-influenced excavation areas.

To compensate for the presence of saturated soil conditions within several excavations while maintaining compliance with DART screening requirements, Shaw will excavate saturated soil and transport the material to a lay-down area for drying. Lay down areas will be located within parts of the excavation footprint containing soils with the same waste classifications as the saturated soil (e.g. Class 1 hazardous soil will be placed atop soil also characterized as Class 1 hazardous). If needed, "drying racks" (i.e. stockpiles constructed with thick-milled plastic liners which will be sloped to allow drainage of water from the soil) will be constructed for temporary storage and drying of saturated soil. Once it is sufficiently dry to allow for DART screening, the screening process will follow the current and approved methods. Disposal of the screened soil will be based on RASO-approval in accordance with current practices.

Plan Reference

Work Plan Section 4.6.4.6 Excavation De-Watering

Variance

Page 4-16, first paragraph, change to "Although excavations are not expected to reach groundwater, excavations may fill with water during rainstorms. Water may also infiltrate open excavations in areas under influence of tides. If necessary, Shaw may use perforated buckets to expend excavations that contain rainwater. Soil that is too wet for radiological screening will be transported to lay down areas selected within the excavation footprint. Once the soil is sufficiently dry, it will be screened using DART methods. If necessary, soil may be initially placed within drying racks prior to DART screening."

Page 4-17, delete first paragraph

Plan Reference

Work Plan Section 5.1.1 Stockpiling

Variance

Page 5-1, last paragraph, change to "If excavation activities occur during rainstorms or extend below depths containing tidally-influenced groundwater, and large amounts of saturated waste soil is encountered, Shaw may transport saturated soil to lay down areas located within the excavation footprint. Excavated soil will be placed within areas containing soils with similar waste characteristics. If necessary, soil drying racks may be built atop concrete at the waste soil staging area. Once the soils are sufficiently dewatered for radiological screening they will be screened using DART methods."

Requested by: Alex Naughton (Shaw Environmental, Inc.) Technical Manager

FIELD WORK VARIANCE

No	122412-010-003
Date	8/20/2007
Page	Page 2 of 2

APPROVALS

Shaw Approvals

Project Manager	8-20-07 Date	Project Technical Manager	8/20/07 Date

Navy Approval

Approved (✓) Rejected ( )			
Navy BRAC PMO RPM	8-23-07 Date	RASO Representative	8/20/07 Date

FIELD WORK VARIANCE

No.	122412-010-004
Date	8/23/2007
Page	Page 1 of 1

Project Name / Number: Treasure Island / 122412 CTO 10 / Site 12

Reference Documents:

1. *Final Removal Action Work Plan / Remedial Design, Non-Time Critical Removal Action, Installation Restoration Site 12, Three Solid Waste Disposal Areas (SWDAs A&B, 1207/1209, and 1231/1233), Treasure Island, San Francisco, California* (Shaw Environmental, Inc.), DCN NAV010-002-H, Revision 0, dated February 26, 2007 (Work Plan)

Introduction:

On-going excavations within low-lying parts of Site 12 have encountered groundwater present at depths of 2 feet below ground surface (bgs). Excavations in these areas will be completed to depths of 4 feet bgs and will require backfilling in accordance with RAWP/RD section 4.7.1.3. Backfill materials to be placed at depths beneath groundwater will consist of imported drain-rock or crushed concrete. The supplier will certify that these materials meet CalTrans specifications, as described in section 4.7.1.2 of the RAWP/RD.

A visual inspection of the materials will be periodically documented to insure that the material received does not have any staining or misc. debris, as described in the RAWP/RD. Any load or loads of the imported material that do not pass the visual inspection will be rejected and sent back to the vendor at no cost to Shaw or the Navy. The drain rock and crushed concrete will be screened for radiological impacts before it is accepted for use within Site 12. Shaw will collect discrete samples from each supplier of the materials at an approximate rate of 1 sample per 2,000 cubic yards. Samples will be analyzed for radiological contamination by New World Technology using mobile gamma spectroscopy laboratory equipment. Materials represented by samples which contain radiation at concentrations exceeding background concentrations will be rejected.

Plan Reference
Work Plan Section 4.7.1.2
Variance
Page 4-18, first sentence, change to "pea gravel" to "crushed concrete".

Page 4-18, last paragraph, change to:

Drain Rock/Crushed Concrete - Drain rock and crushed concrete will be visually inspected to ensure it is clean and free of organic matter. The supplier will certify that the crushed concrete and ¾-inch drain rock conforms to CalTrans specifications. Samples will be collected from each supplier of the material at an approximate rate of 1 sample per 2,000 cy and will be analyzed for radiological contamination before acceptance.

Requested by: Alex Naughton (Shaw Environmental, Inc.) Technical Manager

APPROVALS

Shaw Approvals

Project Manager	8-27-07 Date	Project QC Manager	8/23/07 Date

Navy Approval

Approved (✓) Rejected ( )

Navy BRAC PMO RPM	8/27/07 Date	RASO Representative	8/24/07 Date

8/23/2007; 9:06:42 AM

Response to Comments

Response to Comments on the *Draft Construction Work Plan, Non-Time Critical Removal Action, Installation Restoration Site 12, Three Solid Waste Disposal Areas (SWDAs A&B, 1207/1209, and 1231/1233), Treasure Island, San Francisco, California,* dated December 14, 2006.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
1	Title Page	Work Plan	Document Name: Please rename the Construction Work Plan as the "Removal Action Work Plan / Remedial Design" with the acronym "RAWP/RD" throughout the document and appendices. Henceforth, this comment letter uses RAWP/RD to identify the Construction Work Plan.	The Final Construction Work Plan was renamed as the "Removal Action Work Plan / Remedial Design" and published on February 26, 2007. However, substantial edits to text, tables, and figures would have been required to alter acronyms in the Plan's body and those changes were not made.
2	4-13		Excavation Sloping: Please include the following sentences to describe sidewall excavation: "Vertical cut on the excavation sidewalls down to 2 to 4 feet below ground surface will be implemented as practicable depending on engineering considerations. Applicable engineering considerations include structural stability of excavation, buildings, and hardscape; equipment operability limitations near building and hardscape structures; and project personnel health and safety requirements."	Comment noted. As stated in the RAWP/RD, vertical cuts, "may be sloped at up to 1 to 1 adjacent to buildings or other permanent structures and at 1 to 0.5 adjacent to pavement or landscaped areas." The Navy's experience at TI indicates that excavation sidewalls may be cut at 1 to 1 slopes safely and without affecting stability of structures adjacent to and outside the excavation.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
3	4-16		Action Levels, section 4.6.5.4: The RAWP/RD identifies the following residential soil cleanup targets at Site 12: lead at 400 mg/kg, polychlorinated biphenyl at 1 mg/kg, benzo(a)pyrene toxicity equivalent at 0.62 mg/kg, and dioxin toxicity equivalent at 12 ng/kg. These cleanup targets exceed the U.S. EPA, Region IX and California-Modified residential preliminary remediation goals. DTSC nonetheless believes that these residual concentrations may be acceptable as final cleanup targets. In the final Site 12 Remedial Investigation/Feasibility Study, DTSC will review these cleanup targets for appropriateness as final cleanup targets. Pending such determination, DTSC requires that the Site 12 SWDAs' cleanup targets be applied as maximum concentrations. Please revise Section 4.6.5.4 to specify this requirement. Please note that if Site 12 were to be developed as a wetland, the proposed residential soil cleanup targets are not likely adequate to protect ecological receptors.	The RAWP/RD is based on Navy-approved recommendations detailed in the EE/CA. The Navy understands the site specific clean-up goals to be final cleanup targets; Shaw will expand excavations laterally to achieve these clean-up targets. Excavations are not anticipated to be extended beyond 4 feet bgs. It is noted herein that DTSC review suggests that the proposed residential soil cleanup targets are not likely adequate to protect ecological receptors if Site 12 were to be developed as a wetland. However, because such an assertion is beyond the scope of the RAWP/RD, no text related to this comment will be added.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
4	4-17		Clean Soil Backfill: The Navy proposes to backfill the excavation with clean soil. Please identify the source and define performance standards for clean backfill. DTSC's October 2001 "Information Advisory, Clean Import Fill Material" details criteria for suitable clean fill materials.	The RAWP/RD section 4.7.1.2 Backfill Materials specifies: " Imported backfill material will be free of deleterious substances and chemical contaminants, having been pre-screened in general accordance with DTSC procedures identified in their October 2001 Informational Advisory fact sheet (DTSC, 2001)." It also states: Select fill to be used for backfill will be sampled at a rate of at least one sample per 500 cubic yards. Samples are analyzed for VOCs; total petroleum hydrocarbons as gasoline, as diesel, and as motor oil; semi-volatile organic compounds; PCBs; chlorinated pesticides; Title 22 metals; and radiological contamination. Select fill analytical results will be compared to EPA preliminary remedial goals (PRGs) (USEPA, 2004) for residential soil and TI metals background concentrations; no select fill containing an analyte exceeding the PRGs will be accepted without an evaluation of risk. Select fill sources are varied.
5			Contamination Caused by Remedial Activities: Upon completion of the remedial action, DTSC requires soil sampling at the decontamination, loading, staging, and stockpile areas to ensure that remedial activities have not introduced new contaminants to the site. Please expand the Sampling and Analysis Plan (SAP) to include confirmation sampling to ensure that remedial activities have not contaminated the project areas.	The RAWP/RD specifies that stockpiled materials will be stored within lined and bermed cells constructed atop concrete. Cells will be constructed atop concrete with thick-milled plastic liners (minimum of 20 mils) to prevent mixing of stockpiled soil with base material. These engineering controls will prevent introduction of new contaminants to the site and no confirmation sampling in the vicinity of the Site 6 stockpile area will be performed.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
6			Volatile Organic Compounds: The Navy detected elevated 1,1,2,2- tetrachloroethane soil gas concentrations from both sides of the roadway, directly in front of Building 1323 and at other locations at SWDA A&B. Please revise the RAWP/RD to include 1,1,2,2-tetrachloroethane, along with methane, as a soil gas contaminant that will be remediated. Please also provide an action level for this chemical. Please describe the remedial action for the methane and 1,1,2,2-tetrachloroethane in soil gas, include air monitoring procedures, and provide action levels for the methane and 1,1,2,2-tetrachloroethane. Please expand the confirmation sampling program to ensure that methane and 1,1,2,2- tetrachloroethane are not present above action levels.	The purpose of this NTCRA is to address threats of actual or potential contaminant exposure and/or pollutant migration, as described in the EE/CA section 3.1. Methane was included in the EE/CA as a contaminant of concern and the RAWP/RD will be updated to reflect methane as being a soil gas contaminant that will be remediated. Lower Explosive Level measurements describing methane concentrations in air will be collected during excavation within methane-effected parts of SWDA A&B. Soil samples collected within the SWDA A&B excavation area will not be analyzed for methane. 1,1,2,2-tetrachloroethane was not identified in the EE/CA as a COC and is not a target of this NTCRA. Excavation within SWDA A&B to address EE/CA-identified COCs will coincidentally remove soil impacted by 1,1,2,2-TCA and soil confirmation samples collected within SWDA A&B will quantify remaining 1,1,2,2-TCA concentrations.
7			Document Certification: DTSC requires either a California-registered professional engineer or geologist signs and certifies the RAWP/RD. DTSC believes a remedial design is an engineering proposal and specification that requires certification pursuant to the California Board for Professional Engineers and Land Surveyors' and the California Board for Geologists and Geophysicists' requirements.	Comment noted.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
8			Hardscape: The selected remedy is: "Soil excavation to 4 feet bgs. Soil below hardscape such as sidewalks and driveways would not be excavated. Soils beneath roadways would be excavated." Please identify the hardscape locations that would not be excavated. DTSC understands these locations hardscape includes (a) nine carports and associate driveways and sidewalks at Buildings 1319, 1321, 1323, and 1325, and (b) 19 storage sheds conjoining Buildings 1207, 1211, 1213, 1231, 1233, 1235, and 1237.	The RAWP/RD Figures 4, 5, and 6 have been updated to identify the hardscape areas that will not be excavated.
9	Pages iv and 3-1		Please replace "Base Closure Team" with "BRAC Cleanup Team" and replace "Base Environmental Coordinator" with "BRAC Environmental Coordinator."	Comment noted.
10	Page 2-2	Section 2.2.1, second to the last paragraph and page 4-10	Please confirm whether the locations with elevated methane gas concentrations are "east" or "west" of Buildings 1319 and 1321.	Shaw will revise RAWP/RD pages 2-2 and 4-1 to clarify that methane was detected within an area west of Buildings 1319 and 1321.
11	Page 2-2	Section 2.2.1, last paragraph	The RAWP/RD states that elevated concentrations of 1,1,2,2-tetrachloroethane in soil gas were collected from the roadway in front of Building 1323. Please refer this roadway as Westside Drive.	It is noted that the roadway "directly in front" of Building 1323 is Westside Drive. The location will be described as such in the construction completion report; however, no further clarification to the RAWP/RD will be made.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
12	Page 2-3	Section 2.2.2, first three bullets	Please supplement the term "below levels associated with an unacceptable risk to human health or the environment" with the contaminants' target levels in previous removal actions.	RAWP/RD section 2.2.2 will be revised so that the term "below levels associated with an unacceptable risk to human health or the environment" will be replaced with "below the contaminants' target levels."
13		Page 3-4 and Figure 9	Please revise Figure 9 to show a section of Perimeter Road that would be accessible to the public from Friday through Sunday. Figure 9 should show a gate near the "Truck Loading Area for Debris Area" for controlling access to Perimeter Road.	RAWP/RD Figure 9 was updated to depict two sections of Perimeter Road that will be accessible to the public Friday through Sunday. Shaw will provide a revised Figure 9 showing gates and fencing which control access to Perimeter Road.
14		Page 3-5, last paragraph	Please provide the March 29, 2006 SOW on utility interruption as an appendix to the RAWP/RD.	Section 2.4.1 of the March 29, 2006 SOW will be provided within Appendix I to the RAWP/RD.
15		Section 3.8	Please include procedures to ensure all doors, windows, and openings of all unoccupied buildings at and near the SWDAs are shut.	Any open doors, windows, and openings on unoccupied buildings observed during construction efforts will be reported to JSCO, DPW, TIDA or the SFPD. The Navy cannot guarantee that all doors or openings will be secured throughout the project.
16		Section 3.8	Please clarify that there are no window and door on the sides of the first and last apartment units (e.g., Units A, F, G, H).	No doors are on the sides of the first and last apartment units. Bathroom windows have been observed on the sides of some buildings adjacent to excavation areas. When observed, these windows have been sealed with plastic sheeting.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
17	Page 3-7	Untitled Table	Please include a tarping plan for Building 1224 (see Table 1).	The Navy will install an "enviroscreen" mesh on temporary fencing installed north of Building 1224 Due to the building's distance from the excavation; no additional tarping of the building will be performed.
18	Page 3-7	Untitled Table for Building 1235	The table cites that the "(r)esidents who may be temporarily be displaced to Units D or E will only have access through the front." The November 29, 2006 John Stewart Company's handout informs that 1235-D is occupied. Please resolve this discrepancy.	The only resident of Building 1235 at the start of SWDA 1231/1233 excavation activities was occupying Unit D and does not require displacement.
19	Page 3-7	Table for Building 1237 and Table 1	Please revise Table 1 to show that the doors and windows of Units A and B, instead of Units C through E, of Building 1237 need to be covered.	Table 1 will be revised.
20		Work Plan Sections 4.2 and 5.2, and Appendix A, SWPPP, Section 6.0	The RAWP/RD states that wastewater will be disposed to the Treasure Island's Publicly Owned Treatment Works unless analytical data indicate the wastewater that has exceeded disposal thresholds. The SAP, Appendix F of the RAWP/RD, does not seem to describe wastewater sampling procedure, frequency, analytes, analytical methods, and disposal thresholds. Please provide this information in the RAWP/RD and SAP.	Wastewater will be sampled in accordance with POTW requirements. As described in the Waste Management Plan, waste water may be sampled for TPH as diesel fuel, gasoline, and motor oil, Total Title 22 metals, PCBs, SVOCs, Total suspended solids, Chemical Oxygen Demand, and pH.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
21		Work Plan Section 4.3 and Appendix E, SHSP Section 5.5	There should be signs posted on the fences and/or barriers warning unauthorized entry to the exclusion zones, work areas, staging, loading, clean soil stockpile, and waste soil stockpile areas. Please describe such security measure in the RAWP/RD. Please report that the subcontracted security guard will patrol SWDAs, staging, loading, stockpile, resident storage, and adjacent areas during all off-hours (i.e., Monday through Thursday nights, all hours from Friday through Sunday).	Entry into exclusion zones will be controlled by Shaw employees during working hours and security guards during non-working hours. However, the Navy has posted appropriate signs identifying restricted areas throughout Site 12.
22	Page 4-4	Work Plan, Last paragraph	Please replace “ach” with “each.”	This typographic error was edited in the final RAWP/RD.
23		Work Plan, Section 4.6	Please provide the reasons for excavating potentially contaminated soil down to four feet below ground surface but not any deeper. The Engineering Evaluation/Cost Analysis may have presented the rationales; however, the RAWP/RD should recount this information.	Comment noted.
24	Page 4-10	Last paragraph	Please verify whether “Units A, B, and G of Building 1211” should be replaced with “Units A and F of Building 1211.”	It is verified herein that the Navy will excavate the front yards of units A and F, not units A, B, and G as stated in section 4.6.2 of the RAWP/RD.
25		Section 4.6.5.3 and relevant sections of the SAP	DTSC discourages the use of composite samples for demonstrating cleanup goal achievement. Please revise the RAWP/RD and its appendices accordingly.	The Work Plan and SAP has been updated per previous DTSC comments; no composite samples are to be collected.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
26		Section 4.6.4.7	Please include the Drilling, Development and Heavy Equipment Decontamination SOP as an appendix to the RAWP/RD. Please provide figures depicting the locations of personnel, equipment, and truck decontamination areas for the SWDAs, staging, loading, and stockpile areas. These figures should also identify the storage locations for containers and tanks holding potentially contaminated liquid.	Figure 10 and Figure 8 will be updated to depict dry decontamination areas within Site 6 and at SWDA A&B. Due to project scope changes, direct loading of excavated material from SWDA 1231/1233 is not occurring; the material is being transported to Site 6. Decontamination of trucks filled with soil from SWDA A&B will occur at the area's truck loading area on Perimeter Road. Dry decontamination procedures are being used; containers and tanks are not in use. The Drilling, Development and Heavy Equipment Decontamination SOP will be provided within Appendix J.
27		Section 4.7.1.2:	Please clarify that "DTSC procedures" is DTSC's October 2001 Information Advisory, Clean Imported Fill Material.	See comment 4. DTSC procedures refer to DTSC's October 2001 Information Advisory, Clean Imported Fill Material.
28		Section 5.1.1	Please include the Soil Stockpiling Standard Operating Procedure as an appendix to the RAWP/RD. Please define the "thick-milled plastic" and include engineering drawings illustrating the construction of the stockpiling cells.	The Soil Stockpiling Standard Operating Procedure will be attached within Appendix J.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
29		Section 5.2	Please clarify that the "waste soil/debris staging area" is the "Waste and Clean Soil Stockpile and Truck Loading Area" as shown on Figure 3. The RAWP/RD states that the liquid waste that is not acceptable by the Treasure Island's Publicly Owned Treatment Works will be profiled for an offsite disposal facility. Please describe the liquid waste profiling procedure, frequency, analytes, and analytical methods. Please provide this information in the RAWP/RD and SAP.	The waste soil/debris staging area" is the "Waste and Clean Soil Stockpile and Truck Loading Area" as shown on Figure 3. Dry decontamination procedures are being used and liquid waste is not being generated during this project. If it is generated, liquid waste profiling procedures will be dependant upon source area and disposal facility requirements.
30		Section 8.0	Please ensure that the post construction summary report includes (a) confirmation sampling results at the SWDA excavations demonstrating cleanup goal achievement, and (b) soil sampling results at the staging, loading, and stockpile areas showing that cleanup activities have not introduced new contaminants at these areas.	The post construction summary report will include confirmation sampling results at the SWDA excavations demonstrating cleanup goal achievement. However, no soil confirmation sampling will be performed in the Site 6 vicinity, as discussed above.
31		Tables	Please provide table numbers.	Table 1 and 2 will be updated to show Table numbers.
32		Table 2	Please ensure that the table's title in the table of contents (i.e., Project Schedule) is consistent with that on the table (i.e., Anticipated Excavation Durations). Please add a note indicating that the workdays are from Monday through Thursday. Please also include the hours when delivery trucks are passing the on- or off-ramps of the San Francisco Oakland Bay Bridge.	Comment noted. Table 2 will be renamed and revised.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
33	Title Page	All Appendices	Please replace "Site 12 Final Remedy Removal Action" with "Site 12 Removal Action Work Plan / Remedial Design."	Comment noted.
34		Appendix A	Please ensure all RAWP/RD figure references are correct.	Comment noted.
35		Appendix A	Please provide figures showing all storm drain inlets and stormwater pipelines at and near the SWDAs, staging, loading, and stockpile areas.	All storm drain inlets within excavation areas have been depicted on Appendix A Figures 2 and 3. Figure 4 will be prepared to show stormwater features within Site 6.
36		Appendix A, Sections 2.0 and 5.0	All clean fill stockpile areas, waste soil stockpile areas and staging/loading areas are potential sources that are likely to add significant quantity of pollutants and sediments to storm waster discharges. Please identify these sources in Appendix A.	Clean fill stockpile areas, waste soil stockpile areas and staging/loading areas will be added to the discussion of potential stormwater pollution sources. In addition, the stockpile management BMP, which describes protocols used to limit potential releases, will be added to Appendix A Attachment 1. .
37		Appendix A, Section 2.2	Please note that the figure for "Truck Routes and Staging Areas" does not show the location of a decontamination pad. Please prepare new figures showing all decontamination areas at the SWDAs, staging, loading, and stockpile areas.	RAWP/RD Appendix A Figure 2 will be updated to show the SWDA A&B decontamination area. Figure 4 will be created to show the decontamination area within Site 6, which is the loading area for both SWDA 1207/1209 and 1231/1233.
38		Appendix A, Section 3.4.1	Please include dioxin, methane, and 1,1,2,2-tetrachloroethane as the site pollutants.	Section 3.4.1 will be revised to include dioxin as a randomly distributed site pollutant. We will also note that methane, and 1,1,2,2-tetrachloroethane are pollutants within localized areas of SWDA A&B.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
39		Appendix A, Section 4.3, last paragraph and Section 8.0	DTSC requires that all stockpiles and storage containers be covered at all times, except during loading and unloading operations, to minimize uncontrolled hazardous substance, hazardous waste, and sediment releases to the environment. Please revise Appendix A accordingly.	Comment noted. As stated in the RAWP/RD, stockpiles will be covered to prevent releases. Stockpiles will be covered using a minimum of 6 mil visqueen.
40		RAWP/RD, Section 4.3.3 and Appendix B, Section 1.2.3	The RAWP/RD states that the Navy will water spray the excavation areas, access roads, and paved areas to control dust emissions. Dust control activities should also be conducted at the staging, loading, and stockpile areas.	Comment noted. Shaw will monitor airborn dust concentrations in all work areas and, if needed, will adjust engineering controls accordingly.
41		Appendix B	Please numerate the appendix pages.	A revised version of Appendix B, enumerating pages 1 through 4, will be provided.
42		Appendix B, Section 1.3, last paragraph	The stockpiled clean fill and waste debris/soils should be adequately covered, especially during off-hours and weekends, to minimize dust and/or hazardous substance transport due to weather conditions. Please include these requirements in Appendix B.	Appendix B will be revised to indicate waste debris/soils will be adequately covered to minimize dust and/or hazardous substance transport due to weather conditions. Clean fill stockpiles are not being covered because the materials have a high clay content. The import soil has formed large aggregates and particulates are not affected by windy conditions. Rainfall is not expected until the start of the rainy season, in October, by which time stockpiled materials will have been utilized as backfill.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
43		Appendix B, Section 1.6:	The RAWP/RD proposes that the storage area for trucks serving all three excavations will be along Avenue N and within the parking lot north of Building 570. Please explain why there is a need to clean Building 570 after SWDA remediation.	Appendix B will be revised so that it does not suggest there is any need for cleaning of Building 570.
44		Appendix D, Tables 2, 3, and 5	Please include dioxin as the Class 1 (hazardous) soil in the "Waste Streams" column.	Appendix D Tables 2, 3, 4, and 5 will be revised to include dioxin as the Class 1 (hazardous) soil in the "Waste Streams" column.
45		Appendix D, Table 3	Please provide EPA method numbers for all proposed analyses. Please detail "representative" sample for all listed waste type by describing the sampling frequencies, locations, depths, sizes, etc.	Comment noted. Class 1 hazardous and Class 2 non-hazardous soil comprise the majority of the wastes discussed in Appendix D, Table 3. These materials were pre-characterized for disposal using standard EPA Methods on samples collected at a rate of approximately one 4-point composite sample per 500 cy. Table 3 will be updated to reflect the analytical methods used and soil sample frequency. Likely analytical methods for analysis of the other waste types (construction debris, concrete and asphalt chunks, and waste water) will also be listed. However, characterization of these wastes is dependent on factors which cannot be assumed at this point, such as source area and disposal facility requirements; therefore, "representative" is an appropriate description of the sampling rationale for these waste types.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
46	Pages 1-2 and 3-1	Appendix E	Please add methane and 1,1,2,2-tetrachloroethane as the SWDA A&B's contaminants. Please change the anticipated cleanup duration to seven months.	Pages 1-2 and 3-1 of Appendix E will be updated to include methane and 1,1,2,2-tetrachloroethane as contaminants within SWDA A&B. At this time, Shaw estimates the project's duration at 8 months, as stated in Appendix E.
47		Appendix E, Section 7.1	Please include methane and 1,1,2,2-tetrachloroethane in the air monitoring program and specify action levels.	Appendix E Section 7.1.1.1 and Table 2 will be updated to include methane and 1,1,2,2-tretrahloroethane. As discussed in the RAWP/RD, Shaw will monitor areas impacted by 1,1,2,2-tretrahloroethane using a PID. If Shaw detects more than 5 ppm of total VOCs in breathing zone air using the PID for a sustained period, work will be stopped until airborn concentrations dissipate

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48		Appendix E, Sections 10.1 and 10.6, and Attachment 5	The RAWP/RD identifies Concentra Medical Center, an occupational health clinic, as the nearest medical facility. Please note that the RAWP/RD and the health and safety plan should advise the locations and route maps of medial facilities with emergency room services. Please include nearby hospitals and route maps in Appendix E.	The Site Safety Officer will assess health and safety incidents to determine if emergency care is required. If emergency care is required, an ambulance will be summoned and will most likely take the worker to either of the nearby hospitals listed in Attachment 2 (San Francisco General Hospital [1001 Potrero Ave, San Francisco, CA 94110; (415) 206-8000] and Alta Bates Summit Medical Center [350 Hawthorne Ave, Oakland, CA 94609; (510) 655-4000]. Maps including driving directions to these facilities from TI will be included in the RAWP/RD. However, the majority of health and safety incidents do not require medial attention and the Concentra Medical Center will provide medial evaluations and treatment.
49		Appendix E, Tables 1 and 2	Please define "NE" and "HSM."	Table 1 will be edited to indicate NE denotes "Not Established". HSM will be replaced with Project Superintendent/Site Health and Safety Specialist on a revised version of Table 2.
50	Page 1-1	Appendix F, first paragraph	Please include methane and 1,1,2,2-tetrachloroethane as the contaminants for Site 12 SWDA.	Methane and 1,1,2,2-tetrachloroethane will be included as potential contaminants for SWDA A&B.
51	Page 1-2L	Appendix F	Please change DTSC's contact to: Henry Wong, Remedial Project Manager, DTSC, 510-540-3770, hwong@dtsc.ca.gov.	The distribution list will be revised.

Comments by Henry Wong, DTSC, dated March 2, 2007				
No.	Page No.	Section, Figure, Table	Comment	Response
52		Appendix F, Sections 1.3 and 2.0	Please include sampling of the staging, loading, and stockpile areas with the SAP's scope and objectives.	No sampling of the Site 6 stockpile area will be performed, as discussed above.
53		Appendix F, Section 7.3	Please describe procedures for controlling the reporting limits to ensure meaningful comparison with the cleanup targets. Please provide corrective measures for reanalyze samples with elevated detection limits due to matrix interference.	The subcontract laboratory is supplies a list of maximum reporting limits. If sample dilution is required due to matrix interference, the laboratory is instructed to minimize dilution (just enough to overcome matrix interference) to keep RLs low. The Shaw Project Chemist will monitor sample RLs compared to action levels as data is received and will work with the lab to ensure the data is usable for project decisions. In some cases sample cleanup may be required.