DECOMMISSIONING WORK PLAN

SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL

Project Number: 501513
Contract Number: N00024-20-C-4139

Prepared for

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April 2021

Revision 1

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April 2021

Revision 1

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Record of Revisions

Revision No.	Description of Revision	Date
0	Decommissioning Work Plan	August 2020
1	Decommissioning Work Plan - Various changes throughout based on NRC comments on Rev. 0 document and to incorporate minor updates to project status/approach.	April 2021

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Acronyms and Abbreviations

°F	degrees Fahrenheit
ABL	above baseline
ACM	asbestos-containing material
ALARA	as low as reasonably achievable
AMS	APTIM Management System
APP	Accident Prevention Plan
APTIM	Aptim Federal Services, LLC
ASY	Alabama Shipyard
C-14	carbon-14
CAR	Corrective Action Report
CCS	Casualty Control Station
CDRL	Contract Data Requirements List
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
cm^2	square centimeter
Co-60	cobalt-60
CS	Containment Structure
CSM	Corporate Safety Manager
D&D	dismantlement and disposal
DAC	Derived Air Concentration
DCGL	Derived Concentration Guideline Level
DOT	U.S. Department of Transportation
dpm	disintegrations per minute
DSV	default screening value
DWP	Decommissioning Work Plan
EPA	U.S. Environmental Protection Agency
Fe-55	iron-55
FSS	Final Status Survey
GM	Geiger–Müller
GPS	Global Positioning System
H-3	tritium
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCS	Heavy Component Shop

HEPA	high-efficiency particulate air
HSE	Health, Safety, and Environmental
HVAC	heating, ventilation, and air conditioning
I&E	Inspection and Enforcement
ID	identification
ICDC	Irradiated Component Disposal Container
IMC	intermodal container
IP-1	Industrial Package Type 1
km	kilometer
LLMW	low-level mixed waste
LLRW	low-level radioactive waste
µCi	microcurie
µCi/cc	microcuries per cubic centimeter
m	meter
m^2	square meter
M&E	materials and equipment
MARSAME	Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCSRP	Materials Categorization, Survey, and Release Plan
MDC	minimum detectable concentration
mrem	millirem
MSA	metropolitan statistical area
NAVSEA	Naval Sea Systems Command
Ni-63	nickel-63
NNS	Newport News Shipbuilding
NRC	U.S. Nuclear Regulatory Commission
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
PWEFC	Prototype Waterborne Expended Fuel Container
PM	Project Manager
PPE	personal protective equipment
PRSO	Project Radiation Safety Officer
QA	quality assurance
QAM	Quality Assurance Manager

RCA	radiologically controlled area
RCOPC	radiological contaminant of potential concern
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RDWH	reactor discharge water holding
RPP	Radiation Protection Plan
RW	radioactive waste
RWP	Radiation Work Permit
SAP	Sampling and Analysis Plan
SM	Site Manager
SME	subject matter expert
SPMT	self-propelled modular transporter
SSC	structures, systems, or components
SSHO	Site Safety and Health Officer
SSSB	Surface Ship Support Barge
SU	survey unit
TCEQ	Texas Commission on Environmental Quality
TGRM	Translating Gate Refueling Machine
TLD	thermoluminescent dosimeter
TSDF	treatment, storage, and disposal facility
WAC	waste acceptance criteria
WCS	Waste Control Specialists, LLC
WTDC	Waste Transportation and Disposal Coordinator

Executive Summary

What it is

The U.S. Navy Surface Ship Support Barge (SSSB) is a barge that was used to support Navy nuclear vessel refueling. The function of the SSSB was to receive, hold, and prepare previously used reactor components designated for ship-out or reuse. The SSSB provided the ability to perform maintenance functions similar to those performed in a typical pressurized water reactor spent fuel pool with the exception of long-term spent fuel storage. The SSSB was exclusively used in the Hampton Roads, Virginia area.

How it is regulated

This Decommissioning Work Plan (DWP) is prepared in accordance with U.S. Nuclear Regulatory Commission NUREG -1757, Volume 1, *Consolidated Decommissioning Guidance* as a modified Group 4 decommissioning due to NUREG-1757 being written for land-based fuel cycle facilities and the unique nature of the SSSB as a vessel under the auspices of the Naval Nuclear Power Program.

What we propose to do with it

This DWP describes the planned decommissioning, dismantlement and disposal (D&D) of the SSSB. The physical D&D process includes the following major evolutions:

1. Physical preparation and transfer of the SSSB from Huntington Ingalls Industries shipyard in Newport News, Virginia, to Aptim Federal Services, LLC and wet tow to Colonna’s Shipyard in Norfolk, Virginia

2. Preparations at Colonna’s Shipyard for SSSB transport via ocean-going heavy lift transport barge to Alabama Shipyard in Mobile, Alabama

3. Ocean transport from Hampton Roads, Virginia, to Port of Mobile, Alabama

4. Transfer of SSSB from heavy lift barge to “on-the-hard” at Alabama Shipyard using self-propelled modular transporters

5. Survey, identification, physical separation, and segregation of radiologically contaminated SSSB structures, systems, and components (SSC) from non-contaminated SSSB SSCs during the ship-breaking process

6. Packaging, transport and disposal of radiologically contaminated material at the Waste Controls Specialists, LLC federal facility in Andrews, Texas

7. Unrestricted release non-radiologically contaminated materials for recycling.

The process used to D&D SSSB will be documented in a Final Report detailing the D&D process and conclusions.

1.0 Facility Operating History

The U.S. Navy's Surface Ship Support Barge (SSSB) is a barge (i.e., non-powered vessel) that was used to support refueling Navy nuclear-powered ships. The function of the SSSB was to receive, hold, and prepare previously used reactor components designated for ship-out or reuse. The SSSB provided the ability to perform maintenance functions like those performed in a typical pressurized water reactor spent fuel pool except for long-term spent fuel storage.

The SSSB was originally a portion of the World War II-era T-2 tanker (SS CANTIGNY). CANTIGNY was constructed in 1945 by Sun Shipbuilding Company in Chester, Pennsylvania. Some of the remainder of CANTIGNY was reused with a new and larger midsection and bow constructed by Burmeister and Wain of Copenhagen, Denmark. The rebuilt CANTIGNY was operated until it was scrapped in Spain in 1984.

The CANTIGNY mid-body section was converted to a nuclear support facility in 1964 by Newport News Shipbuilding and was originally referred to as the Prototype Waterborne Expended Fuel Container (PWEFC). The PWEFC was constructed by Newport News Shipbuilding and Drydock Co. and used for support of the first and second CVN-65 (USS ENTERPRISE) refuelings. The SSSB was extensively refurbished by Newport News Shipbuilding in the late 1980s. Much of the original hull and tank structure was replaced and new longitudinal bulkheads were installed. In 1990 the PWEFC was upgraded to provide an additional 50-years of service by completing repair and alteration. During the repair the PWEFC was renamed the SSSB. Thus, the SSSB bears little resemblance to the original CANTIGNY. No new concepts in nuclear support facilities were used in the SSSB.

1.1 License Number/Status/Authorized Activity

There is no U.S. Nuclear Regulatory Commission (NRC) license number associated with the SSSB. Radioactive material is possessed under contractual authorization with the U.S. Navy Nuclear Power Program.

The SSSB had been used to support refueling U.S. Navy nuclear-powered surface ships. It was originally named the PWEFC and functioned analogously to a spent fuel pool in a commercial nuclear power reactor site. It underwent significant repair in 1985 and was refurbished and renamed the SSSB in 1996. It was last used to support the final defueling of the Ex-Enterprise (CVN-65) in approximately 2016. The SSSB is currently in an inactive layup status.

1.2 License History

There is no NRC license associated with the SSSB.

1.3 Previous Decommissioning Activities

Section 9.2.4 of the SSSB Technical Manual (Naval Sea Systems Command [NAVSEA], 2009) notes that, “The forward part of the machine shop, laundry drain tank, No. 4 centerline tank and dry pit are potentially contaminated. Ensure that any activity involving these spaces is conducted following the radiological control requirements of Reference 6.” Reference 6 is NAVSEA 389-0288 Navy Radiological Controls Manual.

1.3.1 Office (Former Laundry)

The office is located on the upper deck forward of the auxiliary pump room entrance between Frames 61 and 64. This area was originally the decontamination laundry facility. The office is approximately 29 feet by 28 feet, including the former laundry area.

1.3.2 Machine Shop/Component Assembly – Disassembly

The machine shop/component assembly - disassembly area occupies a 35-foot-wide compartment on upper deck at the forward end of the SSSB superstructure. The distance from the aft bulkhead of the compartment, positioned about four feet forward of Frame 63, to the forward bulkhead, positioned about three feet forward of Frame 68, is approximately 72 feet.

After the SSSB refurbishment in 1985, this compartment was classified as "abandoned in place." Abandonment of the space included termination of all services (power, ventilation, etc.) at the aft compartment bulkhead, except for the existing overhead incandescent lighting.

Since the 1996 SSSB reconfiguration this compartment has been converted into a conference/training room for production personnel with insulation added to the interior bulkheads of the compartment. There are several designated uses for this compartment:

1. Storage for the permanent leveling stand for each floating and reseating of the SSSB
2. A quality inspection office
3. A conference/training room for production personnel to conduct meetings
4. A shop area and eating area.

A new permanent stand-alone ventilation system has been added to supply heating and cooling to this compartment. The compartment has the following items:

1. The area has a 1-ton capacity overhead bridge crane which supplies service to the entire compartment. Presently, the crane is "abandoned in place." With Cognizant Design Agency approval, the crane could be connected to a power source and returned to service. Naval Reactors shall be informed of any intended use of this crane to lift reactor plant components. This crane is presently labelled with radioactive material labels.

2. There is a 7-foot by 11-foot rolling hatch in the compartment overhead, between Frames 66 and 67. The deck plating can take a maximum loading of 10 tons distributed over the deck directly under the hatch.

1.3.3 Dry Pit

The dry pit is a 22-foot-wide, 14-foot-long, 32-foot-deep compartment which is located below the upper deck between Frame 53 and the aft end of the fuel holding pit shielding. The top surface of the dry pit is recessed two feet below the level of the upper deck.

Inside the dry pit are four contaminated shroud storage racks which remain from the pre-repair and alteration state of the SSSB. The racks are completely enclosed in stainless-steel sheets which are pop riveted together and bonded at the joints with a sealing compound to contain the contamination.

The compartment has some fixed contamination which has been painted over. The compartment is vented into the clean house through two high-efficiency particulate air (HEPA) filter assemblies.

1.3.4 Laundry Drain/No.4 Centerline Tanks

The laundry drain tank is located between Frames 61 and 62. Built into the laundry drain tank are two stainless-steel tanks: the decontamination drain tank and the decontamination holding tank. The sounding tubes for these tanks have been capped off and the tanks were "abandoned in place."

The No. 4 centerline tank is located between Frames 62 and 65. The outboard boundaries of the No. 4 centerline tank are formed by the old mid-body port and starboard longitudinal bulkheads that are 17 feet, 6 inches off the SSSB centerline. Due to corrosion in the vicinity of these tanks, the bottom shell between Frames 61 and 65 and the 17 feet, 6 inch longitudinals has been reinforced with a hull doubler plate.

Since both tanks were previously used for collection and storage of contaminated liquids and still have residual fixed contamination, they are vented to the atmosphere through HEPA filter assemblies.

1.4 Spills

1.4.1 Wet Pit Leakage

The SSSB contains a permanent leak detection system for detection of leaks from the wet pit. The bottom and sides of the fuel holding pit are surrounded by a series of carbon steel plating and bulkhead structures to form an outer pit. The void between the outer pit and the fuel holding (wet) pit is filled with concrete for the purpose of shielding. The concrete portions of the outer pit were designed to be divided into two separate sections by installation of a watertight diaphragm at Frame 56. However, it has been proven that fluid can leak through this boundary. Leakage from the fuel holding pit or the wet pit voids into the concrete filled portions of the outer pit is monitored and collected by the SSSB Leak Detection Systems.

The SSSB Permanent Leak Detection Systems are gravity drain systems consisting of the Forward Leak Detection Piping which utilized six drainage locations on bulkhead 59, and Aft Leak Detection piping which utilizes seven drainage locations on the forward dry pit bulkhead. Each drainage location has an installed isolation valve. The drain lines of each system are routed to separate collection bottles (one for Forward Leak Detection Piping and one for Aft Leak Detection Piping) located in the bilge sump in the lower level pump room. A valve is installed immediately upstream of each collection bottle so that each bottle can be independently secured. The pump room bilge provides a readily accessible location for monitoring and changing the bottles. The Aft Leak Detection Piping has a stainless-steel pipe for a drain line running from the dry pit to the pump room routed through the starboard wet pit voids and sealed at penetrations through watertight bulkheads. The Aft Leak Detection Piping is designed to eliminate the need to routinely access the dry pit.

The SSSB Technical Manual makes the following notes regarding the Leak Detection System:

> *Care shall be exercised when operating/maintaining the SSSB Permanent Leak Detection Systems. The systems drain fluids from the concrete filled spaces to which radioactively contaminated water is known to have leaked. Therefore, these systems and fluids drained from the concrete filled spaces should be treated as radiologically controlled. Servicing facility installed portions of the SSSB Permanent Leak Detection Systems shall comply*

with Reference 1 [389-0288 Navy Radiological Controls Manual] local, state and federal regulations. The SSSB Permanent Leak Detection Systems are to be operated in accordance with Servicing Facilities Procedures.

Fluids drained from the concrete filled spaces should be treated as radiologically controlled. Water in prolonged contact with concrete may have elevated pH levels. Fluid collected from concrete filled spaces between the fuel holding pit and the outer pit may have excessively high pH (> 12.5) due to excessive concentration of sodium hydroxide. Collect, handle and dispose of collected fluid in accordance with Reference 1 [388-0289 Navy Radiological Controls Manual] local, state and federal regulations.

1.5 Prior On-Site Burials

There are no prior on-site burials on the SSSB. Previous contaminated areas are identified in Sections 1.3 and 1.4.

2.0 Facility Description

This chapter describes the SSSB vessel itself, the shipyards at which the decommissioning activities will take place, and the travel route between shipyards. The facility description includes:

- The SSSB structures, systems, and components (SSC)
- Newport News Shipbuilding (NNS) in Newport News, Virginia
- Wet Tow from NNS to Colonna's Shipyard
- Colonna's Shipyard in Norfolk, Virginia
- The heavy lift barge and transit from Hampton Roads, Virginia, to Port of Mobile
- Alabama Shipyard (ASY) in Mobile, Alabama

2.1 SSSB

The SSSB is described in terms of compartments and spaces. A compartment is a portion of the space within the vessel defined vertically between decks and horizontally between bulkheads. A space is defined as an area on the vessel, or vessel section, such as, but not limited to: cargo tanks or holds, pump or engine rooms; storage lockers; and tanks containing flammable or combustible liquids, gases or solids. Elevation and plan views of the SSSB major spaces and compartments and lists of the SSSB compartments and spaces; anticipated radiation and contamination levels; and contaminated SSCs contained within the space or compartment are included in Chapter 5.0 of this Decommissioning Work Plan (DWP). A general description of the SSSB is provided in Book 1, Chapter 1 of the SSSB Technical Manual.

2.1.1 Clean House, Wet Pit, and Shroud Canister Loading Station

The SSSB clean house provided a controlled environment in which most of the surface ship refueling support operations were executed. The wet pit is shielded on its four sides and bottom by concrete and when the SSSB was used in a drydock additional bottom shielding was provided by water introduced into void spaces around and below the pit.

2.1.1.1 Clean House

The clean house provides a fuel holding pit and a shroud canister loading area for temporarily holding nuclear components plus adequate hatches and crane and hoist facilities for component handling. The fuel holding pit and shroud canister loading area have portable steel covers to be used during long term layup.

2.1.1.2 Fuel Holding (Wet) Pit

The Fuel Holding (Wet) Pit is the location within which underwater fuel handling and refueling support operations were conducted. A combination of several differing fuel stand variants were used to store new and spent fuel assemblies as they were received, removed, replaced, reconfigured, and shipped. The configuration of racks and stands differs from A2W to A4W refuelings. The fuel holding pit has two Multi-Cluster Removal Container discharge stands which were utilized during A2W refuelings. These two stands were converted into Translating Gate Refueling Machine (TGRM) discharge stands prior to A4W refueling.

The fuel holding pit has provisions for temporary underwater stowage and inspection of nuclear reactor fuel components. The majority of underwater handling tools are stored in the wet pit.

2.1.1.3 Shroud Canister Loading Area

The dry pit was sealed during the SSSB repair and alteration and is now called the Shroud Canister Loading Area. The deck area over the old dry pit has a support platform for the hold-down barrel/shroud removal container station.

The full range of clean house features and capabilities is discussed in the SSSB Technical Manual Book 1, Chapter 2, *Clean House, Fuel Holding Pit, and Shroud Canister Loading Area*.

2.1.2 Heavy Component Shop

The Heavy Component Shop (HCS), located on the aft end of the SSSB, provided a service space that could be operated as either a clean area and/or a radiologically controlled area (RCA). The HCS is an enclosed space which has a movable weathertight hatch in the overhead to allow for the momentary passing of large components, a 2-ton overhead bridge crane for handling of heavy equipment; and the required electrical power for operation of the lighting/receptacles, ventilation and tools, and service air connections. There is one permanent bulkhead penetration installed into the HCS with a coaming and a cover to allow temporary services (such as ventilation, hoses, piping, power, etc.) when required. The HCS includes equipment inspection and refurbishment, qualification of personnel, checkout of equipment, and other reactor servicing operations, as applicable. Relevant references and a more fully developed description of the space and its uses is presented in the SSSB Technical Manual Book 1, Chapter 3, *Heavy Component Shop*.

2.1.3 Change Room and Casualty Control Station

The change room and the Casualty Control Station (CCS) are located on the upper deck compartment of the SSSB. The change room is the location where personnel don Anti-C clothing, store their belongings and use toilet facilities. This area also provides the means for personnel to frisk themselves for contamination after leaving contaminated or potentially contaminated areas.

The CCS provides a control location where various operations and systems on the SSSB are monitored. Mounted on the starboard wall of the CCS are heating, ventilation, and air conditioning (HVAC) and gamma alarm panels. Adjacent to the open CCS/change room area (starboard of the HCS and aft of Frame 51) is an enclosed guard station that houses closed-circuit television monitors, Radiological Condition status boards, and other casualty control panels from which SSSB surveillance and security control is managed. An expanded description of the CCS and change room area is found in the SSSB Technical Manual Book, 1 Chapter 4, *Change Room and Casualty Control Station*.

2.1.4 Log Room, Clean Tunnel, and Dirty Tunnel

The office on the SSSB provided a location where the servicing facility could administer fueling/refueling operations, control, and issue procedures; maintain data; and perform the functions necessary to coordinate any support activities. This area was originally the decontamination laundry facility. The clean tunnel, which runs along the starboard side of the SSSB, provides access to the non-contaminated areas of the barge such as the log room. The dirty tunnel, which runs along the port side of the SSSB, provides access to the potentially contaminated areas of the clean house, the pump room, and the HCS. The SSSB log room and other office spaces were utilized by the servicing facility to administer, control and issue procedures, maintain data and perform the other functions necessary to coordinate the refueling support activities on the SSSB. The "other" office spaces occupied part of the upper deck compartment between Bulkheads 61 and 63 which was previously a decontamination laundry facility. The SSSB Technical Manual Book 1, Chapter 5, *Office, Clean Tunnel, and Dirty Tunnel* presents a detailed description of the tunnels and office spaces.

2.1.5 Pump Rooms

The main pump room space is constructed on two levels. The 8 feet, 6 inch level, or pump room lower level, contains the components and connecting piping for the various SSSB fluid systems. The 18 feet, 2-inch level, or pump room operating level, contains the controls by which the components located in the 8 feet, 6 inch level are operated.

The auxiliary pump room is an "L"-shaped room located on the 27 feet, 2-inch level of the SSSB. It is reached via the auxiliary pump room entrance which is immediately forward of the log room in the clean tunnel.

2.1.5.1 Main Pump Room

The main pump room, which is below main deck between Frames 59 and 61, is an enclosed space housing the SSSB fluid system components and the controls that are used to monitor and regulate these systems. The pump room contains controls for the fuel pit circulating water system; the ballast system pumps; bilge pump; sea chests and contaminated drain collecting system; and the valves, pumps, piping, and gages which connect these systems.

2.1.5.2 Auxiliary Pump Room

The auxiliary pump room, located on the 27 feet, 2-inch level below the log room, contains the sanitary system collection tank and pure water system components (storage tank, pump, piping and demineralizer). The pump rooms are described in detail in the SSSB Technical Manual Book 1 Chapter 7, *Main and Auxiliary Pump Rooms*.

2.1.6 Miscellaneous Spaces and Tanks

Distinctive characteristics of the wet pit voids, ballast tanks, change room, machine shop (abandoned in place), Number 4 centerline tank and other spaces not covered elsewhere in this plan can be found the SSSB Technical Manual Book 1, Chapter 9, *Miscellaneous Spaces and Tanks*. Featured is information such as tank capacities, tank soundings, space arrangements, space usage, and special maintenance needs.

2.1.7 Heating, Ventilation, and Air Conditioning

The HVAC system provides ventilation and temperature control for the SSSB workspaces. When all doors and other temporary openings on the SSSB are closed, the systems are designed to maintain minimum negative pressures of 0.15 inches of water in the clean house, HCS, pump room, and counting room, and 0.10 inches of water in the dirty tunnel.

The SSSB ventilation is divided into three independently controlled, HVAC systems and three local area ventilation systems:

1 The office HVAC system (non-radiologically controlled)
2. The forward HVAC system (radiologically controlled)
3. The aft HVAC system (radiologically controlled)
4. Change room, chiller equipment room, and Machine Shop ventilation systems.

Summary descriptions of ventilation systems are provided below. Detailed system information can be found in the SSSB Technical Manual Book 1, Chapter 20, *Heating, Ventilation and Air Conditioning*.

2.1.7.1 Office (Non-Radiologically Controlled) HVAC System

The office system supplies conditioned air (warm/cooled/filtered) to the log room, office spaces, change room/CCS, clean tunnel, guard station, auxiliary pump room and auxiliary pump room entrance. The system consists of an air-handling unit, located in Fan Room No. 1, that contains a mixing box, a filter section, a heating unit, a cooling coil, and a supply and an exhaust fan. The supply duct(s) to each of the spaces identified above has an electrical duct heater.

2.1.7.2 Forward Potentially Contaminated HVAC System

The forward HVAC system supplies conditioned air (warm/cooled/ filtered) to the counting room, dirty tunnel (forward of Frame 59), pump room lower level, pump room operating level, and the pump room entrance. This system consists of an air-handling unit, located in Fan Room No. 1, that contains a mixing box, a filter unit, a heating unit, a cooling coil section, and a supply and exhaust fan. The supply duct(s) to each of the spaces serviced by this system have an electrical duct heater and a manually controlled damper. The exhaust duct from each of the spaces has a HEPA filter and a manually operated damper.

2.1.7.3 Aft Potentially Contaminated HVAC System

The aft HVAC system supplies conditioned air (warm/cooled/filtered) to the clean house, HCS and the dirty tunnel (aft of Frame 59). The air-handling unit, located in Fan Room No. 2, and the ducts in this system contain components that are similar to those described for the forward system.

2.1.7.4 Change Room Exhaust, Chiller Equipment Room, and Machine Shop Ventilation Systems

Independent of the office HVAC system, is an exhaust fan in the overhead of the change room, for the removal of objectionable odors, and a special set of heating and ventilation equipment for the chiller equipment room. The change room exhaust fan is locally controlled by a wall switch. The chiller equipment room is ventilated by a bulkhead mounted exhaust fan and a motor-controlled damper which operate to circulate outside air through the room. An 8.2-kilowatt electric space heater heats the chiller equipment room. A multi-stage thermostat demands heat when the ambient temperature is below 50 degrees Fahrenheit (°F) and ventilation when the temperature exceeds 80°F. A new Machine Shop stand-alone ventilation system has been

installed to supply heating and cooling to this compartment. The ventilation system consists of a heat pump located outside the Machine Shop on the main deck. The ventilation system ducting and air-handling unit are located within the Machine Shop space. Electrical power is provided from the non-vital (P1) 480-volt, 3-phase panel by a 90-amp circuit breaker.

2.2 SSSB Possession Transfer (NNS)

The transfer of possession of the SSSB from NAVSEA to Aptim Federal Services, LLC (APTIM) will occur once the SSSB is floated at NNS prior to the wet tow to Colonna's Shipyard. Prior to the transfer, APTIM personnel will be trained on the vessel's emergency and ballast sounding procedures. NAVSEA will then remove any postings and controls and turn the SSSB over to APTIM where postings and controls will be re-established under the APTIM Radiation Protection Plan (RPP).

2.3 Wet Tow to Colonna's Shipyard

Following transfer of possession at NNS, the SSSB will be towed approximately 10 miles to the Colonna's Shipyard in accordance with the Wet Tow Plan (APTIM, 2021a). The tow will take approximately four hours and APTIM will have a casualty crew on board during the tow to monitor the vessel.

2.4 Colonna's Shipyard

2.4.1 Site Location and Description

Colonna's Shipyard address is 400 E Indian River Rd, Norfolk, Virginia, 23523 and is located at N36° 50' 7.67" W76° 16' 55.171". The SSSB will be transferred from Huntington Ingalls Industries shipyard in Newport News, Virginia and temporarily located at Colonna's Shipyard as it is prepared for transit by submersible barge to the Port of Mobile. The SSSB will be placed on blocks in a floating drydock and will subsequently be transferred via self-propelled modular transporters (SPMT) to an ocean-going barge for transit to ASY in the Port of Mobile.

2.4.2 Population Distribution

Hampton Roads refers to both the body of water formed where the James, Nansemond and Elizabeth Rivers join near the Chesapeake Bay mouth to the Atlantic Ocean and the surrounding metropolitan region. Hampton Roads includes the Virginia Beach-Norfolk-Newport News, Virginia-North Carolina metropolitan statistical area (MSA). The MSA has a population of over 1.7 million and ranks as the 37th largest metropolitan areas in the United States. The MSA

includes 10 independent cities and nine counties. The population in 2010 was 1.68 million people. The current population estimate is 1.77 million people.

2.4.3 Current/Future Land Use

Colonna's Shipyard is located on the south bank of the Elizabeth River between Interstate Highway 464 and Campostella Road within the Norfolk city boundary. The immediate waterfront land use is primarily heavy industry including shipyards, marine construction facilities, and petrochemical transfer and storage facilities. To the south of the industrial belt along the river shoreline, are mixed use residential areas and recreational facilities.

The SSSB will remain at the Colonna's Shipyard for a relatively short duration, currently scheduled for eight to 12 weeks, as it undergoes preparations for ocean transport to the Port of Mobile, including mounting on the submersible ocean-going barge.

2.5 Submersible Barge and Transit

2.5.1 Tow Route Description

The transportation route for the SSSB aboard the transport barge via tow will include departure from the James River/Hampton Roads area in Virginia and travel east through the Chesapeake Bay to the Atlantic Ocean. From there the tow will follow the Eastern Seaboard south and then west through the Straits of Florida to the Gulf of Mexico. Once in the Gulf of Mexico the tow will head north to Mobile Bay and complete the voyage in the Mobile River at ASY in Mobile, Alabama. Weather conditions will be monitored during preparations for transport and during transport. Appropriate measures will be implemented to transport the SSSB with minimal impact from storms or adverse sea states. Discussion of the sea states and emergency procedures is presented in the Transportation and Dry Tow Plan (ATPIM, 2021b).

2.6 Alabama Shipyard

2.6.1 Site Description and Location

ASY's address is 660 Dunlap Dr, Mobile, Alabama, 36602, and it is located at N30° 40' 22.908" W88° 1' 41.8434". Figure 2-1 shows the location of ASY on Pinto Island and in relation to the city of Mobile and Interstate Highway 10. Figure 2-2 shows an aerial view of the city of Mobile and Pinto Island. Figure 2-3 shows an aerial view of ASY.

Pinto Island is an island within the city limits of Mobile located on the northwestern coast of Mobile Bay. It is bounded on the west by the Mobile River, on the south by Mobile Bay, on the

east by the Spanish River and on the north by Pinto Pass (now partially infilled with dredged material to form a land bridge) and Blakeley Island. It is dedicated to industrial uses, primarily shipbuilding. The BAE Systems Southeast Shipyards was originally the site of the Alabama Drydock and Shipbuilding Company, and most recently Atlantic Marine, which was acquired by BAE in 2010. The Alabama State Port Authority operates a terminal on the southern end of the island for the ThyssenKrupp steel plant upriver in Calvert. Austal USA is also part of this island chain taking up most of the central part of this island and has a stocking shop channel on the west bank, of the island. In June 2018 BAE Systems Southeast completed a total shutdown of all facilities on Pinto Island, and sale of all their land and shipyard to EPIC Companies, LLC in October 2018. The shipyard was renamed Alabama Shipyard, LLC in July of 2019. The facility includes approximately 423 acres of Pinto Island.

The island is approximately 0.75 miles (1.21 kilometers [km]) at its widest and 1.45 miles (2.33 km) at its longest with an average elevation of 10 feet (3.0 meters [m]). It, along with downtown and Blakeley Island, forms District Two of Mobile's city council districts.

Figure 2-1
Surface Map of Mobile, Alabama, and Pinto Island

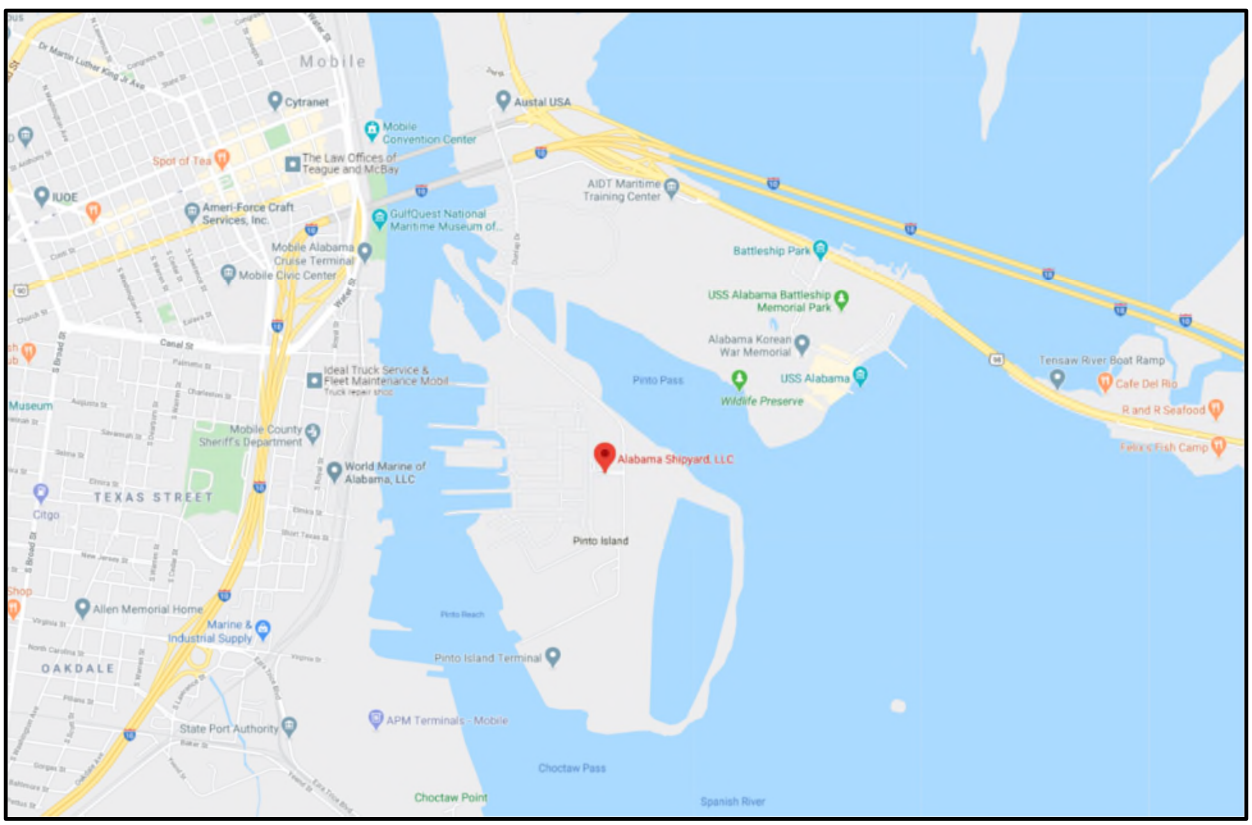


Figure 2-2
Aerial View of Mobile, Alabama, and Pinto Island

Figure 2-3
Aerial View of Alabama Shipyard Showing SSSB Unloading and Dismantlement Areas

2.6.2 Population Distribution

The 2010 United States Census determined that there were 195,111 people residing within the city limits of Mobile. Mobile is the center of Alabama's second-largest metropolitan area, which consists of all of Mobile County. Metropolitan Mobile was estimated to have a population of 413,936 in 2012. As of 2011, the population within a 60-mile (100 km) radius of Mobile was 1,262,907.

The 2010 census indicated that there were 78,959 households, out of which 21,073 had children under the age of 18 living with them, 25,439 of all households were made up of individuals and 8,477 had someone living alone who was 65 years of age or older. The average household size was 2.4 and the average family size was 3.07 (Wikipedia 20200724).

2.6.3 Current/Future Land Use

Pinto Island is zoned nearly exclusively as Heavy Industry except for the Battleship Alabama historical site which is zoned as Parks and Open Space and a few sites along the water's edge on the north side of Pinto Island designated as Water Dependent.

2.6.4 Mobile Bay

Mobile Bay is a shallow inlet of the Gulf of Mexico, lying within the state of Alabama in the United States. Its mouth is formed by the Fort Morgan Peninsula on the eastern side and Dauphin Island, a barrier island on the western side. The Mobile River and Tensaw River empty into the northern end of the bay, making it an estuary. Several smaller rivers also empty into the bay: Dog River, Deer River, and Fowl River on the western side of the bay, and Fish River on the eastern side. Mobile Bay is the fourth largest estuary in the United States with a discharge of 62,000 cubic feet (1,800 cubic meters) of water per second. Mobile Bay is 413 square miles (1,070 square kilometers) in area. It is 31 miles (50 km) long by a maximum width of 24 miles (39 km). The deepest areas of the bay are located within the shipping channel, sometimes more than 75 feet (23 m) deep, but the average depth of the bay is 10 feet (3 m).

2.6.5 Climatology

Daily temperature and precipitation data as well as historical hurricane information for Mobile, Alabama, is presented in this section. For the period 1971 to 2000 daily temperature data by month are presented in Table 2-1; daily precipitation data by month is presented in Table 2-2. Aggregate hurricane data is provided on Figure 2-4.

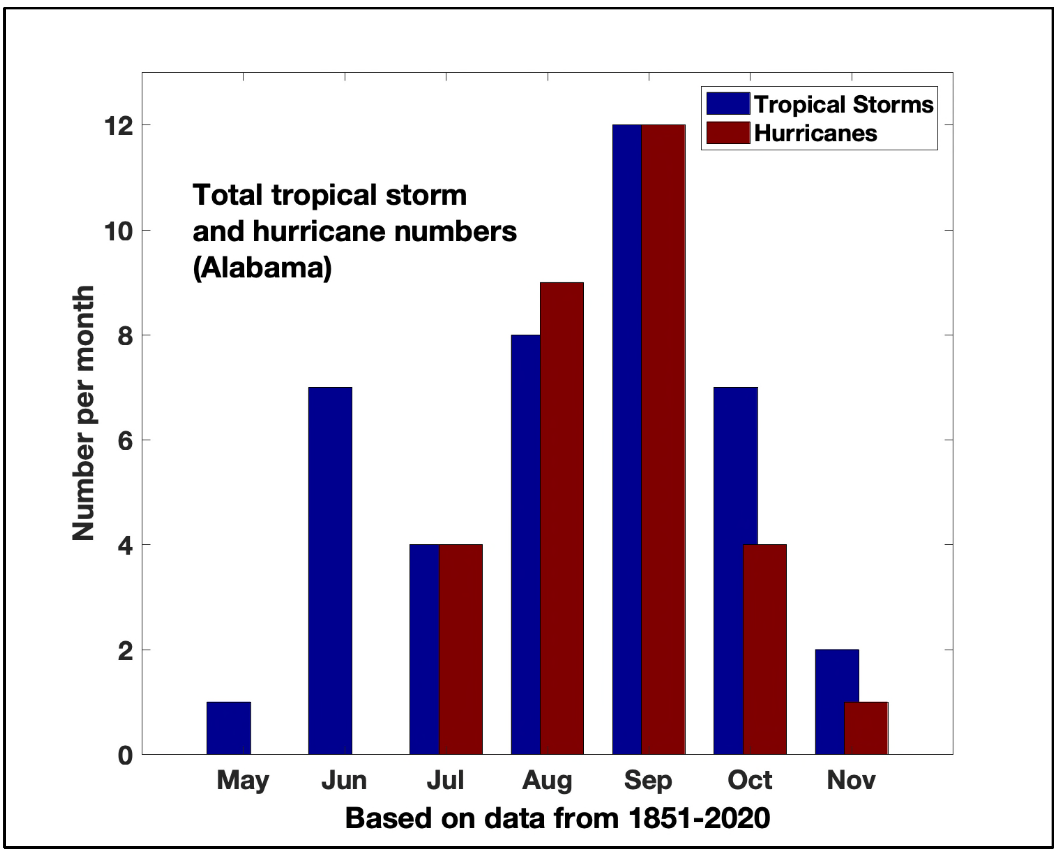
Table 2-1
Temperature Data (°F)

Month	Daily Maximum	Daily Minimum	Mean	Record High Temperature	Record Low Temperature
January	60.7	39.5	50.1	84	2
February	64.5	42.4	53.5	84	11
March	71.2	49.2	60.2	89	21
April	77.4	54.8	66.1	94	32
May	84.2	62.8	73.5	100	43
June	89.4	69.2	79.3	102	49
July	91.2	71.8	81.5	104	62
August	90.8	71.7	81.3	105	59
September	86.8	67.6	77.2	99	42
October	79.2	56.3	67.7	93	30
November	70.1	47.8	58.9	87	22
December	62.9	41.6	52.3	81	8
Annual	77.4	56.2	66.8	105	3

Table 2-2
Precipitation Data (inches)

Month	Mean	Median	Extreme	Year	Mean Annual Snowfall
January	5.75	5.17	16.92	1998	0.1
February	5.10	4.47	11.89	1983	0.2
March	7.20	6.65	13.46	1980	0.2
April	5.06	4.34	15.43	1980	Trace
May	6.10	5.27	15.08	1980	0.0
June	5.01	4.33	11.00	1982	0.0
July	6.54	6.57	13.14	1982	0.0
August	6.20	5.53	15.19	1984	0.0
September	6.01	4.41	24.13	1998	0.0
October	3.25	1.99	13.20	1985	0.0
November	5.41	4.80	12.70	1992	0.0
December	4.66	4.35	8.86	1995	0.0
Annual	66.29	65.66	--	--	0.4

Figure 2-4
Tropical Storms and Hurricanes by Month



2.6.6 Geology and Seismology

Mobile Bay and estuaries along the Gulf of Mexico margin typically originate as incised fluvial valleys that formed during the most recent drop in sea level and were then drowned by the subsequent postglacial sea-level rise. Most of these estuaries have been filling with sediment from fluvial and marine sources. The Mississippi-Alabama shelf province is defined by characteristics resulting from deltaic deposition advancing and receding as sea level rose and fell.

The geologic history of the Mobile Bay area has been dominated by rapidly changing sea levels over the past several thousand years. Some 15,000 to 18,000 years ago, sea level was about 300 feet lower than today and the coastline was near the edge of the continental shelf; that is, the abyssal deep was only a short distance offshore. About 6,000 years ago, sea level rose to a level about 15 feet below its present level. Mobile Bay was only a freshwater river, the west Florida coast was about 15 miles further west than its present position, and corals in the Florida Keys began to flourish. Sea level continues to rise, and portions of the Gulf coast are subsiding.

During the recent geologic history of the Mississippi-Alabama shelf area, river mouths, such as that of the Mobile River, alternately incised and flooded as the sea transgressed and regressed because of sea-level changes of as much as 90 feet. Over the past 4,000 years, many of the incised river valleys filled with estuarine muds, while the near-shore marine environment saw the formation of sandy shoals and barrier beaches. As sea level rose, these accumulations of sand migrated shoreward while wave action spread the sand along the shore. During regressions, however, sand bodies move seaward and tend to be covered by muds and other fine sediments of quieter estuarine environments.

3.0 Radiological Status

Based on historical document review, there was little radiological information available on which to assess the various structural areas, components and systems of the SSSB. Considering the lack of information, the radiological status of the vessel was based on descriptions of historical use, general historical statements and an engineering evaluation of the various areas and systems.

3.1 Structures and Spaces

A brief description, historical use and radiological status of the various structural areas of the vessel are provided in this section and summarized in Table 3-1.

3.1.1 Heavy Component Shop

The HCS was historically used as an RCA with some fixed contamination remaining on the floor. This was an enclosed space for the handling and storage of contaminated and/or radioactive components, tools and equipment for inspection and refurbishment during refueling operations. It was also used for the storage and handling of waste. As a result, the HCS is considered an impacted area.

3.1.2 Casualty Control and Guard Stations

The CCS is located adjacent to the change room on the starboard (clean) side of the vessel and housed various control stations for monitoring operating systems. Adjacent to this area was an enclosed guard station and vestibule to control access to the vessel. These areas were maintained as clean areas with no radiological controls.

3.1.3 Change Room and Restroom

The change room and restroom consisted of a locker area where personnel changed into anti-contamination clothing and stored personnel belongings. This area was maintained as a clean area with no radiological controls.

3.1.4 Control Point/Anti-C Removal Area

The control point or Anti-C removal area is located on the port side of the change room and restroom and was used for access to and from the RCAs of the vessel by way of the dirty tunnel.

3.1.5 Fan Room 2 (Aft)

The aft fan room, located above the change room and CCS, houses the permanent HEPA-filtered ventilation units that serviced the HCS, clean house and dirty tunnel. The area is a radioactive materials storage area containing potentially contaminated ventilation equipment and filters.

3.1.6 Dirty Tunnel

The dirty tunnel is located on the port side of the vessel and provides access to the RCAs of the vessel including the HCS, main pump room and clean house from the control point on the port side of the change room. This area was an RCA.

3.1.7 Clean Tunnel

The clean tunnel is located on the starboard side of the vessel and provides access to the non-contaminated areas of the vessel including the log room, forward offices and auxiliary pump room. As defined, this tunnel is not an RCA.

3.1.8 Clean House

The clean house is a high bay enclosed area providing a controlled environment where the majority of refueling support operations were performed including the dry and wet pits for the shroud canister loading areas and spent fuel holding. The area was an RCA.

3.1.9 Log Room

The log room provided administrative space on the vessel and a viewing window for the clean house area and is accessed from the clean tunnel. The log room is not an RCA.

3.1.10 Count Room

The count room is accessed by through the main pump room entrance and has a pass through to the dirty tunnel. This area was used for counting radiological samples.

3.1.11 Main Pump Room Access

The main pump room access is located off the dirty tunnel and provides entry to the main pump room. This is an RCA.

3.1.12 Auxiliary Pump Room Access

The auxiliary pump room access is off the clean tunnel.

3.1.13 Office Spaces

The office spaces are located forward of the pump room access and provided administrative spaces on the vessel. Although the office area has no radiological controls and is accessed from the clean tunnel, the area was previously the decontamination laundry facility.

3.1.14 Fan Room 1 (Forward)

The forward fan room, located above the forward offices, houses the permanent HEPA-filtered ventilation units that serviced the dirty tunnel, pump rooms and the count room. The area is a radioactive materials storage area containing potentially contaminated ventilation equipment and filters.

3.1.15 Machine Shop (Re-purposed)

The machine shop was historically an RCA that has been repurposed; however, residual fixed contamination remains in the area.

3.1.16 Wing Tanks

The wing tanks are located along the perimeter of the vessel hull and primarily consist of ballast tanks except for Port Wing Tank 3 and Starboard Wing Tank 3 which were used for the storage of Controlled Pure Water. These tanks were decontaminated during vessel refurbishment in 1983/1984 and released by NAVSEA for unrestricted use and have not been used to store radioactive liquids subsequent to refurbishment and should not be impacted; however, access to several of the wing tanks are located within radiologically controlled or historically controlled areas including the dirty tunnel and clean house. These included Port Wing Tanks 6 and 7.

Although not intended to contain anything other than ballast water, document review indicated that Starboard Wing Tank 8 was used during the CVN-65 (Enterprise) refueling to store phosphate water. The accumulated sludge was determined to be contaminated and the sludge was removed and the tank decontaminated and considered radiologically clean. As a result, Port Wing Tanks 6 and 7 and Starboard Wing Tank 8 are considered impacted.

3.1.17 Centerline Tank 3

Centerline Tank 3 is located at the forward end of the vessel and was used as a ballast tank with tank access located outside any RCA. The tank was decontaminated during vessel refurbishment in 1983/1984 and released by NAVSEA for unrestricted use and has not been used to store radioactive liquids subsequent to refurbishment.

3.1.18 Centerline Tank 4

Centerline Tank 4 was used for the storage of radioactive liquids and still contains fixed contamination.

3.1.19 Centerline Tank 8

Centerline Tank 8 was decontaminated during vessel refurbishment in 1983/1984 and released by NAVSEA for unrestricted use and has not been used to store radioactive liquids subsequent to refurbishment; however, the tank is located adjacent to the dry pit (i.e., boundary area).

3.1.20 Centerline Tank 9

Centerline Tank 9 is located at the aft end of the vessel and was used as a ballast tank. Although the tank was decontaminated during the 1983/1984 refurbishment and released by NAVSEA for unrestricted use, historical documentation indicated that the tank was used during the CVN-65 (Enterprise) refueling to store phosphate water along with Starboard Wing Tank 8. The accumulated sludge was determined to be contaminated and the sludge was removed and the tank decontaminated.

3.1.21 Wet and Dry Pits

The wet and dry pits are located within the clean house forward of Centerline Tank 8 and aft of the auxiliary and main pump rooms. These pits were for radiological use with the wet pit used to store spent nuclear fuel during refueling support. As a result, the dry and wet pits are considered radiologically contaminated.

3.1.22 Wet Pit Shield Water Voids

The wet pit aft and forward voids on the port and starboard sides are located adjacent to the wet pit and contained shield water. These tanks are boundary areas and are considered potentially contaminated.

3.1.23 Wing Tank Voids (Port and Starboard)

The port and starboard wing tank voids (4, 5, 6 and 7) are all considered boundary areas. Wing Tank 6 and 7 voids are adjacent to the wet pit shield water tanks, Wing Tank 5 voids are adjacent to the pump rooms and laundry drain tank, and Wing Tank 4 voids are adjacent to Centerline Tank 4 which was used to store radioactive liquids. In addition, the Port Wing Tank 4-7 voids are also accessed from the dirty tunnel.

3.1.24 Centerline Tank 3 Void

Centerline Tank 3 void is located forward of Centerline Tank 4 and is considered a boundary area.

3.1.25 Auxiliary Pump Room

The auxiliary pump room consists of an upper and lower level accessed from the clean tunnel and is located directly forward the wet pit to the starboard side and contained the controlled pure water systems and sanitary collection tank.

3.1.26 Main Pump Room

The main pump room consists of an upper and lower level access from the dirty tunnel and is located directly forward the wet pit to the port side and contained the wet pit systems (chiller/heat exchanger, demineralizers, filters, etc.).

3.1.27 Laundry Drain Tank

The laundry drain tank is located forward of the main and auxiliary pump rooms and aft of Centerline Tank 4. This area contains residual contamination.

3.1.28 Laundry Drain Tank Voids

The laundry drain tank voids (port and starboard) are boundary areas.

3.2 Systems and Components

A brief description, historical use, and radiological status of the various systems and components on the vessel are provided in this section and summarized in Table 3-2.

3.2.1 Wet Pit Water Circulating System

The wet pit water circulating system was used to maintain the wet pit water chemistry and temperature. The system consisted of circulating pumps, a heat exchanger, demineralizers, filters, strainers and associated piping and valves. The majority of the wet pit water circulating system is located in the pump room. The wet pit is an RCA that contained spent fuel and radiological components.

3.2.2 Reactor Discharge Water Holding System

The reactor discharge water holding (RDWH) system consist of a tank and pump located on the lower level of the pump room used to contain water in the TGRM during refueling operations.

3.2.3 Contaminated Drain Collection

The contaminated drain collection system was used to collect and store radioactive and potentially radioactive effluents from various systems and areas of the vessel. It collected water from the bilge well discharge (lower pump room level), pit circulating water system, pit water sampling sink, wet pit overflows and RDWH tank overflow in a collection tank located on the lower level of the pump room. Contaminated water could be pumped through the port and/or starboard shore connections to an off-hull collection facility

3.2.4 Chiller Cooling Loop

The chiller cooling loop is a secondary system (i.e., secondary side of the wet pit water heat exchanger) used to cool and maintain the temperature of the wet pit water circulating system. The system consists of two chiller units located on the upper deck along with a compressor, air separator tank, makeup tank, glycol pumps and associated piping and valves located in the pump room operating level. A backup saltwater circulating system is connected to the chiller loop to provide emergency cooling when the glycol system required repair. The chiller cooling loop is a boundary (secondary) system.

3.2.5 HVAC - Forward

The forward HVAC system is a HEPA-filtered system located in Fan Room 1 and serviced the counting room, dirty tunnel, and pump room.

3.2.6 HVAC - Aft

The aft HVAC system is a HEPA-filtered system located in Fan Room 2 and serviced the clean house, HCS and dirty tunnel.

3.2.7 HVAC – Office Space

A separate HVAC system, located in Fan Room 1 serviced the log room, office spaces, change room, CCS, clean tunnel, guard vestibule and auxiliary pump rooms.

3.2.8 HVACs – Change Room and Machine Shop

Independent of the office HVAC system is an exhaust fan located in the overhead of the change room and a separate system for the chiller equipment room and machine shop. Other than the machine shop, these service non-impacted areas of the vessel. The system servicing the machine shop area was new following the repurposing of the area.

3.2.9 Electrical Power and Lighting

The electrical power and lighting systems will be classified according to the areas they serviced and where they are located.

3.2.10 Communications System

The communications system will be classified according to the areas it serviced and where it is located.

3.2.11 Indicating and Alarm Systems

The indicating and alarm systems will be classified according to the areas they serviced and where they are located.

3.2.12 Cathodic Protection System

The cathodic protection system will be classified according to the areas it serviced and where it is located.

3.2.13 Service Air and Hatch Air Systems

The service and hatch air systems provided compressed air to various locations throughout the SSSB and provided air to operate the clean house rolling roof hatches. The system is considered not impacted: however, it will be classified according to each area it is located.

3.2.14 Sounding Tubes, Air Escapes, and Overflows

All the void spaces, ballast tanks and other spaces below the upper deck of the SSSB were equipped with sounding tubes, air escapes and overflows. These areas will be classified based on the areas and spaces with which they were associated.

3.2.15 Cranes and Hoists

There are cranes and hoists located in the HCS (2T overhead bridge crane) and the clean house (3T overhead forward bridge crane; 3T overhead aft bridge crane, and 5T platform bridge crane). In general, both the HCS and the clean house are impacted areas. These cranes and hoists will be classified according to the areas they service and where they are located.

3.2.16 Pure Water System

The pure water system consists of a storage tank, demineralizer, transfer pump and associated piping and valves. The majority of the pure water system is located in the auxiliary pump room. Shore water was processed through a demineralizer and stored in a tank which provided makeup

demineralized water to the clean house and wet pit. Although connected to the wet pit system, there are isolation valves.

3.2.17 Ballast and Controlled Pure Water System

The ballast system provided means for arranging water volume to the various ballast tanks of the vessel through a series of pumps, valves and piping to maintain the SSSB draft, list and trim. The controlled pure water system consisted of shore connection, pumps, valves and piping to supply controlled pure water to support vessel operations. Although, the systems should not be contaminated, they are connected to tanks and areas that are considered boundary areas and potentially contaminated.

3.2.18 Freshwater System

The freshwater system is a system of piping, to supply fresh water from shore servicing the drinking fountains, lavatories, sprinkler system, etc.

3.2.19 Sanitary System

The sanitary system consists of piping, pumps and a collection tank located in the auxiliary pump room for wastewater from the freshwater services.

3.3 Surface Soil Contamination

There was no potential for surface soil contamination on the vessel.

3.4 Subsurface Soil Contamination

There was no potential for subsurface soil contamination on the vessel.

3.5 Surface Water Contamination

There was no potential for surface water contamination on the vessel.

3.6 Groundwater Contamination

There was no potential for groundwater contamination on the vessel.

Table 3-1
Structural Areas

Area	Radiological Status	Planned Disposition	Classification	Notes
Upper Deck				
Heavy Component Shop (<2m)	Impacted	RW		Historically a Radiologically Controlled Area; will be used for waste packaging during D&D
Heavy Component Shop (>2m)	Impacted	RW		
Casualty Control Station	Not Impacted	RW		
Guard House / Vestibule	Not Impacted	RW		Access to Change Room.
Change Room / Restroom	Potentially Impacted	RW		Will reduce in size and use as Change Room during D&D
Anti-C Removal Area (Control Point)	Impacted	RW		Will move in-board and use as Control Point
Fan Room 2	Potentially Impacted	RW		Used for initial cooling and ventilation
Dirty Tunnel	Impacted	RW		Access to Wet Pit
Clean Tunnel	Not Impacted	RW		Access to non-contaminated portion of Clean House
Clean House (<2m)	Impacted	RW		Containment for cleaning/removing wet pit.
Clean House (>2m)	Impacted			
Log Room	Not Impacted	RW		
Counting Room	Impacted	RW		
Main Pump Room Entrance	Impacted	RW		Access to Pump Room
Auxiliary Pump Room Entrance	Potentially Impacted	RW		Access to Auxiliary Pump Room
Office Space	Impacted	RW		

Area	Radiological Status	Planned Disposition	Classification	Notes
Fan Room 1	Potentially Impacted	RW		
Machine Shop (Re-purposed)	Impacted	RW		Area re-purposed to crew break room.
Upper Deck Exterior	Not Impacted	RW	Clean Area Access	
Below Upper Deck				
Port Wing Tank 3	Not Impacted	Release	Class 2	Controlled Pure Water Storage
Port Wing Tanks 4, 5, 8	Not Impacted	RW		Ballast tanks
Port Wing Tank 9	Not Impacted	Release	Class 2	Ballast tank
Port Wing Tanks 6, 7	Potentially Impacted	RW		Ballast tanks; access via Dirty Tunnel
Starboard Wing Tank 3	Not Impacted	Release	Class 2	Controlled Pure Water Storage
Starboard Wing Tanks 4, 5, 6, 7	Not Impacted	RW		Ballast tanks
Starboard Wing Tank 9	Not Impacted	Release	Class 2	Ballast tank
Starboard Wing Tank 8	Impacted	RW		Ballast tank. Previously contained phosphate water. Sludge was determined to be contaminated and the tank decontaminated and considered radiologically clean.
Centerline Tank 3	Not Impacted	Release	Class 2	Ballast tank
Centerline Tank 4	Impacted	RW		Used for contaminated liquid storage
Centerline Tank 8	Potentially Impacted	RW		Ballast tank; Wet Pit Boundary
Centerline Tank 9	Impacted	Release	Class 2	Ballast tank. Previously contained phosphate water. Sludge was determined to be contaminated and the tank decontaminated and considered radiologically clean.
Wet Pit	Impacted	RW		Radiological Use

Area	Radiological Status	Planned Disposition	Classification	Notes
Dry Pit	Impacted	RW		Radiological Use
Port Wet Pit Voids (Aft & Forward)	Impacted	RW		Wet Pit Shield Water
Starboard Wet Pit Voids (Aft & Forward)	Impacted	RW		Wet Pit Shield Water
Port Wing Voids 4, 5, 6, 7	Potentially Impacted	RW		Wet Pit Boundary; Dirty Tunnel Access
Starboard Wing Voids 4, 5, 6, 7	Potentially Impacted	RW		Wet Pit Boundary
Centerline Tank 3 Void	Potentially Impacted	Release	Class 2	Centerline Tank 4 Boundary
Main Pump Room Operating Level	Impacted	RW		Wet Pit systems
Main Pump Room Lower	Impacted	RW		Wet Pit systems
Auxiliary Pump Room Operating Level	Potentially Impacted	RW		Boundary Area, Controlled pure water systems
Auxiliary Pump Room Lower	Potentially Impacted	RW		Boundary Area, Controlled pure water systems
Laundry Drain Tank	Impacted	RW		Used for contaminated liquid storage
Laundry Drain Tank Void (Port & Starboard)	Potentially Impacted	RW		Laundry Drain Tank Boundary
Hull Exterior	Not Impacted	RW		

D&D – dismantlement and disposal.

RW – radioactive waste.

Table 3-2
Vessel Systems

System	Radiological Status	Planned Disposition	Classification	Notes
Upper Deck				
Wet / Dry Pit Covers	Impacted	RW		
Wet Pit Tools and Equipment	Impacted	RW		Radioactive Materials
Chiller Cooling Loop	Potentially Impacted	RW		Secondary system
HVAC Forward (Fan Room 1)	Impacted	RW		HEPA system servicing impacted areas
HVAC Aft (Fan Room 2)	Impacted	RW		HEPA system servicing impacted areas
HVAC – Offices (Fan Room 1)	Impacted	RW		
HVAC – Change Room (Fan Room 2)	Impacted	RW		
HVAC – Machine Shop	Impacted			
Electrical and Lighting	Per Area Classification	Per Area		
Communications	Per Area Classification	Per Area		
Indicating Systems and Alarms	Per Area Classification	Per Area		
Service and Hatch Air	Per Area Classification	Per Area		
2T Bridge Crane (Heavy Component Shop)	Per Area Classification	RW		
3T Bridge Crane Aft (Clean House)	Per Area Classification	RW		
3T Bridge Crane Forward (Clean House)	Per Area Classification	RW		

System	Radiological Status	Planned Disposition	Classification	Notes
5T Platform Bridge Crane Aft (Clean House)	Per Area Classification	RW		
5T Platform Bridge Crane Forward (Clean House)	Per Area Classification	RW		
1T Bridge Crane (Machine Shop)	Impacted	RW		
Diesel Generator and Enclosure	Impacted	RW		
Chiller Unit A	Impacted	RW		
Chiller Unit B	Impacted	RW		
Below Upper Deck				
Fresh Water	Not Impacted	Per Area		
Controlled Pure Water	Not Impacted	Per Area		
Wet Pit circulating system	Impacted	RW		Contaminated system
Reactor Discharge Water Holding System	Impacted	RW		Contaminated system
Shore Piping Connection (Port and Starboard)	Impacted	RW		Contaminated System
Contaminated Drain Collection	Impacted	RW		Contaminated system
Bilge	Per Area Classification	Per Area		
Ballast	Per Area Classification	Per Area		
Sanitary	Not Impacted	RW		
Sounding tubes, air escapes, overflow	Per Area Classification	Per Area		
Cathodic Protection	Per Area Classification	Per Area		

System	Radiological Status	Planned Disposition	Classification	Notes
Temporary Systems				
Wet Pit Water Processing	Impacted	RW		
Wet Pit Temporary Cover	Impacted	RW		
Temporary Ventilation	Impacted	RW		

RW – radioactive waste.

4.0 Dose Modeling

4.1 Conceptual Site Model

The general conceptual model for SSSB dismantlement consists of two elements:

1. The SSSB itself
2. The location where the SSSB is dismantled.

With respect to the SSSB itself, all solid portions of the SSSB will be dispositioned into one of four pathways:

1. Low-level radioactive waste (LLRW)
2. Low-level mixed waste (LLMW)
3. Hazardous waste
4. Nonhazardous industrial waste.

Approximately 85% of the SSSB SSCs will be disposed of as LLRW; roughly 15% will be surveyed for radiological unrestricted release and will be dispositioned through disposal at a hazardous waste landfill, a nonhazardous industrial waste landfill or recycled; and, less than 1% is expected to be disposed as LLMW. The entire SSSB will be dispositioned via one of these pathways.

The SSSB will be dismantled in a designated area of ASY. ASY is located on Pinto Island in Mobile Bay. This area has been used for heavy industry including international shipping and port operations since the 1700s. Pinto Island has been used for shipbuilding since the founding of the Alabama Dry Dock and Shipbuilding Company in 1916. It is presently zoned almost exclusively for heavy industry. The anticipated future site use continues to be shipbuilding, ship breaking and port operations for the foreseeable future.

The general conceptual model for the shipyard is one in which continued industrial activities take place during which workers are exposed to residual radioactivity throughout the workday. Workers are assumed to be present on site an average of 2,000 hours per year. No residences are constructed on the site. Water is provided by a municipal utility company as needed to support industrial operations. No crops are grown, or livestock raised on the site. While the northern end of Mobile Bay is used for inshore and offshore sport fishing and some commercial fishing, most notably shrimping; fish harvesting and consumption are not elements of the on-site industrial scenario.

Pinto Island is designated for industrial use. There is no residential land on the island. The undeveloped areas to the northeast, Pinto Pass, is wetland with a potential use for dredge spoils in the future. Groundwater in the area is considered fresh but is not potable. The river water is brackish due to the ebb and flow of tidal water from Mobile Bay.

A baseline facility survey will be performed over the SSSB dismantlement area prior to the SSSB being positioned for dismantlement. A final survey will be performed over the SSSB dismantlement area after the SSSB is demolished and supporting equipment has been removed.

4.2 Radiological Constituents of Potential Concern

The Navy provided guidance[1] in 2006 concerning radionuclide distribution to be used for waste characterization of “filtered” and “unfiltered” waste streams produced by shipyards servicing Navy Nuclear Propulsion powered vessels. The unfiltered distribution represents waste streams which have not had suspended particulates removed through filtration and best represents the nuclide mix expected on SSSB. The SSSB has been idle since defueling the Ex-Enterprise, which was inactivated in December 2012. The waste stream distribution as developed in 2006 has been decay corrected to 2021 to estimate likely nuclide fractions as presented in Table 4-1.

Table 4-1
Decay Corrected Isotopic Distribution of Radiological Constituents of U.S. Navy Shipyard Unfiltered Waste

Isotope	Half-life (years)	2006 Ratio to Co-60	2006 Fraction of Total Activity (Normalized to 1 curie)	Total Activity after decay to 2021 (curies)	2021 Fraction of Total Activity (Normalized to 1 curie)	2021 Ratio to Co-60
Co-60	5.27E+00	1.00E+00	4.184E-01	6.635E-02	5.699E-01	1.000E+00
Co-58	1.94E-01	1.90E-01	7.950E-02	1.539E-23	1.322E-22	2.319E-22
Fe-55	2.70E+00	1.00E+00	4.184E-01	1.150E-02	9.876E-02	1.733E-01
Ni-63	1.00E+02	8.00E-02	3.347E-02	3.038E-02	2.610E-01	4.579E-01
Ni-59	7.50E+04	8.00E-04	3.347E-04	3.347E-04	2.875E-03	5.044E-03
C-14	5.73E+03	1.50E-02	6.276E-03	6.266E-03	5.382E-02	9.444E-02
Mn-54	8.54E-01	8.00E-02	3.347E-02	3.895E-07	3.346E-06	5.871E-06
Zn-65	6.68E-01	8.00E-03	3.347E-03	1.642E-09	1.411E-08	2.475E-08
Sb-125	2.76E+00	5.00E-03	2.092E-03	6.215E-05	5.339E-04	9.368E-04
Cs-137	3.01E+01	4.00E-03	1.674E-03	1.212E-03	1.041E-02	1.827E-02
Cs-134	2.06E+00	4.00E-04	1.674E-04	1.505E-06	1.293E-05	2.269E-05
Ag-110m	6.84E-01	6.00E-03	2.510E-03	1.745E-09	1.499E-08	2.631E-08
Sr-90	2.88E+01	2.00E-04	8.368E-05	5.974E-05	5.132E-04	9.005E-04

[1] Commander, Naval Sea Systems Command, “Revised Method for Determining Radionuclide Concentrations in Shipyard Low-Level Radioactive Waste”, Ser 08R/06-04529, December 14, 2006.

Isotope	Half-life (years)	2006 Ratio to Co-60	2006 Fraction of Total Activity (Normalized to 1 curie)	Total Activity after decay to 2021 (curies)	2021 Fraction of Total Activity (Normalized to 1 curie)	2021 Ratio to Co-60
Nb-94	2.03E+04	2.00E-04	8.368E-05	8.364E-05	7.185E-04	1.261E-03
Tc-99	2.11E+05	4.00E-04	1.674E-04	1.674E-04	1.438E-03	2.522E-03
I-129	1.57E+07	2.00E-07	8.368E-08	8.368E-08	7.189E-07	1.261E-06
Sum		2.39E+00	1.000E+00	1.164E-01	1.000E+00	

Nuclides present at greater than 1% of the total nuclide activity after decay are highlighted in the table above and are carried forward for further evaluation as the radiological contaminants of potential concern (RCOPC). These include cobalt-60 (Co-60), iron-55 (Fe-55), nickel-63 (Ni-63), carbon-14 (C-14), and cesium-137 (Cs-137). This nuclide distribution will be confirmed through samples collected from the wet pit deposits and other representative locations (e.g., air filters, resin beds, dry active waste [DAW]) analyzed in accordance with the requirements of Title 10 of the Code of Federal Regulations (CFR) Part 61 (10 CFR 61) for waste characterization. The nuclide distribution will be adjusted consistent with the results of characterization samples.

The Navy guidance directs the estimate of tritium (H-3) concentration in waste packages be based on the volume of water in the waste package multiplied by 0.005 microcuries per cubic centimeter (µCi/cc). Since a little more than one H-3 half-life has passed since this guidance was issued, the current concentration in water would be approximately 0.0025 µCi/cc. For a 96-cubic-foot B-25 box at 1% free-standing liquid (water) this would be 0.96 cubic feet of water or approximately 70 microcuries (µCi). The activity in a B-25 box with an average contact (i.e., 2 inches) direct radiation level of one milliroentgen per hour (mR/hr) based on the Navy nuclide mix decayed to 2021 is approximately 1.2E+03 µCi. The estimated H-3 content is less than 1% of the total box activity.

Previous experience at a similar facility with a similar radionuclide mixture showed that due to the high default screening values (DSV), together with the low amount of activity present, H-3 contribution to the surface contamination sum of fractions was negligible. This will be confirmed to be the case for SSSB during characterization and materials and equipment (M&E) release surveys.

The RCOPCs listed in Table 4-1 are for preliminary planning purposes. These will be updated along with their relative abundance following characterization of the vessel.

4.3 Unrestricted Release Criteria for SSSB Structural Materials and Equipment

There are no SSCs containing induced radioactivity, resulting from activation of the matrix material, being considered for unrestricted release as part of the SSSB dismantlement and disposal (D&D) project. The unrestricted release criteria for structural M&E released from the SSSB for unrestricted use is "no detectable activity" on surfaces of the M&E. "No detectable activity" is defined as less than 5,000 disintegrations per minute (dpm)/100 square centimeters (cm^2) total and 1,000 dpm/100 cm^2 removable beta-gamma activity from nuclear power reactors as defined in Inspection and Enforcement (I&E) Circular 81-07.[2]

The I&E Circular also states, "If alpha contamination is suspected, appropriate surveys and/or laboratory measurements capable of detecting 100 dpm/100 cm^2 -fixed and 20 dpm/100 cm^2 removable alpha activity should be performed." Alpha-emitting radionuclides are not anticipated to be present on the SSSB. This will be confirmed during characterization and M&E release surveys.

It should be noted that the unrestricted release criteria as specified are below the NRC building surface screening values contained in NUREG -1757 *Consolidated Decommissioning Criteria*, Vol. 1 Appendix B Table B.1 Acceptable License Termination Screening Values of Common Radionuclides for Building-Surface Contamination. Default building surface and soil screening values for the RCOPCs are listed in Table 4-2.

Table 4-2
Building Surface and Soil Contamination Screening Values

Radionuclide	Symbol	Surface DSV (dpm/100 cm^2)	Soil DSV (pCi/g)
Cobalt-60	Co-60	7,100	3.8
Iron-55	Fe-55	4,500,000	10,000
Nickel-63	Ni-63	1,800,000	2,100
Carbon-14	C-14	3,700,000	12
Cesium-137	Cs-137	28,000	11

DSV – default screening value.
pCi/g – picocuries per gram.

[2] U.S. Nuclear Regulatory Commission, *Control of Radioactively Contaminated Material*, I&E Circular No. 81-07, May 14, 1981.

4.4 Unrestricted Release Using Screening Criteria

The area of the shipyard on which the SSSB will be dismantled consists of paved/concrete surfaces and unpaved soil/crushed limestone surfaces. The paved surfaces have embedded steel platens that support stands cradling the vessel. This area will be treated as both a structure and open land area for the purposes of the Final Status Survey (FSS). This area will be surveyed (i.e., baseline survey) before the SSSB is placed and an FSS will be performed after SSSB dismantlement is completed. The acceptance criteria are the screening levels identified in Table 4-2.

Co-60 accounts for 57% of Total Activity and has the lowest Surface Screening Level at 7,100 dpm/100 cm^2. Consequently, for surveys of shipyard structures, measured beta-gamma activity will be compared directly to the Co-60 surface screening criterion, rounded down to 7,000 dpm/100 cm^2.

The unrestricted release criteria for the decommissioning site is compliance with the Co-60 Derived Concentration Guideline Level (DCGL) based on screening criteria with an as low as reasonably achievable (ALARA) goal of no statistical difference between baseline and post-D&D measurements.

4.5 Unrestricted Release Using Screening Criteria for Surface Soil Residual Radioactivity

As mentioned above, the site designated for decommissioning the SSSB at ASY consists of paved/concrete surfaces and unpaved soil/crushed limestone surfaces. The unpaved areas will be surveyed as open land areas using the soil DSVs provided in Table 4-2.

Based on currently available information on radionuclide fractional abundance and published NRC DSVs, Co-60 is the limiting (bounding) isotope. Co-60 is the bounding radionuclide because, for other radionuclides present, either the radionuclide’s fractional abundance is very low (e.g., C-14 and Cs-137); the DSV is very high (e.g., C-14 surface, Fe-55 and Ni-63 soil and surface) or the combination of both lower abundance and higher DSV indicate they are not limiting (e.g., C-14 and Cs-137 soil). This will be reviewed and confirmed following completion of SSSB characterization.

Consequently, non-isotope-specific beta and gamma measurements are attributed to Co-60. That is, gross beta activity and gross gamma activity above background is considered to be due to Co-60.

4.6 Unrestricted Release Using Site-Specific Information

There are no site-specific unrestricted release criteria developed or utilized for the SSSB D&D project.

4.7 Restricted Release Using Site-Specific Information

The SSSB D&D project is an unrestricted release of M&E with no detectable contamination, consequently there is no site-specific information for restricted release.

4.8 ALARA Analysis

The unrestricted release criterion for M&E released from the SSSB is "no detectable beta contamination" at a detection limit no greater than 5,000 dpm/100 cm^2 total contamination and 1,000 dpm/100 cm^2 removable contamination. "No detectable beta contamination" at this level is ALARA given the state of instrumentation and the level of resources and effort required to complete the survey. Per I&E Notice 81-07 this detection level equates to approximately five millirem (mrem) per year.

When compared to NRC DSVs contained in NUREG-1757 Appendix B, Table B-1, an unrestricted release standard of "no detectable contamination" at a detection level of 5,000 dpm/100 cm^2 total contamination is approximately 70% of the screening level for the most restrictive RCOPC, Co-60. The NUREG-1757 screening values are equivalent to 25 mrem/year under the conservative assumptions used in the DandD v.2 Building Occupancy screening analysis.

5.0 Planned Decommissioning Activities

The overall decommissioning approach is first described in chronological order in this introductory portion of this chapter. This is followed by a more detailed description of decommissioning contaminated structures, systems, and equipment provided in Sections 5.1 and 5.2. This is a planned sequence, cut lines, and details listed herein may be revised pending further engineering analysis of actual vessel condition and firsthand inspections.

Summary of Decommissioning Activities. Preparations will be made at ASY's facility prior to the arrival of SSSB including:

- Establishment of a security perimeter. A separate site security plan has been developed and will be implemented (see Section 5.3).
- Establishment of perimeter environmental monitoring stations (air sampling and external dose).
- Baseline radiological survey.
- Placement of 80-mil liner under the footprint of SSSB.
- Placement of mounting blocks for SSSB atop the liner.
- Placement of elastomer belting atop liner for SPMTs.
- Placement of a protective gunnite or similar layer atop the liner (after SSSB has been placed on blocks by SPMTs).
- Preparation of two stair towers to provide personnel access to the upper deck.

The SSSB will be towed from Colonna's Shipyard to ASY on a deck barge. It is expected that little or no ballast water will be required in the SSSB during transport. This will be confirmed prior to loading on the deck barge and will be documented in the final Transportation and Dry Tow Plan. However, if ballast water is required in the SSSB it will be removed and treated according to local regulations at ASY prior to the start of decommissioning activities.

The SSSB will be moved from the deck barge onto blocks, using SPMTs, at a location on ASY's dock between Piers K and L. As shown in Figure 5-1, it will be positioned under ASY's 'Goliath' bridge crane and within reach of two gantry cranes (primarily the south gantry crane) which will be used in the decommissioning process. During initial dismantlement activities, the SSSB will provide containment, and the existing ventilation systems will be operated to maintain negative pressure and HEPA filtration.

After the SSSB is in place, a Containment Structure (CS) will be erected to the east. The CS will be used to contain work while sizing sections of the SSSB for disposal. The CS will include road plates, as required, for heavy equipment traffic and staging of materials. Initially, forward and aft sections of the SSSB will be cut and lifted into the CS for further sizing. Eventually, the SSSB remnant will be moved eastward, under the CS, for final sizing and removal. APTIM intends to use at least one CS; however, a second CS may be installed to work multiple contaminated sections of the ship in parallel. The design and radiological controls for each containment would be similar.

The Waste Handling and Storage area is shown on Figure 5-1. This area will accommodate 24 or more intermodal containers (IMC) which will contain LLRW. The IMCs will be placed in this area using either one of the large overhead cranes (Goliath or gantry when coming from the SSSB) or a large forklift (when coming from the CS). The IMCs will be completely closed and surveyed prior to placement in these areas. They will also be tarped upon placement in the area. The IMCs will be in this area awaiting shipping typically 14 days or less but never more than 90 days. They will be loaded onto a conveyance using either one of the overhead cranes or large forklift.

The CS will be approximately 120 feet wide x 285 feet long x 80-foot eave height. It will have a telescoping roof to allow large sections of the SSSB to be placed and then covered with the roof. The CS will be closed and HEPA-filtered ventilation will be connected to the CS to provide a negative-air enclosure during dismantlement, sizing, and loading operations. Figure 5-2 provides a schematic showing the CS ventilation system with HEPA filters for air discharge to the atmosphere. In addition to the HEPA filters, a pulse-jet dedusting filter with continuous particulate removal is used to precondition air from operations that generate high particulate matter loads (e.g., torch cutting). This unit discharges to the HEPA filter inlet.

The HEPA filter system will remove 99.97% of 0.3-micron particulate matter from the discharge air. The air in the CS will be sampled on a routine basis. SSSB sections will be sized to fit into IMCs within the negative-air CS using conventional metal cutting methods (predominantly shears but also torches and saws). Excavator(s) with shear(s), mobile crane, telescoping forklift, and manlifts will be deployed in the CS as required.

Figure 5-1
SSSB Decommissioning Area at ASY

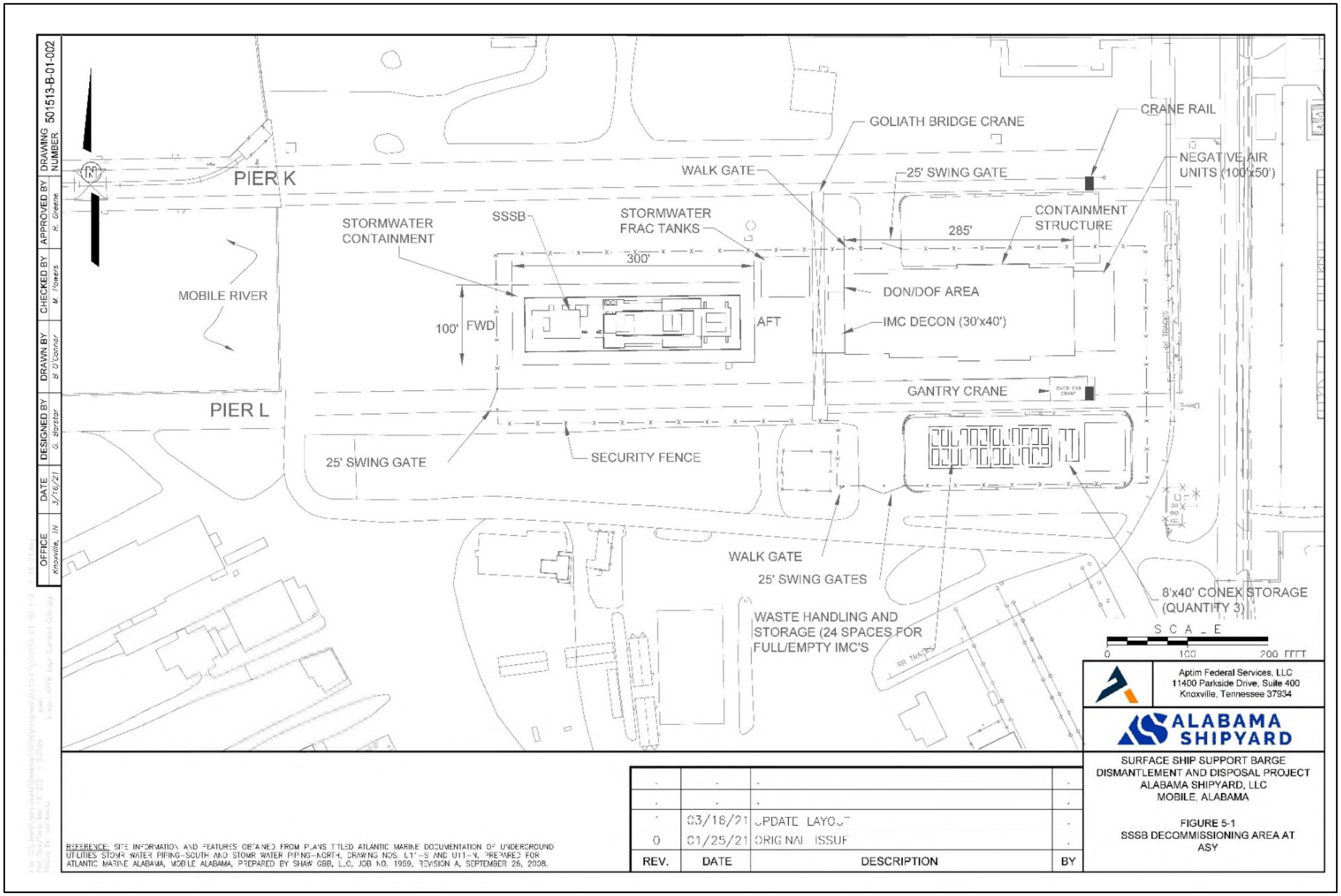
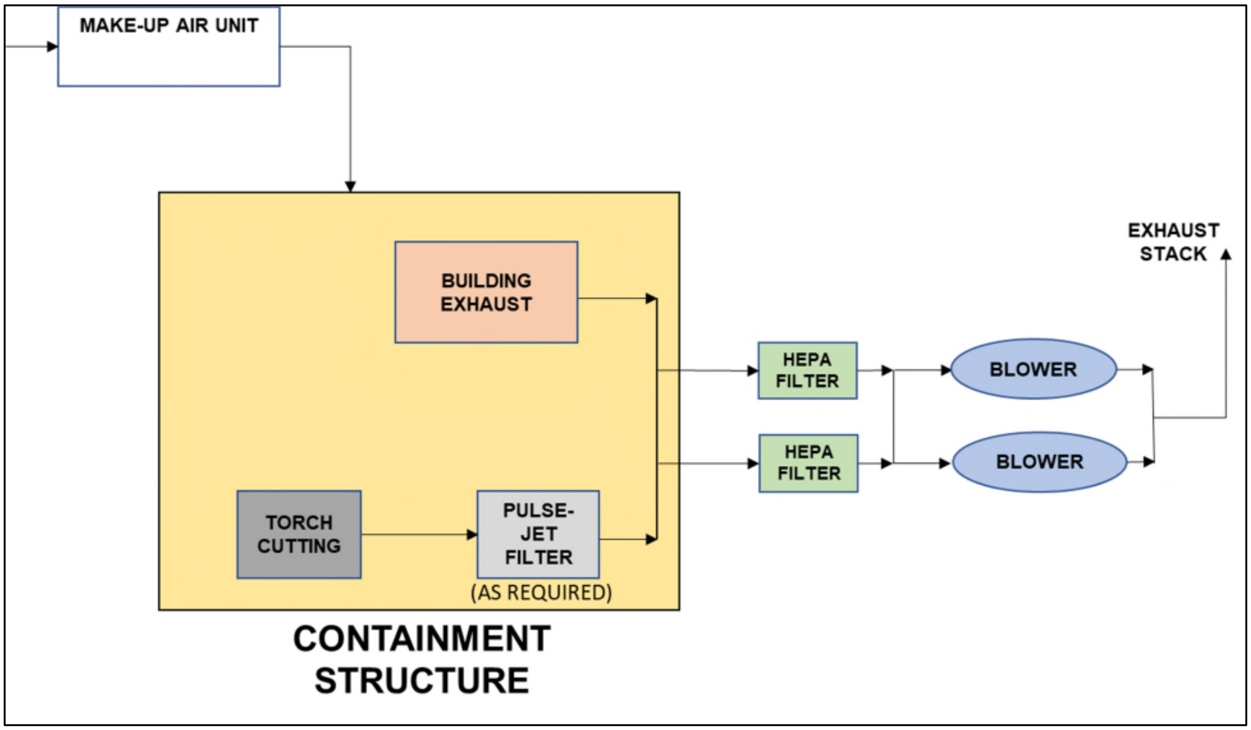


Figure 5-2
Containment Structure Ventilation Schematic



During initial set up and preparation of the SSSB at ASY, the existing CCS and Change Room will be used to don and doff Anti-C clothing and be the control point for entering and exiting contaminated or potentially contaminated areas including the clean house, dirty tunnel, HCS, and Pump Rooms. This area will be reconfigured prior to the start of dismantlement to allow movement of IMCs and other large items from the clean house and wet pit to the HCS for packaging and removal from SSSB.

After packaging of wet pit systems and equipment is complete and removal of the wet pit shielding is partially complete, the change room and control point will be moved to the Pump Room Entrance location on the forward upper deck. Relocation of the control point will be required, in accordance with the schedule, prior to removal of this entire area, including Fan Room 1 above and Ballast Tank #8 Centerline below, from the SSSB and placement in the CS for sizing and disposal. The change room and control point will be located at the Pump Room entrance during the completion of the wet pit shielding and all other on-board activities prior to the CS being moved to enclose the remaining portion of the SSSB.

In cases where ballast and wing tanks must be entered from the outer upper deck, local, temporary containments will be constructed in order to locate the control point at the tank entry hatch and provide a donning and doffing area.

The CS will have an external vestibule, or conex containers, that will be used to don and doff Anti-C clothing and provide a control point for entering and exiting.

At the start of dismantlement, equipment and systems from the HCS, Dry Pit, Wet Pit, Clean House, and Pump Rooms will be placed in IMCs or U.S. Department of Transportation (DOT) Industrial Package Type 1 (IP-1) bags and removed from the SSSB. Sections of two bulkheads aft of the Clean House will be removed in the area of the existing control point and change room compartments to facilitate transfer of loaded IMCs and packages off the vessel and transfer of empty containers onto the vessel. The remaining ~18 inches of water in the Wet Pit will be filtered and solidified for disposal as LLRW or transferred into tank trucks for proper disposal offsite.

In parallel with equipment removal, forward portions of the SSSB including the Machine Shop, Fan Room Number 1, Ballast Tank #4 Centerline, Port Wing Tank #4, and Starboard Wing Tank #4 will be removed and transferred to the CS for size reduction and loading into IMCs. Based on preliminary characterization data, it is anticipated that forward Ballast Tank #3, Centerline and adjacent void, and both forward Port Wing Tank #3 and Starboard Wing Tank #3 will be released for unrestricted use after they are radiologically surveyed (see Section 11.3.2 of this DWP).

A temporary cover will be installed near the base of the Clean Room to facilitate removal of the Upper Clean Room and the onboard saw cutting of the Wet Pit Shielding using the SSSB for containment. The Upper Clean Room will be placed in the CS for size reduction and containerization. Saw-cut steel and concrete shielding will be placed in contamination control bags within the negative air-handling environment on the SSSB then transferred to IP-1 bags on the dock for disposal as LLRW.

The aft portions of the SSSB will be removed for disposal as LLRW. This includes the HCS, Fan Room Number 2, Ballast Tank #8 Centerline, and Port Wing Tank #8 and Starboard Wing Tank #8. These structures are removed in large sections using the Goliath or gantry cranes and placed under the CS for size reduction. Ballast Tank #9 Centerline as well as #9 Port and Starboard

Wing Tanks, based on preliminary characterization data, are likely candidates for unrestricted use.

At this stage in the dismantlement, the remainder of the SSSB will be relocated to the CS, with HEPA filtration and negative-air ventilation maintained during remaining size reduction and containerization activities.

After the SSSB is relocated, the vessel blocks, stormwater containment system materials, CS, vehicle mats/plates, and CS filter housings and ductwork will be surveyed in accordance with *Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual* (MARSAME) protocols; and, either released for unrestricted use, disposal as unrestricted solid waste, or disposal offsite as LLRW. All filter elements from the SSSB and the CS will be disposed as LLRW.

Figures 5-3 through 5-6 provide side elevation views of the SSSB with the forward end of the barge to the right. They are labeled numerically to show the chronological sequence of the main decommissioning activities, with each item described in more detail in subsequent paragraphs.

Figure 5-3 depicts removal of the most contaminated structures, systems, equipment, and wet pit water. It is expected that >99% of the radiological material will be removed when the activities depicted on Figure 5-3 are completed. The SSSB itself is used as a containment for removal of these items. Existing SSSB ventilation systems will remain in operation to provided negative pressure during this time.

Figure 5-4 depicts removal of the forward SSSB structure, with a portion being free released and the remainder disposed of as LLRW, as shown. This work will be conducted largely in parallel with the activities shown in Figure 5-3.

Figure 5-5 illustrates installation of a temporary cover in the clean house, removal of the upper clean house, and removal of the wet pit shielding concrete. This shielding concrete will be removed under a negative-pressure environment using the remainder of the clean house and SSSB outer hull as containment.

Figure 5-6 depicts removal of aft SSSB structure, with a portion being free released and the remainder disposed as LLRW, as shown. This work will be conducted largely in parallel with the activities shown in Figure 5-5.

After the shielding concrete and aft structure are removed, the CS will be moved on tracks to the west to cover the remainder of the SSSB in order to size it for disposal as LLRW. Figure 5-7 illustrates the relocated CS in plan view and Figure 5-8 shows an elevation view.

Figure 5-3
SSSB Decommissioning Sequence – Removal of Equipment and Systems from Dry Pit, Wet Pit, Clean House, Pump Rooms

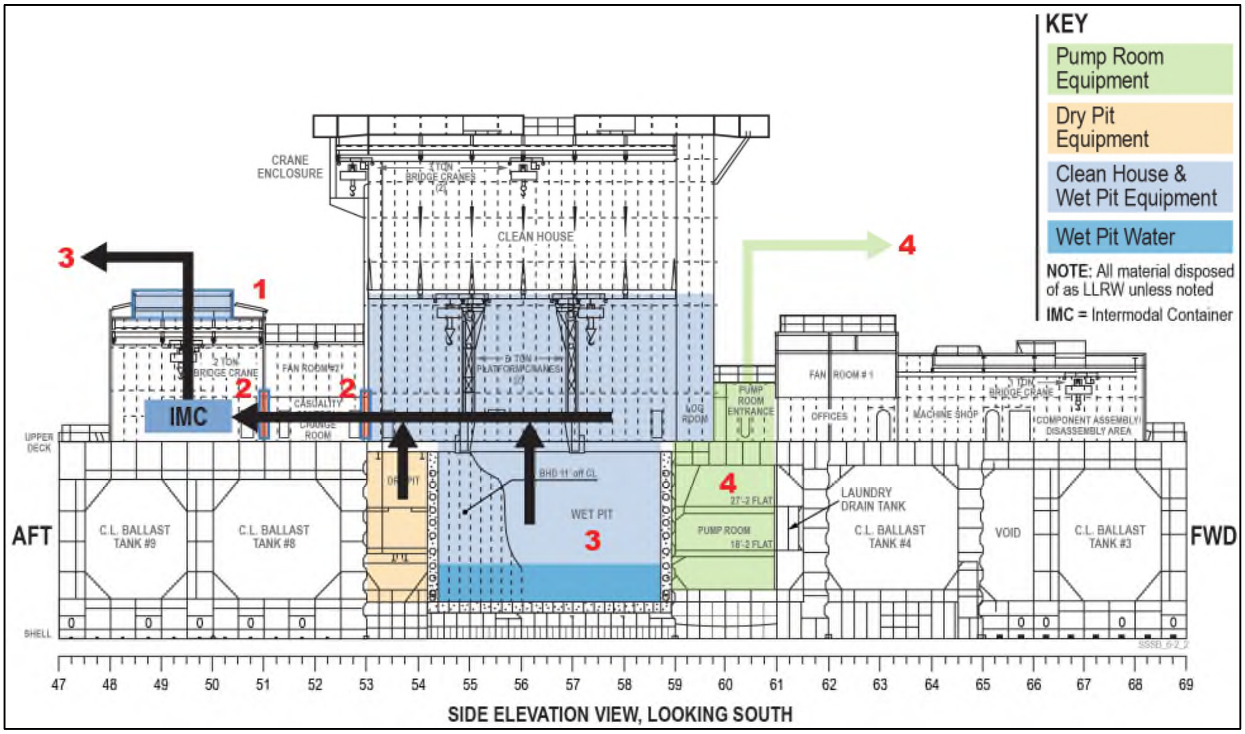


Figure 5-4
SSSB Decommissioning Sequence – Removal of Forward Structure

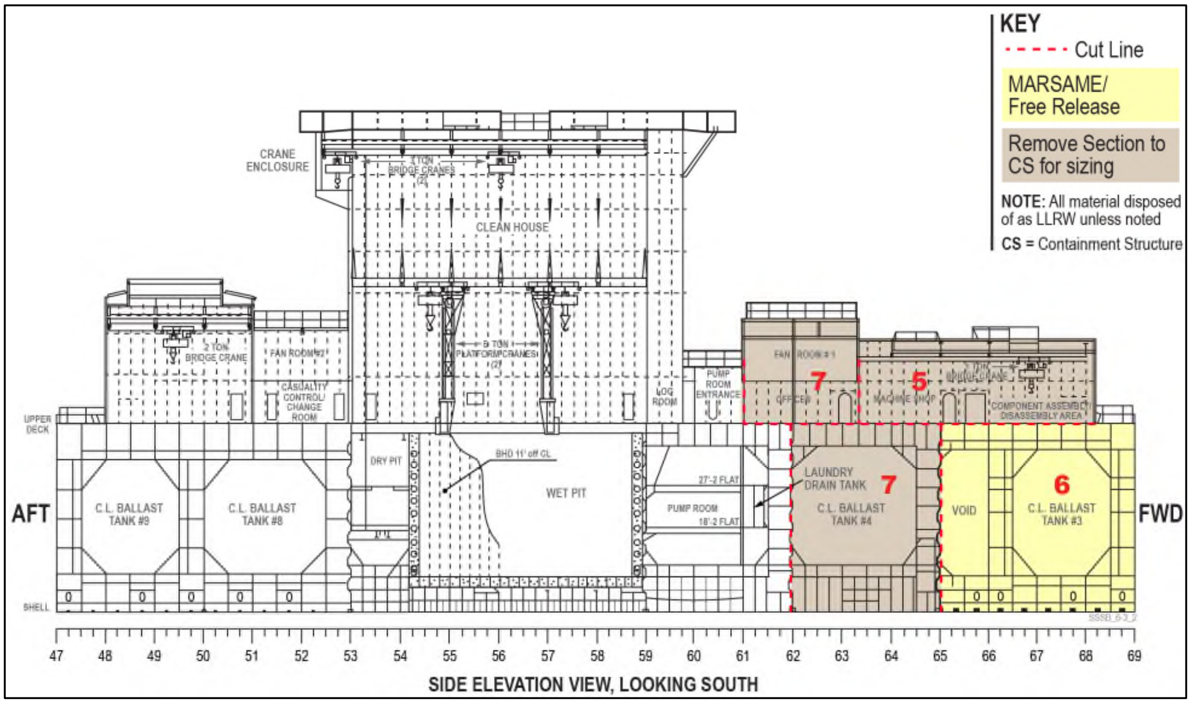


Figure 5-5
SSSB Decommissioning Sequence – Removal of Upper Clean Enclosure and Wet Pit Shielding

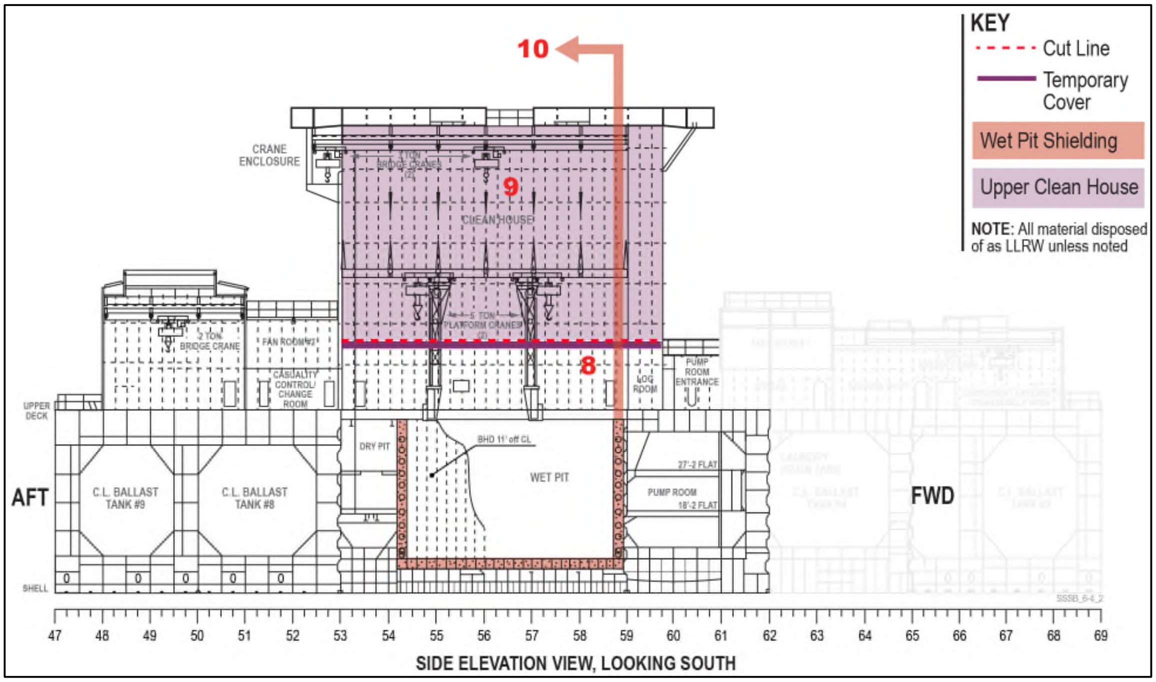
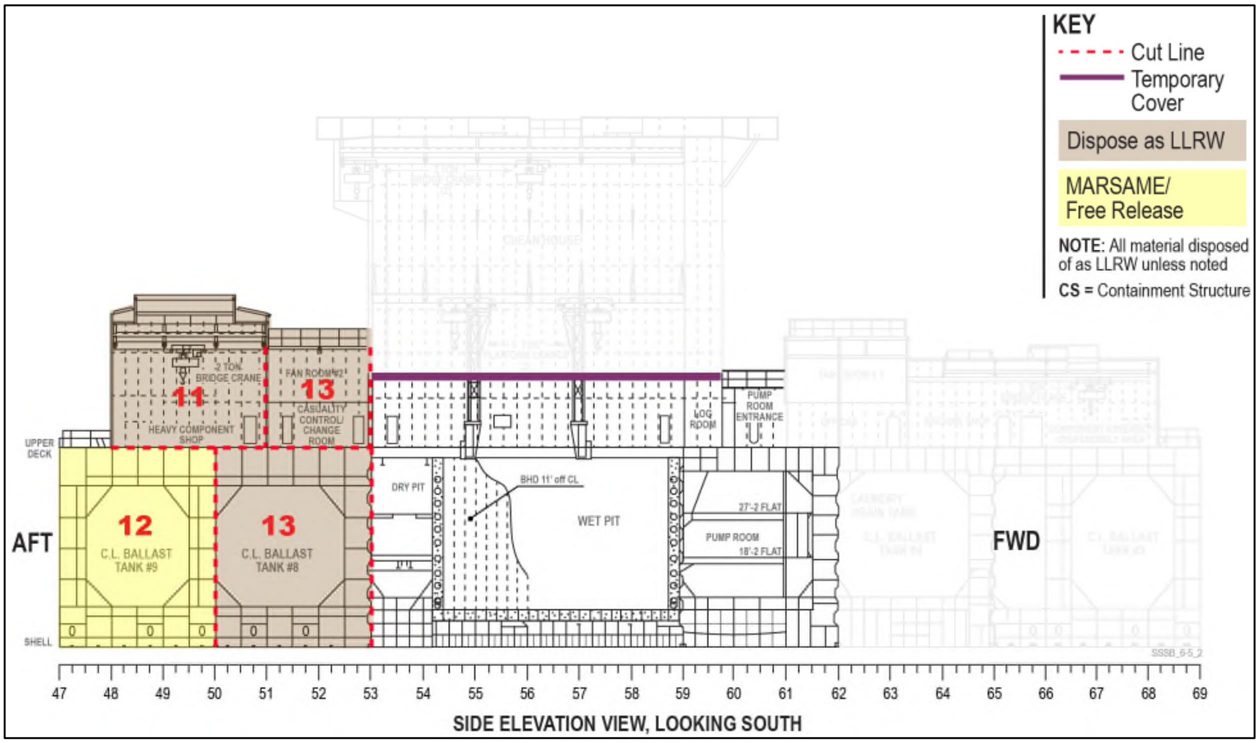


Figure 5-6
SSSB Decommissioning Sequence – Removal of Aft Structure



A more detailed chronological sequence of decommissioning activities at ASY is provided below. The Item numbers are shown on Figures 5-3 through 5-6.

- ***Reconfigure SSSB for removal of systems and equipment from clean house and wet pit area (Figure 5-3, Items 1 and 2)*** – Use the area aft of the wet pit, including the HCS to package systems and equipment from the wet pit, dry pit, and clean house for removal from the SSSB as LLRW in IMCs. This is accomplished by reconditioning the HCS hatch (Item 1) and making openings for IMC movement through bulkheads at Frames 51 and 53 (Item 2). This reconfiguration allows removal of systems and equipment while maintaining a contiguous, contained RCA with negative-air ventilation.

- ***Remove systems and equipment from wet pit area (Figure 5-3, Item 3)*** - Remove the primary source of SSSB contamination while maintaining a contained and negative-air RCA. This includes racks and stands in the Wet pit, dry pit equipment and clean house equipment. The forward and aft 5-ton platforms crane will be re-certified and used for removal of items in the wet pit. The wet pit water, and metal parts and other solids below the water line within the containment will be removed after the racks and stands are removed from the wet pit.

- ***Remove Pump Room systems and equipment (Figure 5-3, Item 4)*** - These systems and equipment were used to recirculate and purify the wet pit water. This includes filters, heat exchanger, ion exchangers, pumps, and piping. The Pump Room actually encompasses a group of rooms located on three deck levels, one above the other. The systems and equipment in these rooms will be removed through hatch covers, progressing from the top down. Pump Room systems and equipment will be placed into contamination control bags and lifted directly into IMCs located in a designated Waste Handling and Storage Area or into IP-1 bags positioned on the conveyance on the dock for shipment.

- ***Remove forward portions of SSSB as LLRW (Figure 5-4, Items 5 and 7)*** - This includes the Machine Shop, Fan Room Number 1, Ballast Tank #4 Centerline as well as Port Wing Tank #4 and Starboard Wing Tank #4. These structures are removed in large sections using the Goliath or gantry cranes and placed on the dock and covered with the CS for further sizing and placement into IMCs for disposal as LLRW. Approximate locations of the cut lines are shown in Figure 5-3. The cut lines will be surveyed and radiologically evaluated prior to cutting with appropriate radiological controls established to prevent release of radiological material. The survey methodology will be consistent with our radiological program including a plan, survey, and report. Upon approval from the APTIM Certified Health Physicist (CHP), the Project Radiation Safety Officer (PRSO), and/or project radiological safety team, each section will be cut using oxy/gas torches. Prior to the final stage of cutting, the section will be connected to the crane. Once the section is cut free, the crane will lift the section to the dock and set it on cribbing. The CS will then be moved on rails and positioned over the section. The CS will be closed and HEPA-filtered ventilation will be connected to the CS to provide a negative-air enclosure. The section will be sized to fit into IMCs within the negative-air CS using conventional metal cutting methods (i.e., torches and saws) A mobile crane, telescoping forklift, and manlifts will be deployed in the CS as required.

- ***Remove and free release forward Ballast Tank #3 (Figure 5-4, Item 6)*** – Based on characterization data showing limited if any contamination, Ballast Tank #3 Centerline as well as Port Wing Tank #3 and Starboard Wing Tank #3, and the void adjacent to tank #3 are likely candidates for unrestricted release. MARSAME surveys will be planned and conducted on this forward end section of the SSSB in accordance with a materials categorization, survey and release plan. These sections will be cut and removed away from SSSB using the Goliath crane and placed on the dock in an uncontrolled area for “chunking” into 20-square-foot sections (typical) which will eventually be loading into barges for shipment to a scrap metal dealer.

- ***Build/install a temporary cover in clean house (Figure 5-5, Item 8)*** – This air-tight cover will have enlarged hatch openings that allow full access to the entire perimeter of the wet pit for rigging/lifting of large, heavy blocks of shielding concrete with the overhead gantry or Goliath cranes.

- ***Remove portion of clean house above the temporary cover (Figure 5-5, Item 9).*** Once the temporary cover is installed, the top portion of the clean house above the cover will be removed to provide clear access for removal of the wet pit shielding concrete. This top structure will be removed in one or more large sections using the Goliath or gantry cranes and placed on the dock and covered with the CS for further sizing and placement into IMCs for disposal as LLRW. Approximate location of the upper clean house cut line is shown in Figure 5-5. The cut line will be surveyed and radiologically evaluated prior to cutting with appropriate radiological controls established to prevent release of radiological material. The cutline will be surveyed in accordance with our radiological program. Upon approval from the project radiological safety team, each section will be cut using oxy/gas torches. Prior to the final stage of cutting, the section will be connected to the crane. Once the section is cut free, the crane will lift the section to the dock and set it on cribbing. The CS will then be moved on rails and positioned over the section. The CS will be closed and HEPA-filtered ventilation will be connected to the CS to provide a negative-air enclosure. The section will be sized to fit into IMCs within the negative-air containment using conventional metal cutting methods (i.e., torches and saws). A mobile crane, telescoping forklift, and manlifts will be deployed in the containment as required. Figure 5-14 shows the upper clean house within the CS.

- ***Remove the wet pit concrete shielding (Figure 5-5, Item 10)*** – Characterization data for the concrete shielding is not available. However, the wet pit concrete shielding may be contaminated due to known leaks in the wet pit liner. The leaks were relatively low in elevation, but any contamination carried by the water may have migrated higher in the concrete due to the hydrostatic head provided by the water inside the wet pit. In order to prevent release of any potentially contaminated material, the wet pit concrete shielding will be removed in a controlled fashion by wire sawing, using the bottom portion of the clean house and the SSSB outer hull as containment, and disposed of as LLRW. The concrete shielding will be cut into blocks and lifted out of the SSSB through openings in the temporary top cover. The blocks will be placed in contamination control bags for the lift and then into IP-1 bags positioned on the conveyance on the dock for shipment.

- ***Remove aft portions of SSSB as LLRW (Figure 5-6, Items 11 and 13)*** - This includes the HCS, Fan Room Number 2, Ballast Tank #8 Centerline as well as Port Wing Tank #8 and Starboard Wing Tank #8. These structures are removed in large sections using the Goliath or gantry cranes and placed on the dock and covered with the CS for further sizing and placement into IMCs for disposal as LLRW. Approximate locations of the cut lines are shown in Figure 5-5. The cut lines will be surveyed and radiologically evaluated prior to cutting with appropriate radiological controls established to prevent release of radiological material. Upon approval from the project radiological safety team, each, each section will be cut using oxy/gas torches. Prior to the final stage of cutting, the section will be connected to the crane. Once the section is cut free, the crane will lift the section to the dock and set it on cribbing. The CS will then be moved on rails and positioned over the section. The CS

will be closed and HEPA-filtered ventilation will be connected to the CS to provide a negative-air enclosure. The section will be sized to fit into IMCs within the negative-air CS using conventional metal cutting methods (i.e. torches and saws) A mobile crane, telescoping forklift, and manlifts will be deployed in the CS as required.

- ***Remove and free release aft Ballast Tank #9 (Figure 5-6, Item 12)*** – Based on characterization data showing limited if any contamination, Ballast Tank #9 Centerline as well as Port Wing Tank #9 and Starboard Wing Tank #9 are likely candidates for unrestricted release. MARSAME surveys will be planned and conducted on this forward end section of the SSSB in accordance with a materials categorization, survey, and release plan. a release These sections will be cut and removed away from SSSB using the Goliath crane and placed on the dock in an uncontrolled area for “chunking” into 20-square-foot sections (typical) which will eventually be loading into barges for shipment to a scrap metal dealer.

- ***Move CS to cover and contain remaining portion of SSSB (Figure 5-7)*** - After the shielding concrete and aft structure are removed, the CS will be moved on tracks to the east to cover the remainder of the SSSB in order to size it for disposal as LLRW. This consists of Frames 53 – 62.

- ***Size remaining portion of SSSB within the CS (Figures 5-8 and 5-9)*** - The remaining portion of the SSSB is shown within the relocated CS in elevation and plan views in Figures 5-8 and 5-9. The CS will be closed and HEPA-filtered ventilation will be connected to the CS to provide a negative-air enclosure. The section will be sized to fit into IMCs within the negative-air CS using conventional metal cutting methods (i.e. torches and saws) A mobile crane, telescoping forklift, and manlifts will be deployed in the CS as required. The SSSB may be cut into multiple smaller subsections within the CS in order to allow multiple crews to work in parallel in order to expedite schedule. The CS may be temporarily opened to allow use of the Goliath or gantry cranes to move the large cut sections of the SSSB within the footprint of the CS to allow simultaneous access to each section by multiple crews. Then the CS would be closed to allow further sizing of the subsections.

Figure 5-7
SSSB Decommissioning Sequence – Containment Structure Moved Over Remainder of SSSB

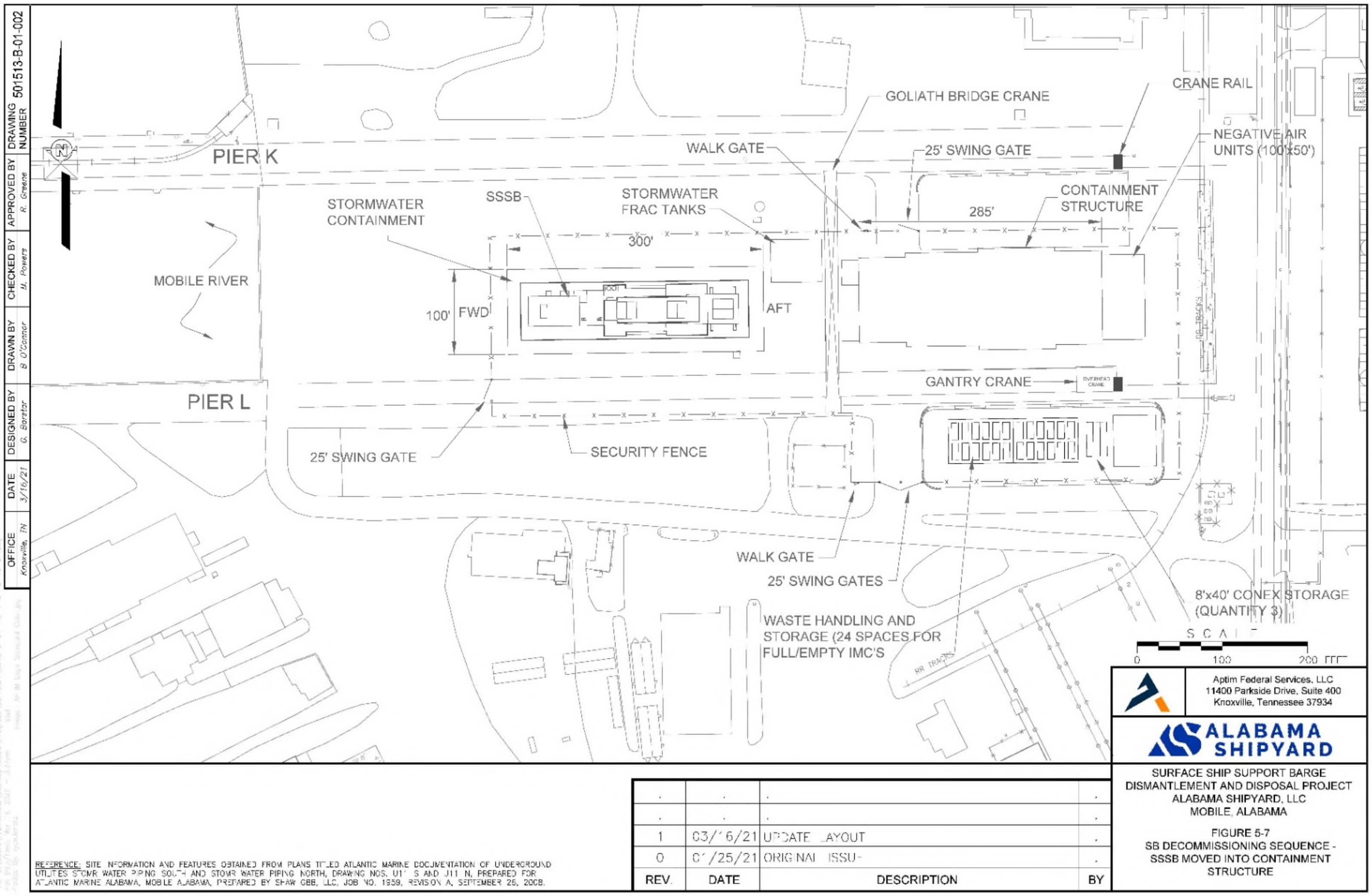


Figure 5-8
SSSB Decommissioning Sequence – Containment Structure Moved Over Remainder of SSSB, Elevation View

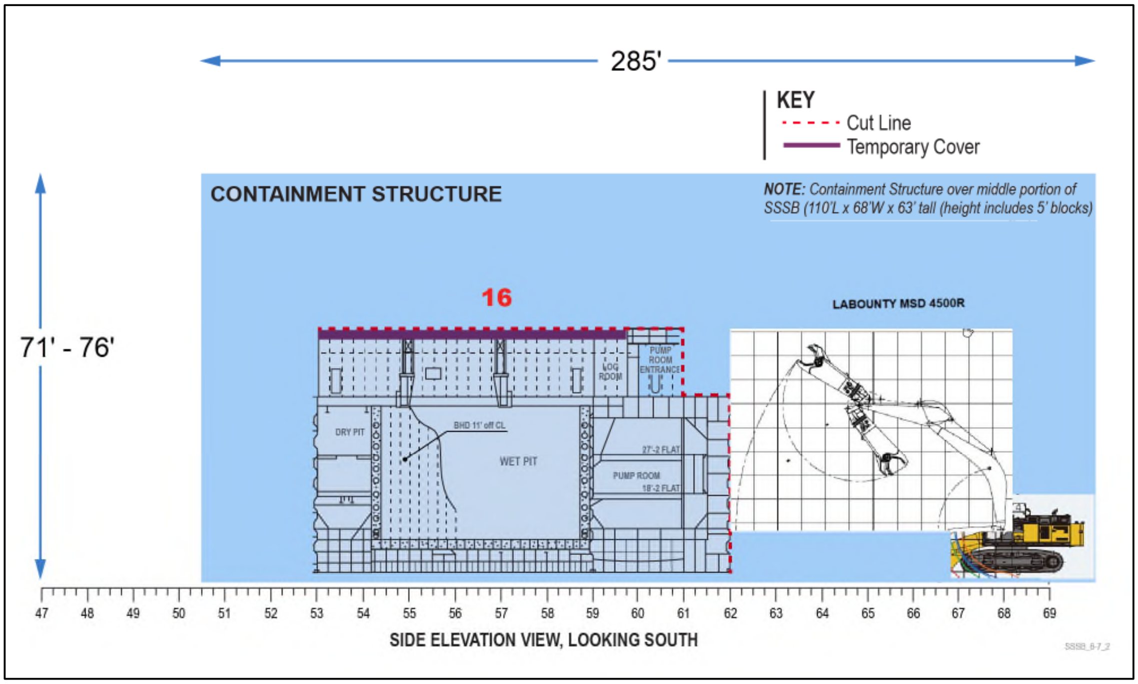
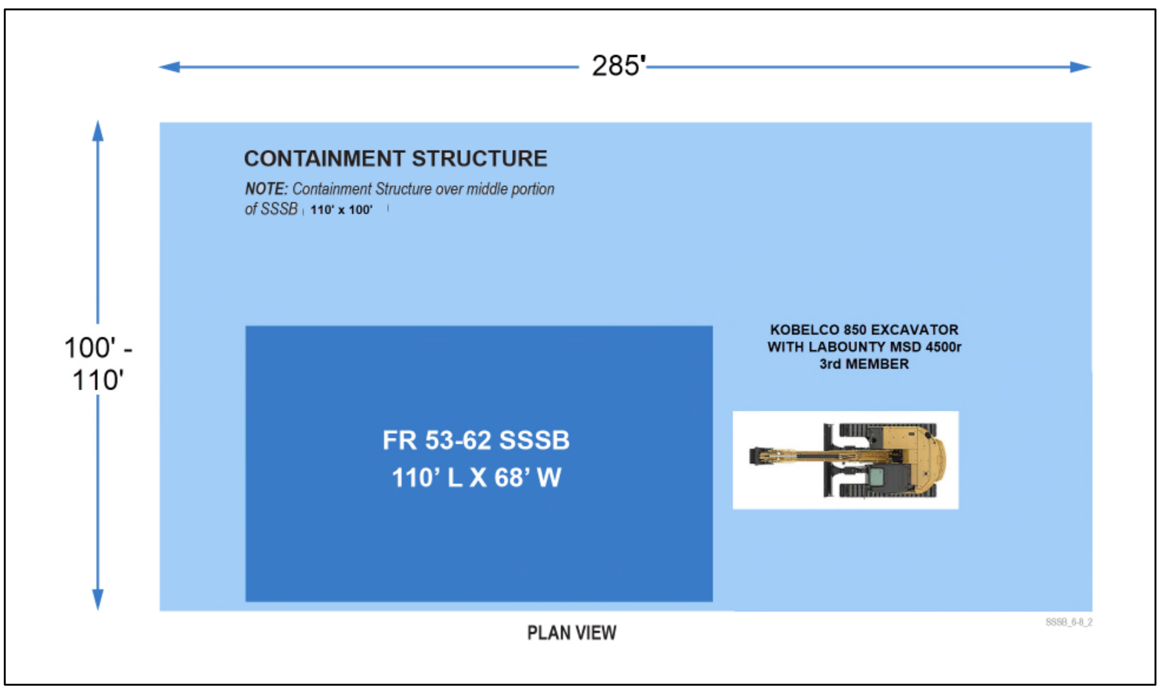


Figure 5-9
SSSB Decommissioning Sequence – Containment Structure Moved Over Remainder of SSSB, Plan View



5.1 Contaminated Structures

The entire SSSB will be disposed as either radioactive waste or released for unrestricted use, as shown in Table 5-1.

Table 5-1
Structural Area Use/Fate/Disposition

Area	Radiological Status	Contamination Potential	RCA	Use/Fate During Decommissioning	Anticipated Disposition
Upper Deck					
Heavy Component Shop (<2m)	Impacted	N/A	Yes	Waste Packaging	RW
Heavy Component Shop Overhead (>2m)	Impacted	N/A	Yes	Waste Packaging	RW
Casualty Control Station	Not Impacted	N/A	No	PPE/Supplies Storage	RW
Guard House/ Vestibule	Not Impacted	N/A	No	Access to Change Room	RW
Change Room/ Restroom	Potentially Impacted	N/A	No	Reduce Size, use as Change Room	RW
Anti-C Removal Area (Control Point)	Impacted	N/A	Yes	Move inboard, use as Control Point	RW
Fan Room 2	Potentially Impacted	N/A	No	Cooling/ventilation	RW
Dirty Tunnel	Impacted	N/A	Yes	Access to wet pit	RW
Clean Tunnel	Not Impacted	N/A	No	Clean access	RW
Clean House (<2m)	Impacted	N/A	Yes	Containment for cleaning/removing wet pit	RW
Clean House Overhead (>2m)	Impacted	N/A	Yes	Containment for cleaning/removing wet pit	RW
Log Room	Not Impacted	N/A	No	N/A	RW
Counting Room	Impacted	N/A	No	N/A	RW
Main Pump Room Entrance	Impacted	N/A	As Req’d	Access to Pump Room	RW
Auxiliary Pump Room Entrance	Potentially Impacted	N/A	As Req’d	Access to Aux. Pump Room	RW
Fan Room 1	Potentially Impacted	N/A	No	Cooling/ventilation	RW
Machine Shop (Re-purposed) (<2m)	Impacted	N/A	No	Crew break room (initially)	RW
Machine Shop Overhead (>2m)	Impacted	N/A	No	Crew break room (initially)	RW
Upper Deck Exterior	Not Impacted	N/A	No	Clean access	RW

Area	Radiological Status	Contamination Potential	RCA	Use/Fate During Decommissioning	Anticipated Disposition
Below Upper Deck					
Port Wing Tank 3	Not Impacted	Class 2	No	N/A	Unrestricted release
Port Wing Tanks 4, 5, 8, 9	Not Impacted	Class 2	No	N/A	RW (Tanks 4, 5, 8); Unrestricted release (Tank 9)
Port Wing Tanks 6, 7	Potentially Impacted	N/A	Yes	N/A	RW
Starboard Wing Tank 3	Not Impacted	Class 2	No	N/A	Unrestricted release
Starboard Wing Tanks 4, 5, 6, 7, 9	Not Impacted	Class 2	No	N/A	RW (Tanks 4-7); Unrestricted release (Tank 9)
Starboard Wing Tank 8	Impacted	N/A	Yes	N/A	RW
Centerline Tank 3	Not Impacted	Class 2	No	N/A	Unrestricted release
Centerline Tank 4	Impacted	N/A	Yes	N/A	RW
Centerline Tank 8	Potentially Impacted	N/A	Yes	N/A	RW
Centerline Tank 9	Potentially Impacted	Class 2	Yes	N/A	Unrestricted release
Wet Pit	Impacted	N/A	Yes	N/A	RW
Dry Pit	Impacted	N/A	Yes	N/A	RW
Port Wet Pit Voids (Aft & Forward)	Impacted	N/A	Yes	N/A	RW
Starboard Wet Pit Voids (Aft & Forward)	Impacted	N/A	Yes	N/A	RW
Port Wing Voids 4, 5, 6, 7	Potentially Impacted	N/A	Yes	N/A	RW
Starboard Wing Voids 4, 5, 6, 7	Potentially Impacted	N/A	Yes	N/A	RW
Centerline Tank 3 Void	Potentially Impacted	Class 2	Yes	N/A	Unrestricted release
Main Pump Room Operating Level	Impacted	N/A	Yes	Containment for equipment removal	RW
Main Pump Room Lower	Impacted	N/A	Yes	Containment for equipment removal	RW
Auxiliary Pump Room Operating Level	Potentially Impacted	N/A	Yes	Containment for equipment removal	RW

Area	Radiological Status	Contamination Potential	RCA	Use/Fate During Decommissioning	Anticipated Disposition
Auxiliary Pump Room Lower	Potentially Impacted	N/A	Yes	Containment for equipment removal	RW
Laundry Drain Tank	Impacted	N/A	Yes	N/A	RW
Laundry Drain Tank Void (Port & Starboard)	Potentially Impacted	N/A	Yes	N/A	RW
Hull Exterior	Not Impacted	Class 2	No	Containment	RW & Unrestricted release

PPE – personal protective equipment.
RCA – radiologically controlled area.
RW – radioactive waste.

5.1.1 Heavy Component Shop

The HCS will ultimately be disposed of as LLRW. It will be cut free of the SSSB, lifted to the dock, and sized within the CS for placement into IMCs for transport to the disposal facility.

During initial decommissioning the HCS will be used as a negative-air RCA to package systems and equipment from the wet pit, dry pit, and clean house for removal from the SSSB as LLRW in IMCs. This will be accomplished by reconditioning the HCS hatch and making openings for IMC movement through bulkheads at Frames 51 and 53. This reconfiguration allows removal of systems and equipment while maintaining a contiguous, contained RCA with negative-air ventilation.

After packaging of systems and equipment is complete, the HCS structure will be cut free from the upper deck and lifted into the CS where it will be sized and placed into IMCs in a negative-air enclosure. First the HCS will be completely emptied of equipment during initial decommissioning. After packaging of systems and equipment is complete, the existing SSSB ventilation system operation will be terminated. Portable HEPA filter ventilation units and HEPA vacuums will be used to collect any fumes and debris this is generated during final preparations for removal of the HCS from the SSSB. Any remaining system ductwork and piping will have openings plugged, capped, or covered with poly sheeting and taped.

The anticipated HCS cut lines are shown in Figure 5-6. The HCS vertical cut line at Frame 51 will be just aft of the transverse bulkhead at that location, which will leave a water-tight barrier behind on SSSB. The cut lines will be surveyed and radiologically evaluated prior to cutting with appropriate radiological controls established to prevent release of radiological material. Upon

approval from the project radiological safety team, the HCS will be cut free using oxy/gas torches. Prior to the final stage of cutting, the section will be connected to the crane. Once the section is cut free, the crane will lift the section to the dock and set it on cribbing. The CS will then be positioned over the HCS. The containment will be closed and HEPA-filtered ventilation will be connected to the containment to provide a negative-air enclosure. The section will be sized to fit into IMCs within the negative-air containment using conventional metal cutting methods (i.e., torches and saws) A mobile crane, telescoping forklift, and manlifts will be deployed in the containment as required.

5.1.2 Casualty Control Station, Guardhouse/Vestibule, Change Room/Restroom, Anti-C Removal Area (Control Point), Fan Room 2

These rooms will ultimately be disposed of as LLRW subsequent to their use during initial decommissioning. They will be cut free of the SSSB, lifted to the dock, and sized within the CS for placement into IMCs for transport to the disposal facility. They will be removed in as a single unit in combination with Fan Room 2, which is located directly above these rooms.

During initial decommissioning this area will be used as a change room to don and doff Anti-C clothing and control point for entering and exiting contaminated or potentially contaminated areas including the clean house, dirty tunnel, HCS, and Pump Rooms. The area will be reconfigured prior to the start of decommissioning to allow movement of IMCs and other large items from the clean house and wet pit to the HCS for packaging and removal from SSSB. Figures 5-10 and 5-11 illustrate the current configuration and the reconfigured area, respectively. Items removed during reconfiguration will be staged in the HCS for removal as LLRW. Portable restroom and handwash facilities will be provided near the vestibule on the outer upper deck during decommissioning.

Figure 5-10
Existing Casualty Control Station and Change Room

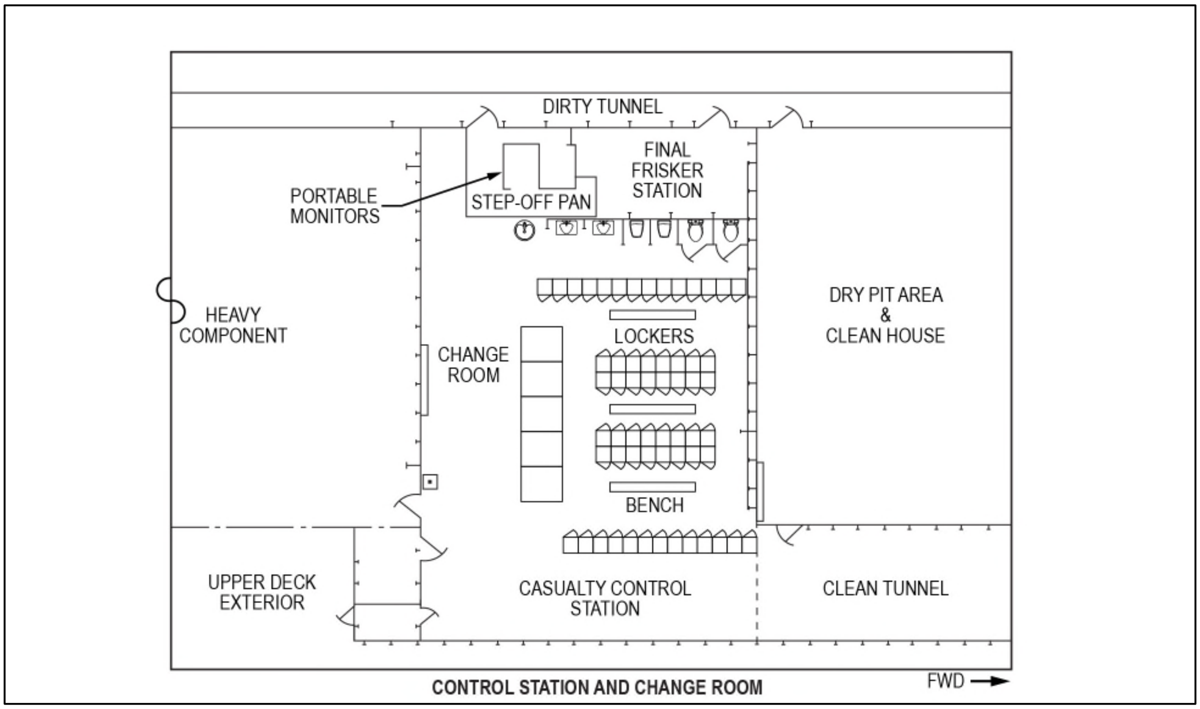
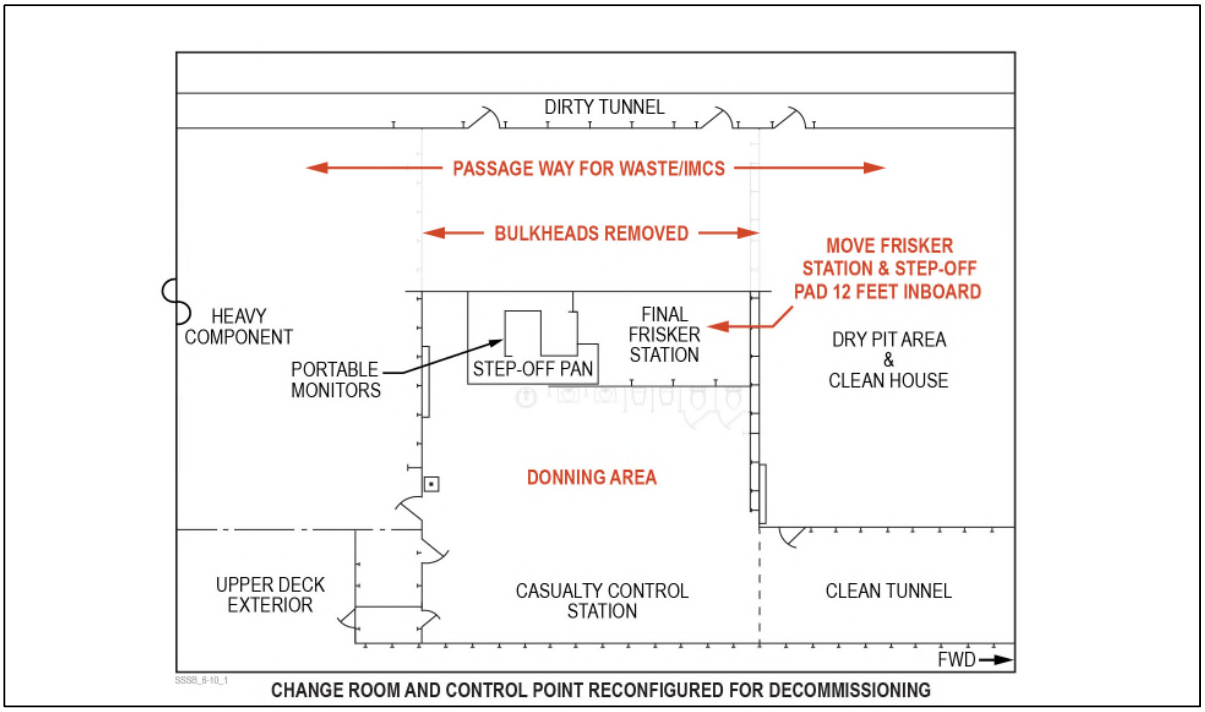


Figure 5-11
Change Room and Control Point Reconfigured for Decommissioning



After packaging of systems and equipment is complete and removal of the wet pit shielding is partially complete, the change room and control point will be moved to the Pump Room Entrance location on the forward upper deck. Negative-air equipment will be replaced with temporary equipment located on the outer upper deck allowing Fan Room 2 to be shut down. At this time the structure will be cut free from the upper deck and lifted into the CS where it will be sized and placed into IMCs in a negative-air enclosure. Fan Room 2, situated immediately above this area, will be removed at the same time. First the CCS, change room, and Fan Room 2 will be completely emptied of loose items and equipment. Permanently mounted ductwork and ventilation equipment will remain in place. Portable HEPA filter ventilation units and HEPA vacuums will be used to collect any debris that is generated during final preparations for removal of the HCS from the SSSB. Any remaining system ductwork and piping will have openings plugged, capped, or covered with poly sheeting and taped.

The anticipated cut lines for this area are shown in Figure 5-6. The vertical cut line at Frame 53 will be just aft of the transverse bulkhead at that location. That will leave a water-tight barrier behind on SSSB. The cut lines will be surveyed and radiologically evaluated prior to cutting with appropriate radiological controls established to prevent release of radiological material. Upon approval from the project radiological safety team, the section of rooms will be cut free using oxy/gas torches. Prior to the final stage of cutting, the section will be connected to the crane. Once the section is cut free, the crane will lift the section to the dock and set it on cribbing. The CS will then be positioned over the section of rooms. The containment will be closed, and HEPA-filtered ventilation will be connected to the containment to provide a negative-air enclosure. The section will be sized to fit into IMCs within the negative-air containment using conventional metal cutting methods (i.e., torches and saws) A mobile crane, telescoping forklift, and manlifts will be deployed in the containment as required.

5.1.3 Dirty Tunnel and Clean Tunnel

The Dirty and Clean Tunnels will ultimately be disposed of as LLRW after their use as access ways during initial decommissioning. They are almost entirely within the middle portion (Frames 53 to 62) of the SSSB which will remain intact until the final stage of decommissioning when the CS will be relocated to provide containment. At that time the dirty and clean tunnel structure will be sized and placed into IMCs for disposal as LLRW. The relatively short and narrow sections of clean and dirty tunnel aft of Frame 53 or forward of Frame 62 will be cut and lifted to the dock, along with the adjacent rooms, and sized within the CS for placement into IMCs for transport to the disposal facility.

5.1.4 Clean House

The clean house will be removed in two stages. The first stage will be removal of the upper portion, in order to provide a clear path for removal of the wet pit concrete shielding. The second stage will removal of the lower portion, which will occur late in the decommissioning, after the CS is positioned over the midsection of the SSSB.

5.1.4.1 Install Temporary Cover

This air-tight cover will have enlarged hatch openings that allow full access to the entire perimeter of the wet pit for rigging/lifting of large, heavy blocks of shielding concrete with the overhead gantry or Goliath cranes. It will be installed just below the 5-ton platform crane rails at elevation 60 feet above baseline (ABL). Figures 5-12 and 5-13 provide a plan view of the wet pit shielding concrete and a depiction of the temporary cover, respectively. The cover will be made by spanning the clean house port to starboard with W14X61, or equivalent, trusses. The openings between the trusses will have removable covers constructed of ¼-inch steel plate with appropriate stiffeners. The construction will include raised combings to prevent rainwater from leaking in. The covers will be stackable. During typical operation only one cover at a time will be removed for rigging and removal of blocks of concrete shielding.

5.1.4.2 Remove Upper Clean House

Once the temporary cover is installed the top portion of the clean house above the cover will be removed to provide clear access for removal of the wet pit shielding concrete. This structure is removed in one or more large sections using the Goliath or gantry cranes and placed on the dock and covered with the CS for further sizing and placement into IMCs for disposal as LLRW. Approximate location of the upper clean house cut line is shown in Figure 5-5. The cut line will be surveyed and radiologically evaluated prior to cutting with appropriate radiological controls established to prevent release of radiological material. Upon approval from the project radiological safety team, each section will be cut using oxy/gas torches. Prior to the final stage of cutting, the section will be connected to the crane. Once the section is cut free, the crane will lift the section to the dock and set it on cribbing. The CS will then be moved on rails and positioned over the section. Figure 5-14 provides an elevation view of the upper clean house section in the CS. The containment will be sealed and HEPA-filtered ventilation will be connected to the containment to provide a negative-air enclosure. The section will be sized to fit into IMCs within the negative-air containment using conventional metal cutting methods (i.e., torches and saws). A mobile crane, telescoping forklift, and manlifts will be deployed in the containment as required.

Figure 5-12
Wet Pit Shielding Dimensions – Plan View

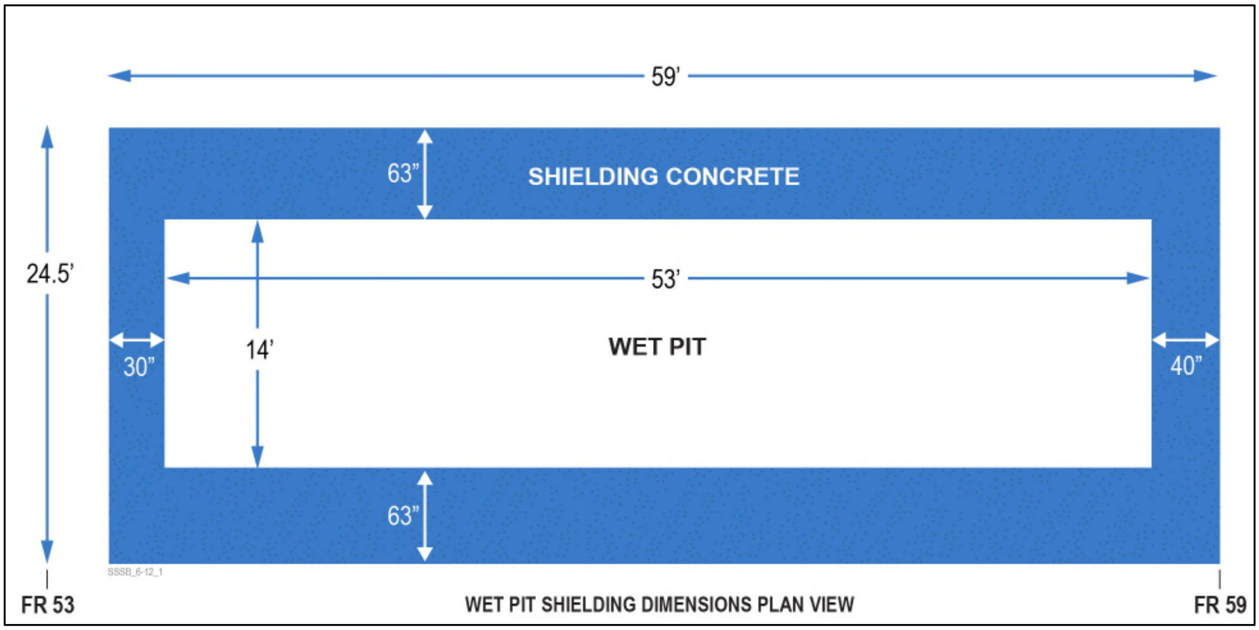


Figure 5-13
Temporary Cover Over Wet Pit – Elevation 56 feet ABL

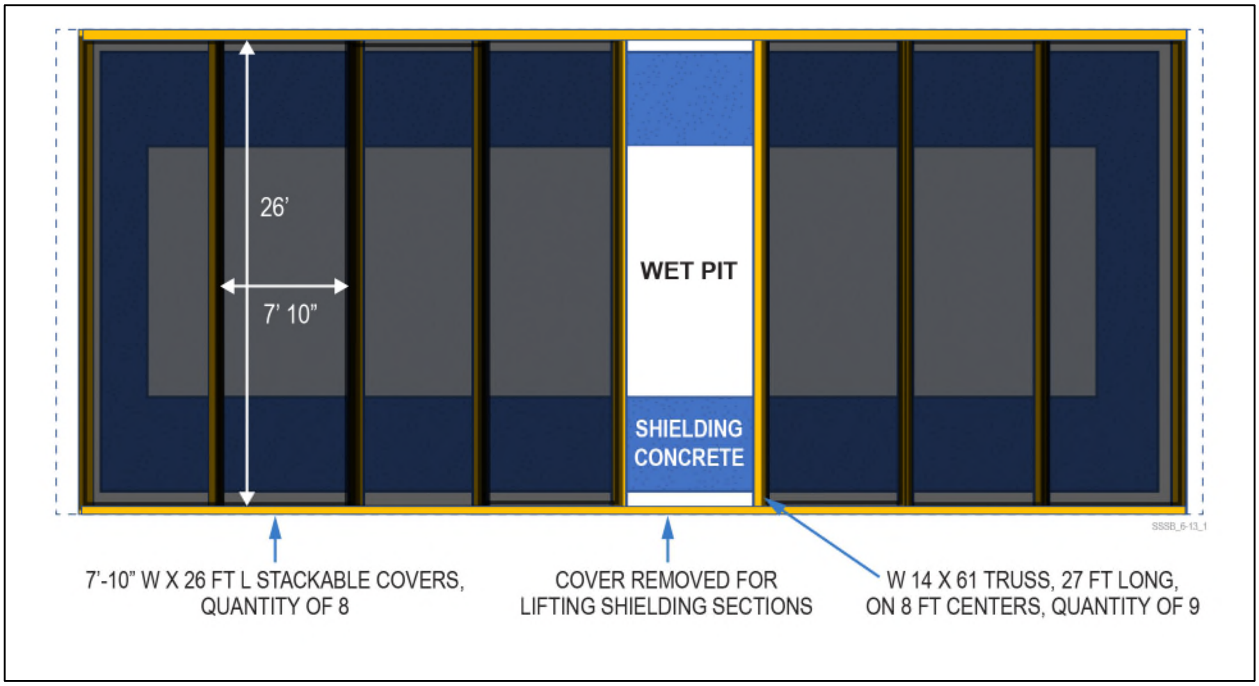
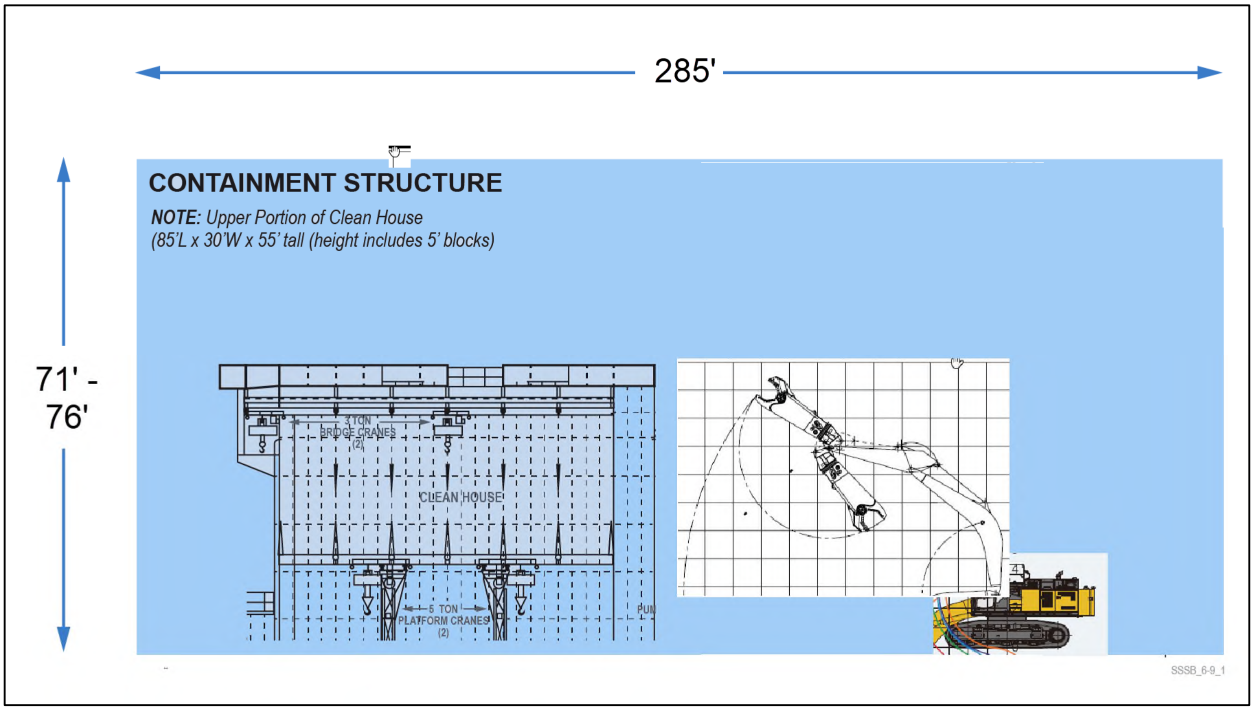


Figure 5-14
Upper Clean House in Containment Structure



5.1.5 Log Room, Counting Room, Main Pump Room Entrance, Auxiliary Pump Room Entrance

These rooms will ultimately be disposed of as LLRW after their use as access ways during initial decommissioning. They are entirely within the middle portion (Frames 53 to 62) of the SSSB which will remain intact until the final stage of decommissioning when the CS will be relocated to provide containment. At that time these structures will be sized and placed into IMCs for disposal as LLRW.

5.1.6 Fan Room 1 and Offices

These rooms will be disposed of as LLRW after their use during initial decommissioning. They will be cut free of the SSSB, lifted to the dock, and sized within the CS for placement into IMCs for transport to the disposal facility. They will be removed as a single unit in combination with Fan Room 1, which is located directly above the offices.

5.1.7 Machine Shop

The Machine Shop will be disposed of as LLRW after its use during initial decommissioning. The Machine Shop will be cut free of the SSSB, lifted to the dock, and sized within the CS for placement into IMCs for transport to the disposal facility.

5.1.8 Ballast Tank 3 Centerline, Port Wing Tank 3, Starboard Wing Tank 3, No. 3 Void, Ballast Tank 9 Centerline, Port Wing Tank 9, Starboard Wing Tank 9

Based on available data showing limited if any contamination, these tanks are likely candidates for unrestricted release. Surveys will be planned and conducted on this forward end section of the SSSB in accordance with a materials categorization, survey and release plan. Once these sections have been surveyed and verified to be released for unrestricted use they will be cut and removed away from SSSB using the Goliath crane and placed on the dock in an uncontrolled area for "chunking" into 20-square-foot sections (typical) which will eventually be loading into barges for shipment to a scrap metal dealer. The forward tank cut lines will be forward of the transverse bulkhead at Frame 65 and the aft tank cut lines will be aft of the transverse bulkhead at Frame 50. This will allow the bulkhead to be sealed and remain behind on SSSB as a containment and weather barrier.

It is expected that these tanks will be meet the unrestricted release criterion with little or no cleaning. As such the plan is to cut these tanks free from the SSSB after survey and release and move them to a free release area where they will be cut into smaller pieces. However, if required they may be decontaminated and re-surveyed. Decontamination will consist of wiping down using cleaning solution, manual brushing and scraping, or more aggressive methods using power tools such as abrasive wheels or scarifiers if necessary. Power tools will be equipped with shrouds having HEPA vacuum attachments to prevent the spread of contamination. Containments and local area HEPA filters will also be used to capture any dust that escapes the tool shroud area. Alternately, a decision may be made to dispose of these tanks as LLRW. If that decision is reached, the tanks will be treated in the same manner as the other large LLRW structures (e.g., upper clean house) that are cut away from the SSSB.

5.1.9 Ballast Tank 4 Centerline, Port Wing Tank 4, Starboard Wing Tank 4, Wing Tank 4 Voids, Ballast Tank 8 Centerline, Port Wing Tank 8, Starboard Wing Tank 8

These tanks will be cut free from the SSSB, moved to the CS, sized, and disposed of as LLRW. These structures will be removed in one or more large sections using the Goliath or gantry cranes and placed on the dock and covered with the CS for further sizing and placement into IMCs for disposal as LLRW. Approximate locations of the cut lines for these sections are shown in Figures 5-4 and 5-6. The cut lines will be surveyed and radiologically evaluated prior to cutting with appropriate radiological controls established to prevent release of radiological material. Upon approval from the project radiological safety team, each section will be cut using oxy/gas

torches. Prior to the final stage of cutting, the section will be connected to the crane. Once the section is cut free, the crane will lift the section to the dock and set it on cribbing. The CS will then be moved on rails and positioned over the section. The containment will be sealed, and HEPA-filtered ventilation will be connected to the containment to provide a negative-air enclosure. The section will be sized to fit into IMCs within the negative-air containment using conventional metal cutting methods (i.e., torches and saws) A mobile crane, telescoping forklift, and manlifts will be deployed in the containment as required.

5.1.10 Wet Pit

Once the wet pit has been de-inventoried of process equipment, the approximately 18 inches of residual water (~8,000 gallons) remaining in the wet pit will be removed. Then the wet pit stainless-steel liner and concrete shielding will be removed and disposed as LLRW.

5.1.10.1 Water Removal

The nominal 18 inches of residual water will be re-circulated and filtered in order to remove suspended solids. Solids will also be “vacuumed” off the bottom of the wet pit during this work evolution. The filtration process will be monitored closely to ensure exposure rates do not adversely affect the shipping container or the disposal process requirements. If necessary, particulate filter changeouts can be made to limit the accumulation of elevated radiation levels on separations media.

After visible cleanliness is achieved, the remaining contaminated wet pit liquids will be processed through the temporary liquid waste transfer system described in Section 4.3 of the SSSB D&D project Request for Proposal (two demineralizers, one portable holding tank, pumps, piping, tubing, and valves to transfer liquid from the wet pit off-hull, perform recirculation, and sample the liquid). This will further reduce the radioactive inventory in the floor of the wet pit. Once a suitable radiation level is reached (calculated in a waste loading plan for the solidification of contaminated liquids), the liquids will be stabilized for disposal as solid LLRW, and the remainder of the water processing equipment prepared for disposal. Alternately, the water will be removed from the wet pit as a liquid and pumped into tank trucks for disposal at a properly licensed facility.

If the ion exchange media from the temporary system require additional radiation protection engineering controls to dewater and stabilize, APTIM will either set up a processing/packaging area designed to contain the media or re-locate that portion of the waste packaging to an NRC licensed nuclear service facility to complete packaging and shipment for disposal. Once the wet

pit cavity has been cleaned and equipment removed, the walls and floors will be sealed prior to sizing and removal. These sections then be loaded out as radioactive waste

5.1.10.2 Wet Pit Liner and Concrete Shielding Removal

Once the temporary cover is installed and the top portion of the clean house above the cover removed, clear access will be available for removal of the wet pit liner and shielding concrete. This will occur only after the storage racks and water have been removed from the wet pit. The wet pit liner will also undergo a gross decontamination prior to cutting and removal of the liner and concrete shielding. In order to prevent release of any potentially remaining contaminated material, the wet pit concrete shielding will be removed in a controlled fashion by wire sawing, using the bottom portion of the clean house as a negative-air containment, and disposed of as LLRW. The concrete shielding will be cut into blocks and lifted out of the SSSB through openings in the temporary top cover. The blocks will be placed in contamination control bags for the lift and then into IP-1 bags positioned on the conveyance on the dock for shipment. Figures 5-15, 5-16, and 5-17 show the cutting plan for the ends, sides, and bottom, respectively, of the wet pit liner and shielding concrete. There are a total of 104 blocks planned, nominally weighing from 19.8 to 31.2 tons.

The wire saw provides a low energy means of sizing the wet pit liner and shielding concrete, minimizing the potential for spread of contamination. The sawing is done with application of water at the cutting surface which provides cooling and minimizes airborne particulate emission. A containment is built to collect the cutting water. The collected water is then filtered and recirculated to the cutting surface. A small containment is also built around the wire saw pully drive apparatus to collect any debris coming off the wire. A local area HEPA ventilation hose is positioned near the work to further contain any emissions. At intervals during cutting and at the conclusion of the cut, a HEPA vacuum will be used to clean up any debris.

Figure 5-15
Wet Pit Shielding Cut Plan, Forward and Aft Ends - Elevation View

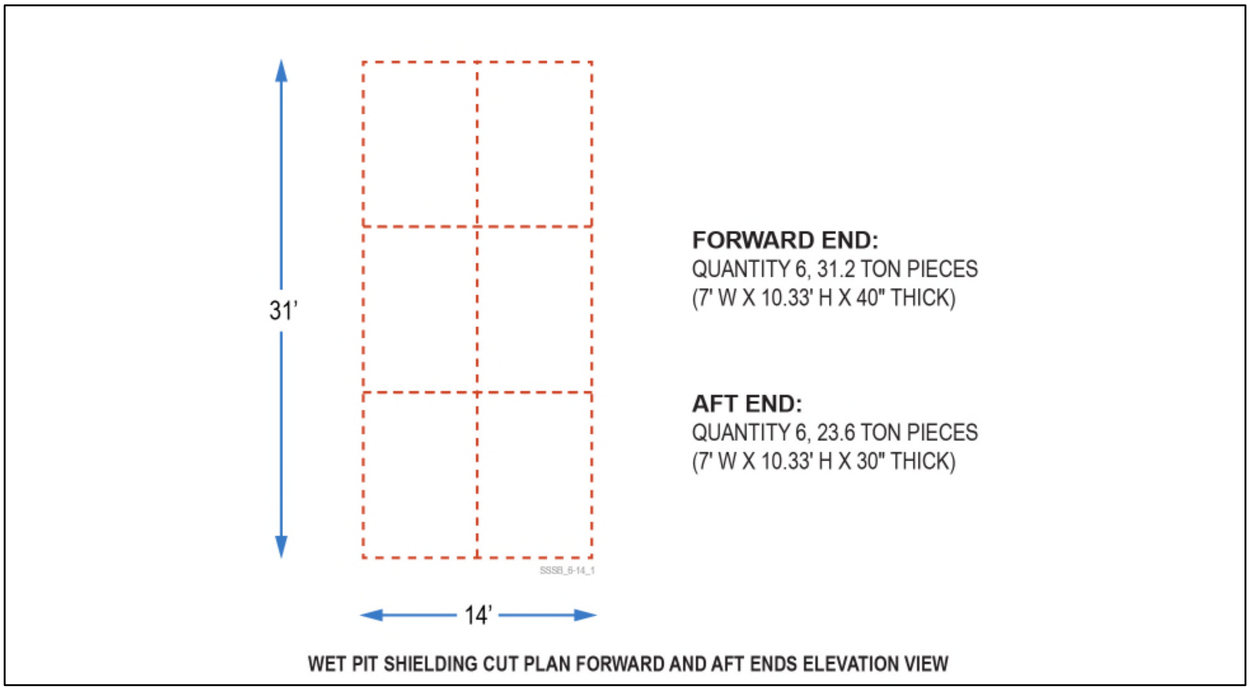


Figure 5-16
Wet Pit Shielding Cut Plan, Sides - Elevation View

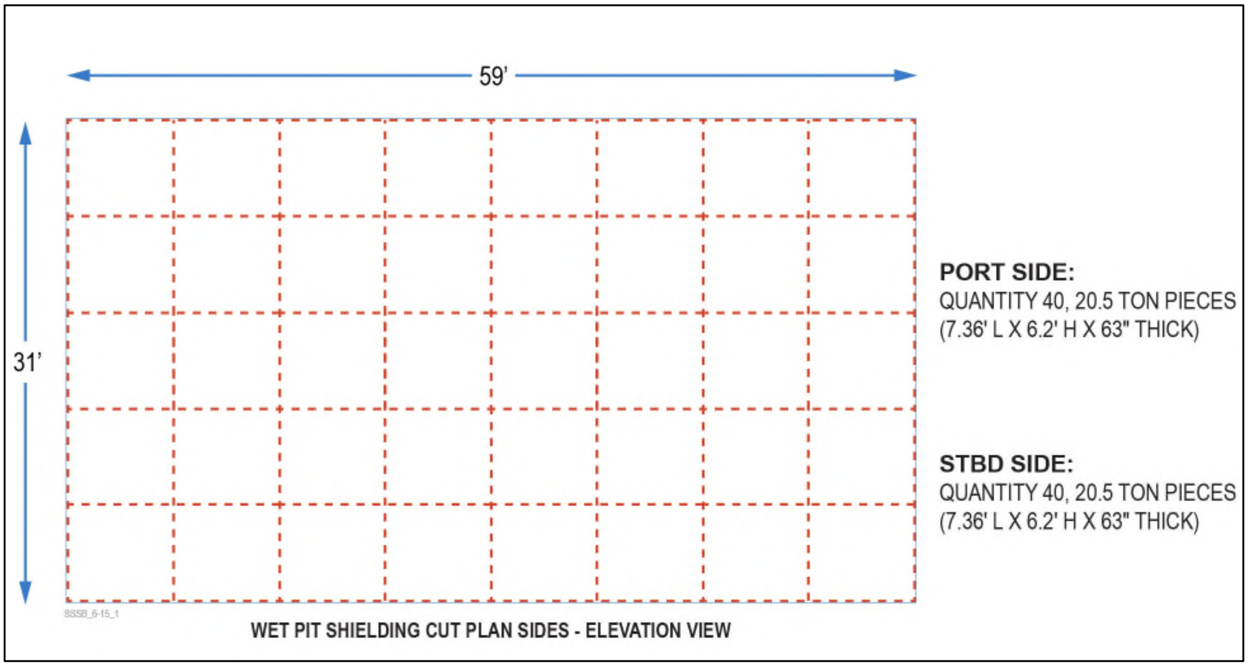
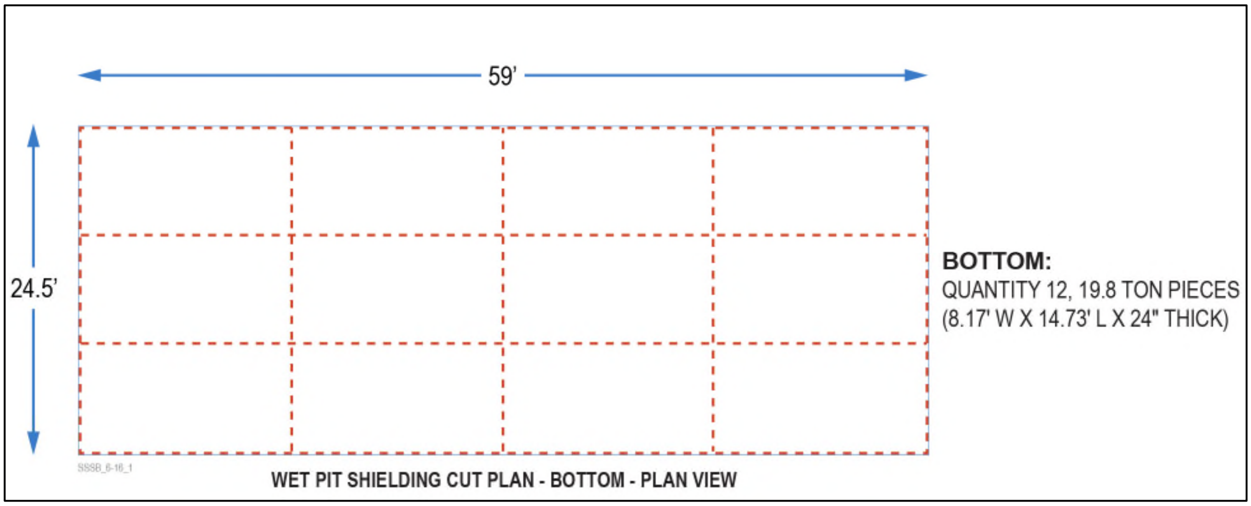


Figure 5-17
Wet Pit Shielding Cut Plan, Bottom- Plan View



5.1.11 Dry Pit

The dry pit will ultimately be disposed of as LLRW after removal of equipment and components during initial decommissioning. The dry pit is within the middle portion (Frames 53 to 62) of the SSSB which will remain intact until the final stage of decommissioning when the CS will be relocated to provide containment. At that time the dry pit will be sized and placed into IMCs for disposal as LLRW.

5.1.12 Wet Pit Voids, Wing Tanks 5, 6 & 7, and Wing Tank Voids 5, 6 & 7

These tanks will ultimately be disposed of as LLRW. They are within the middle portion (Frames 53 to 62) of the SSSB which will remain intact until the final stage of decommissioning when the CS will be relocated to provide containment. At that time the tanks will be sized and placed into IMCs for disposal as LLRW.

5.1.13 Main and Auxiliary Pump Rooms

These rooms will ultimately be disposed of as LLRW after removal of equipment and systems during initial decommissioning. The pump rooms are within the middle portion (Frames 53 to 62) of the SSSB which will remain intact until the final stage of decommissioning when the CS will be relocated to provide containment. At that time the dry pit will be sized and placed into IMCs for disposal as LLRW.

5.1.14 Laundry Drain Tank

Two stainless-steel tanks are built into the laundry drain tank: the decontamination drain tank and the decontamination holding tank. The sounding tubes for these tanks have been capped off and the tanks "abandoned in place". These tanks will be checked for liquids and emptied if required. The laundry drain tank and built in tanks are within the middle portion (Frames 53 to 62) of the SSSB which will remain intact until the final stage of decommissioning when the CS will be relocated to provide containment. At that time, they will be sized and placed into IMCs for disposal as LLRW.

5.2 Contaminated Systems and Equipment

Essentially all systems and equipment associated with the SSSB will be disposed of as LLRW. Portions of systems that are located in areas designated for unrestricted release may be removed or surveyed and released along with the structure as summarized in Table 5-2.

Table 5-2
System Use/Fate/Disposition

System	Use/Fate During Decommissioning	Ultimate Disposition
HVAC Forward (Permanent) (Fan Room 1)	Used during initial decom.	RW
HVAC Aft (Permanent) (Fan Room 2)	Used during initial decom.	RW
2T Bridge Crane (Heavy Component Shop)	Not used	RW
3T Bridge Crane Aft (Clean House)	Not used	RW
3T Bridge Crane Forward (Clean House)	Not used	RW
5T Platform Bridge Crane Aft (Clean House)	Used for removal of wet pit items	RW
5T Platform Bridge Crane Forward (Clean House)	Not Used	RW
Dry Pit Cover	Used before/after components removed	RW
Wet Pit Tools and Equipment	Not used	RW
1T Bridge Crane (Machine Shop)	Not used	RW
Diesel Generator and Enclosure	Used during initial decom.	RW
Chiller Unit A	Not used	RW
Chiller Unit B	Not used	RW
Shore Piping Connection (Port and Starboard)	Not used	RW
Wet Pit Heat Exchanger	Not used	RW

System	Use/Fate During Decommissioning	Ultimate Disposition
Wet Pit Demineralizer	Not used	RW
Wet Pit Filter System	Not used	RW
Controlled Pure Water	Not used	Per Area
Bilge	Not used	Per Area
Contaminated Drain Collection	Not used	RW
Ballast	Not used	Per Area
Sanitary	Not used	RW
Electrical and Lighting	Used during initial decom.	Per Area
Communications	Not used	Per Area
Indicating Systems and Alarms	Not used	Per Area
Service and Hatch Air	Used during initial decom.	Per Area
Cathodic Protection	Not used	Per Area
Sounding tubes, air escapes, overflows	Not used	Per Area

RW – radioactive waste.

5.2.1 Office HVAC System (located in Fan Room 1)

This system will be used to provide conditioned air to non-radiologically controlled spaces, including the log room, office spaces, change room, the clean tunnel, and the auxiliary pump entrance and pump room during the initial stage of decommissioning. The Office HVAC System air-handling unit located in Fan Room 1, consisting of fans, filter housings, heating and cooling coils, will then be disposed of as LLRW after its use during initial decommissioning. Shortly prior to that time, the HVAC system air-handling unit (not including heating coils) will be replaced by a temporary modular HVAC unit that will be placed on the SSSB outer upper deck. It will be connected to existing ductwork with flexible duct as required. Not all locations served by the original system will be reconnected. The abandoned Office HVAC air-handling unit will remain in place when Fan Room 1 is cut free of the SSSB, lifted to the dock, and sized within the CS for placement into IMCs for transport to the disposal facility.

5.2.2 Forward HVAC System (Radiologically Controlled, Located in Fan Room 1)

This system will be used to provide conditioned air to the counting room, dirty tunnel (forward of Frame 59), pump room lower level, pump room operating level, and the pump room entrance, while maintaining negative pressure in those locations, during the initial stage of decommissioning. The Forward HVAC System air-handling unit located in Fan Room 1,

consisting of fans, filter housings, heating and cooling coils, will then be disposed of as LLRW after its use during initial decommissioning. Shortly prior to that time, the HVAC system air-handling unit will be replaced (not including heating coils) by a temporary modular HVAC unit that will be placed on the SSSB outer upper deck. It will be connected to existing ductwork with flexible duct as required. Not all locations served by the original system will be reconnected. The abandoned Forward HVAC air-handling unit will remain in place when Fan Room 1 is cut free of the SSSB, lifted to the dock, and sized within the CS for placement into IMCs for transport to the disposal facility as LLRW. All filters elements in the Forward HVAC System in Fan Room 1 will be removed and bagged using radiological controls and all duct and fan openings will be covered prior to lifting and removal of Fan Room 1.

Each exhaust filter plenum in the Forward HVAC systems contains a HEPA filter to prevent the inadvertent discharge of radioactively contaminated particles to the atmosphere. A pre-filter is located in front of each HEPA filter to capture large particles and prevent the HEPA filter from fouling prematurely. These filters are located in the work areas of the dirty tunnel and pump rooms. These filters will remain in place throughout the decommissioning effort, whether they are served by the originally installed air-handling unit located in Fan Room 1 or the temporary modular HVAC unit. The HEPA and prefilter elements will be removed and bagged for disposal using radiological controls prior to sizing of the ductwork and equipment in order to minimize potential spread of contamination.

5.2.3 Aft HVAC System (Radiologically Controlled, Located in Fan Room 2)

This system will be used to provide conditioned air to the clean house, HCS, and dirty tunnel (aft of Frame 59), while maintaining negative pressure in those locations, during the initial stage of decommissioning. The Aft HVAC System air-handling unit located in Fan Room 2, consisting of fans, filter housings, heating and cooling coils, will then be disposed of as LLRW subsequent to use during initial decommissioning. Shortly prior to that time, the HVAC system air-handling unit will be replaced (not including heating coils) by a temporary modular HVAC unit that will be placed on the SSSB outer upper deck. It will be connected to existing ductwork with flexible duct as required. Not all locations served by the original system will be reconnected. The abandoned Aft HVAC air-handling unit will remain in place when Fan Room 2 is cut free of the SSSB, lifted to the dock, and sized within the CS for placement into IMCs for transport to the disposal facility as LLRW. All filters elements in the Aft HVAC System in Fan Room 2 will be removed and bagged using radiological controls and all duct and fan openings will be covered prior to lifting and removal of Fan Room 2.

Each exhaust filter plenum in the Aft HVAC systems contains a HEPA filter to prevent the inadvertent discharge of radioactively contaminated particles to the atmosphere. A pre-filter is located in front of each HEPA filter to capture large particles and prevent the HEPA filter from fouling prematurely. These filters are located in the work areas of the dirty tunnel and pump rooms. These filters will remain in place throughout the decommissioning effort, whether they are served by the originally installed air-handling unit located in Fan Room 2 or the temporary modular HVAC unit. The HEPA and prefilter elements will be removed and bagged for disposal using radiological controls prior to sizing of the ductwork and equipment in order to minimize potential spread of contamination.

5.2.4 Irradiated Component Disposal Container, Heavy Component Shop

The Irradiated Component Disposal Container (ICDC) is currently stored in the HCS and must be removed early during decommissioning to make room for waste handling operations. The ICDC weighs nearly 22 tons and is approximately 11 feet in diameter by three feet tall. It is constructed of heavy-duty steel and is potentially contaminated and cannot be readily sized. To maintain worker dose ALARA it will be packaged and shipped as an over-width, over-weight load. The ICDC will be covered with poly sheeting and/or a contamination control bag. The HCS hatch will be opened and the ICDC will then be lifted using a dockside crane (gantry crane) into an IP-1 flexible container staged in the HCS or on the conveyance located on the dock for transport and disposal as LLRW. The ICDC support stand may be handled in a similar manner, or ultimately placed in an IMC for disposal as LLRW.

5.2.5 2-Ton Bridge Crane, Heavy Component Shop

The SSSB will be towed and received at ASY with the HCS 2-ton bridge crane in long/short term layup configuration, with the trolley and bridge pinned and locked in position. The crane will not be used during decommissioning and will remain in that position. All liquids will be drained from crane drive components prior to removal and sizing of the bridge crane. The plan is to remove the 2-ton bridge crane and its support structure in conjunction with the HCS when it is removed from the SSSB and placed in the CS. The bridge crane will be sized in the CS along with the HCS and disposed as LLRW. Prior to removal of the HCS, structural analysis will be performed to ensure that the bridge crane and its support structure can be removed in this manner.

5.2.6 3-Ton Bridge Cranes, Aft and Forward, Clean House

The SSSB will be towed and received at ASY with the clean house 3-ton bridge cranes in long/short term layup configuration, with the trolley and bridge pinned and locked in position.

The cranes will not be used during decommissioning and will remain in that position. All liquids will be drained from crane drive components prior to removal and sizing of the bridge crane. The plan is to remove the 3-ton bridge cranes and their support structure in conjunction with the clean house upper section when it is removed from the SSSB and placed in the CS. The bridge crane will be sized in the CS along with the clean house upper section. Prior to removal of the upper clean house, structural analysis will be performed to ensure that the bridge cranes and their support structure can be removed in this manner.

5.2.7 5-Ton Platform Bridge Crane, Aft and Forward, Clean House

The SSSB will be towed and received at ASY with the clean house 5-ton platform bridge cranes in long/short term layup configuration, with the trolley and bridge pinned and locked in position. The forward and aft cranes will be inspected, load-tested, re-certified and used during initial decommissioning to remove equipment and components from the wet pit for packaging and disposal. Subsequent to use, the 5-ton platform bridge cranes will be removed from the clean house and lifted to the CS for sizing and disposal as LLRW. All liquids will be drained from all crane drive components prior to removal of the cranes. First the personnel platforms will be removed from the respective forward and aft platform bridge cranes. The platforms will be enclosed in contamination control bags, lifted out of the clean house through the air-powered rolling roof hatches using a dockside crane (gantry crane), and placed into the CS for sizing. Next the hoist trolleys will be locked in position on the bridges by welding them in place and/or installing pins and bolts in the frame. Each bridge will be lifted off the rails, rotated to clear the rails, and set down on cribbing on the upper deck above the wet pit. Each bridge will be enclosed in a contamination control bag, rigged at one end, and then lifted vertically out of the clean house through one of the roof hatches using a dockside crane (gantry crane), and placed into the CS for sizing

5.2.8 Dry Pit Cover, Clean House

The dry pit cover will be temporarily removed, using the 5-ton Platform Bridge Crane, to gain access to the interior of the dry pit. Inside the dry pit are four contaminated shroud storage racks which remain from a previous alteration state of the SSSB. The racks are completely enclosed in stainless-steel sheets which are pop riveted together and bonded at the joints with a sealing compound to contain contamination. Pending confirmation of dimensions, this assembly will be loaded into an IMC positioned at the aft end of the clean house, using the 5-ton Platform Bridge Crane, for removal and disposal as LLRW. If the assembly will not fit into an IMC, it will be

placed into an IP-1 bag and lifted directly out of the SSSB through the aft air-powered rolling roof hatch and onto a dockside conveyance for transport and disposal as LLRW.

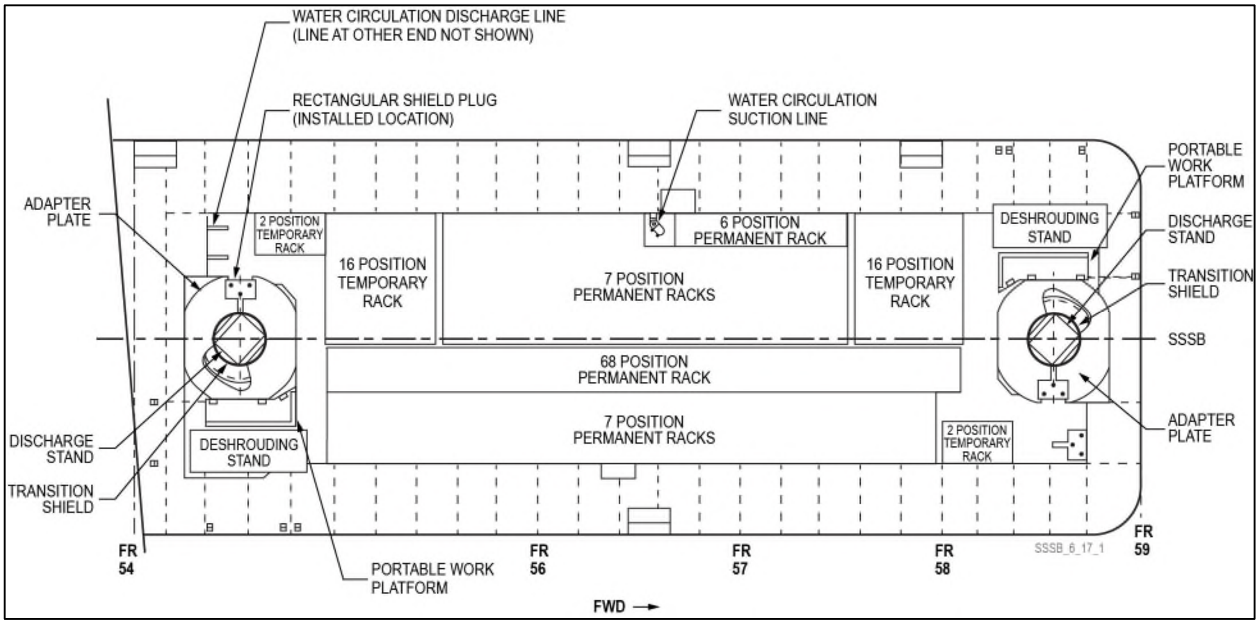
After removal of this component out of the dry pit, the cover will be replaced. The cover will ultimately be disposed of as LLRW. It is within the middle portion (Frames 53 to 62) of the SSSB which will remain intact until the final stage of decommissioning when the CS will be relocated to provide containment. At that time the tanks will be sized and placed into IMCs for disposal as LLRW.

5.2.9 Wet Pit Tools and Equipment

The wet pit equipment consists of stainless-steel racks, rack liners, and stands that were used to hold or assemble/disassemble fuel assemblies in the wet pit. The racks and stands are held in position by a support structure that is welded to the wet pit liner. These items will be removed from the wet pit while the residual water (approximately 18 inches) is still in the wet pit. This water will act as shielding during removal of the wet pit equipment. Once the equipment is removed, internal space will be gained to enable efficient cleaning of the wet pit liner. The equipment will be removed using the 5-ton Platform Bridge Cranes, placed into IMCs staged at the aft end of the clean house, and disposed of as LLRW. The racks and stands will be held above the wet pit and allowed to air dry prior to additional handling. The bottom of the racks and stands will be wrapped in poly sheeting and taped prior to moving into the IMC.

There are temporary and permanent racks in the wet pit as shown in Figure 5-18. The temporary racks are designed to be removed while water is still in the pit. They will be removed first and following their removal, the wet pit bottom in that location will be cleaned using the methods discussed in Section 5.1.10.1 of this DWP. Solids will be “vacuumed” off the bottom of the wet pit using long-handled pool cleaning tools. The nominal 18 inches of residual water will be re-circulated and filtered in order to remove suspended solids. Next work platform(s) will be lowered into the positions vacated by removal of the temporary racks. These platforms will rest on the bottom of the wet pit and provide a location for remote-controlled robotic demolition tool (e.g., Brokk) equipped with a shear or saw. This tool will be used for removal of permanent racks when required.

Figure 5-18
Wet Pit Rack Configuration



The equipment will be removed in the following order:

- Rack liners – The liners will be left in place and removed with the racks. Alternately, depending on the weight of the assembly, the liners may be removed prior to rack removal and placed into the IMC separately.
- Remove work platforms and stands (two/each) and Temporary racks (six total) - These will slide out of the wet pit on guide rails attached to the wall of the pit.
- Clean the wet pit bottom in locations where work platforms and stands have been removed, install temporary work platforms. Place remote controlled robotic demolition tool on a work platform using the 5-ton bridge crane.
- Remove the port and starboard six and seven position permanent racks (14 total) - These racks are attached to each other by plates and are enclosed within the support structure by tie rods. The plates and tie rods will be removed, and the racks will be lifted out of the pit.
- Remove the center six and eight position permanent racks (11 total) – These racks are welded to the to the bottom of the pit liner. The remote -controlled shear may be used to cut the rack legs above the welds. The center permanent racks will then be lifted out of the wet pit.
- Remove remaining support structure – The support structure is also welded to the wet pit liner. The remote-controlled shear may be used to cut the rack legs above the

welds. The support structure will be lifted out of the wet pit. The structure may require additional sizing prior to loading into the IMC. This will be done using cold cutting methods such a shear or reciprocating or circular saw. Saw cutting, if used, will be done using poly containment and HEPA vacuums to collect metal debris and portable HEPA filter unit(s) with suction hose positioned to minimize any airborne emission.

5.2.10 1-Ton Bridge Crane, Machine Shop

The SSSB will be towed and received at ASY with the Machine Shop 1-ton bridge crane in long term layup configuration, with the trolley and bridge pinned and locked in position. The crane will not be used during decommissioning and will remain in that position. All liquids will be drained from crane drive components prior to removal and sizing of the bridge crane. The plan is to remove the 1-ton bridge crane and its support structure in conjunction with the Machine Shop when it is removed from the SSSB and placed in the CS. The bridge crane will be sized in the CS along with the Machine Shop and disposed as LLRW. Prior to removal of the Machine Shop, structural analysis will be performed to ensure that the bridge crane and its support structure can be removed in this manner.

5.2.11 Diesel Generator and Enclosure

The Diesel Generator will be used for backup power during initial decommissioning if operational, until a temporary power system is put in place. At that time the generator will be abandoned. The liquids will be handled as discussed in Chapter 9.0 of this DWP. The generator will be placed into an IP-1 bag and placed on the conveyance on the dock for shipment as LLRW.

5.2.12 Wet Pit Circulating Water System

This system was used to recirculate and purify wet pit water. This includes filters, heat exchanger, demineralizers, pumps, and piping. The system is located in the Pump Room (8’-6” ABL) and the Pump Room Operating Level (18’-2” ABL). The systems and equipment in these rooms will be removed through hatch covers which provide a clear path out of the SSSB through the roof of the Pump Room Entrance and Auxiliary Pump Room Entrance. The system components will be placed into contamination control bags and lifted directly into IMCs located in a designated Waste Handling and Storage Area or into IP-1 bags positioned on the conveyance on the dock for shipment as LLRW.

Prior to breaching and disassembling piping and equipment, any remaining liquids will be drained. This will be done using radiological containment and controls, assuming that the liquids

may be contaminated, until sampling and testing are conducted. Liquids will be drained by opening vents and low points drains and collecting liquids in buckets or catches. The liquids will be transferred to lined 55-gallon drums. The drums will be placed in overpack drums as a means of secondary containment in an on-board Waste Accumulation Area. If any piping is located below the low point drains, a small hole will be drilled into the piping with a catch in place to check for liquids. A gasketed screw will be kept on hand to close the hole if necessary, should the liquid flow need to be interrupted in order to change-out the catch or bucket. Wet pit circulating water will be separated from all other liquids. It is anticipated that other aqueous liquids will be combined in a separate drum and sampled/treated as a composite. Lubricants will be drained and handled separately. The liquids will be sampled and analyzed for waste characterization. The aqueous liquids will be solidified using acceptable reagents meeting the disposal facility waste acceptance criteria (WAC).

Piping will be disassembled into sections and the ends covered with poly and/or taped to prevent internal scale from falling out. Where possible, the piping will be parted at flanges and unions. If additional sizing is required, it will be done by cold cutting using powered hand tools, typically a reciprocating saw. Pending the outcome of initial residual liquid sampling and analysis, pipe breaching will be done in open air using catches positioned to contain any residual liquid or in glove bags if necessary.

5.2.12.1 Chiller Units A and B and Air-Cooled Condensers

Chiller Units A and B, condensers, and interconnecting piping will be disposed of as LLRW. The chillers contain glycol solution that was used in Pit Circulating Water Heat Exchanger to cool wet pit water. The chiller units also contain refrigerant that was used to cool the glycol solution. Air-cooled condensers were used to condense the compressed refrigerant. Glycol solution will be drained from the system at low point drains and disposed of at a properly licensed facility. Refrigerant will be removed by a licensed technician and disposed or recycled at a properly licensed facility. The chiller units and air-cooled condensers will be removed from the SSSB using the dockside crane.

5.2.12.2 Pit Circulating Water Heat Exchanger

The heat exchanger, located in the pump room, was used to cool wet pit water (tube side) with glycol solution (shell side) and will be disposed of as LLRW. It will be drained, disconnected from piping, and placed into a contamination control bag. It will be moved under one of the two hatch openings that reach the pump room, lifted from the SSSB using a dockside crane, and placed into an IMC for disposal as LLRW.

5.2.12.3 Demineralizers

Two demineralizers, located in the pump room, were used to remove ionic impurities in the wet pit water and will be disposed of as LLRW. They will first be drained and disconnected from piping. Once the demineralizers are characterized, it will be determined if the 50-cubic-foot (375 gallon) stainless-steel cylinders containing the resin can be safely removed from the outer shielding containers from an exposure standpoint. If so, the cylinders will be removed and placed in contamination control bags. They will be moved under one of the two hatch openings that reach the pump room, lifted from the SSSB using a dockside crane, and placed into an IMC for disposal as LLRW. The shielding containers contain lead shielding and will be handled separately as mixed LLRW waste. They are oversize with respect to a standard IMC. They will be lifted off the SSSB in contamination control bags and placed into IP-1 bags on the conveyance for transport and processing as mixed LLRW waste at the disposal facility.

Alternately, pending characterization results, if the demineralizers cannot be safely removed from the shielding containers, then the entire demineralizer/shield container assembly will be placed in a contamination control bag lifted into an IP-1 bag, and shipped to the disposal facility as mixed LLRW waste.

5.2.12.4 Filters

Two filters, located in the pump room, were used to remove suspended solids in the wet pit water upstream of the demineralizers and will be disposed of as LLRW. They will first be drained and disconnected from piping. They are designed with piping spool pieces to facilitate removal from the SSSB. The filters will be removed and placed in contamination control bags. They will be moved under one of the two hatch openings that reach the pump room, lifted from the SSSB using a dockside crane, and placed into an IMC for disposal as LLRW.

5.2.12.5 Pumps and Piping

Two pumps, located in the pump room, were used to circulate wet pit water through the system and will be disposed of as LLRW, along with interconnecting piping. The pumps will first be drained and disconnected from piping. Piping will also be drained and sized to lengths approximately 10 feet or shorter. The pumps and piping will be removed and placed in contamination control bags. They will be moved under one of the two hatch openings that reach the pump room, lifted from the SSSB using a dockside crane, and placed into an IMC for disposal as LLRW.

5.2.13 Pure Water System

This system was used to make, store and supply demineralized water, primarily as wet pit make-up water. Whereas no radiological contamination of this system is anticipated, the equipment will be disposed of as LLRW in order to bypass MARSAME survey requirements and in order to avoid any potential problems with segregating these items from similar components in the wet pit circulating water system. The components include shore connections, demineralizer, pure water storage tank, and the pure water transfer pump. The system is located in the Auxiliary Pump Room (27 feet, 2 inches ABL). The equipment in this room will be removed through hatch covers which provide a clear path out of the SSSB through the roof of the Auxiliary Pump Room Entrance. The system components will be drained and placed into contamination control bags and lifted directly into IMCs located in a designated Waste Handling and Storage Area or into IP-1 bags positioned on the conveyance on the dock for shipment. Liquids will be handled as discussed in Chapter 9.0 of this DWP.

5.2.14 Reactor Discharge Water Holding System

The RDWH system was used to collect and hold discharge water from TGRM operations in the wet pit. The water was subsequently returned to the TGRM or discharged to a collection facility. The system consists of piping, filters, a pump, and the 1,550-gallon RDWH tank, all located in the Pump Room (8 feet, -6 inches ABL). The system will be removed and disposed of as LLRW. The filters, pumps, and tank will first be drained and then disconnected from piping. Piping will also be drained and sized to lengths approximately 10 feet or shorter. Liquids will be handled as discussed in Chapter 9.0 of this DWP. The pumps, piping, and filters will be removed and placed in contamination control bags. They will be moved under one of the two hatch openings that reach the pump room, lifted from the SSSB using a dockside crane, and placed into an IMC for disposal as LLRW. The RDWH tank is rectangular, 7 feet x 7 feet x 4 feet, and 3 inches deep, constructed of ¼-inch stainless steel, and will require its void space to be filled or size reduced prior to disposal in accord with the disposal facility WAC. Therefore, the plan is to place tank into a contamination control bag and use the dockside crane to lift it out of the Pump Room and into the CS. Once in the CS the top will be cut off in a radiologically controlled manner. Additional LLRW will be placed inside of the tank once it is placed into the IMC.

Prior to cutting the RDWH tank, it will first be inspected and internal contamination levels measured through the top manway. If contamination is found, fixative will be sprayed on the internal surface of the tank, along the cut lines. Once the fixative has cured, the top portion of the tank will be removed using a circular saw with metal cutting blade. This saw, based on past

experience, results in relatively low cutting temperature (warm to the touch) and generates little, if any, fine particulate matter. Although airborne debris will be minimal, a HEPA-filtered vacuum will be connected to one of the tank lower piping connections for containment.

5.2.15 Contaminated Drain Collection System (including Bilge Water)

This system was used to collect and store radioactive or potentially radioactive effluents from various systems on the SSSB including the RDWH tank overflow, bilge sump pump discharge, and the wet pit circulating water system. It consists of the bilge well with submersible bilge pump, a 3,550-gallon Contaminated Water Tank, Contaminated Drain Pump, and interconnecting piping, all located in the Pump Room (8’-6” ABL). The system will be removed and disposed of as LLRW. The tank will be checked for water level and the water will be sampled for radiological and hazardous constituents. Pending the results of sampling and depending on quantity of water, the tank contents may be pumped directly into a tanker truck for disposal at a properly licensed facility. If this is done, all hose connections will have containment sleeves. Alternately, if there is little or no water, it will be drained into a lined drum and handled as discussed in Chapter 9.0 of this DWP.

Piping will also be drained and sized to lengths approximately 10 feet or shorter. The pumps and piping will be removed and placed in contamination control bags. They will be moved under one of the two hatch openings that reach the pump room, lifted from the SSSB using a dockside crane, and placed into an IMC for disposal as LLRW. The Contaminated Water tank is a horizontal, cylindrical tank, 7 feet diameter x 10 feet 6 inches long, constructed of ¼-inch stainless steel and will require its void space to be filled or partially disassembled prior to disposal in accord with the disposal facility WAC. Therefore, the plan is to place the tank into a contamination control bag and use the dockside crane to lift it out of the Pump Room and into the CS. Once in the CS the tank will be sized such that it will fit into an IMC in a radiologically controlled manner. Additional LLRW will be placed inside of the tank sections when/before they are placed into the IMC.

Prior to cutting the contaminated water tank it will first be inspected and internal contamination levels measured through the top manway. If contamination is found, fixative will be sprayed on the internal surface of the tank, along the cut lines. Once the fixative has cured, the top portion of the tank will be removed using a circular saw with metal cutting blade. This saw, based on past experience, results in relatively low cutting temperature (warm to the touch) and generates little, if any, fine particulate matter. Although airborne debris will be minimal, a HEPA-filtered vacuum will be connected to one of the tank lower piping connections for containment.

5.2.16 Ballast Water and Controlled Pure Water System

The ballast water system was used to provide the means for arranging the volume of water in the various ballast tanks in order to maintain the SSSB at the proper draft, list and trim. The ballast system consists of 14 wing tanks and three centerline tanks that are interconnected by piping to two pumps, associated valves, fittings, one suction and two discharge sea chests. The pumps are located in the Pump Room (8 feet, 6 inches ABL). The controlled pure water system was used to move water between #3 port and starboard wing tanks and also to and from shore connections. The controlled pure water system consists of two pumps, piping, a valve station, and shore connections. The valve station is on the outer upper deck and the pumps are located in #3 void space, 2’-6” ABL. The ballast system and controlled pure water system are not known to be impacted. As such, the systems will be drained but left in place in sections of the ship that are intended to be disposed of as LLRW. Portions of the ballast and pure water system that are located in areas of SSSB planned for free release (Ballast Tank 3 Centerline, Port Wing Tank 3, Starboard Wing Tank 3, No. 3 Void, Ballast Tank 9 Centerline, Port Wing Tank 9, Starboard Wing Tank 9) will be drained and removed as LLRW in order to avoid complicating the MARSAME survey of these areas.

5.3 Site Security

Access to the SSSB will be controlled through multiple layers of security. The outermost security ring consists of the ASY perimeter fencing, locked gates, and security force. The next layer of security will be the SSSB project site boundary, located within the ASY site boundary. The SSSB project site will be bounded by a six-foot-tall temporary perimeter fence with three strands of barbed wire atop. Access stair towers to the SSSB will also be gated. The SSSB site boundary will have its own dedicated Security Officer, who will be continuously present at the guard shack site access control point during work hours. Project site gates will be locked during off hours.

All employees and visitors will be required to wear access badges while at the SSSB project. Employees will be issued photo identification cards, which will include their name and a unique number. Visitors (including contractors) badges will be issued on both an unescorted and escorted basis depending on the level of training and experience.

Details of the site security measures are presented in the Site Security Plan, which is an appendix to the SSSB project Accident Prevention Plan (APP) (APTIM, 2021c).

5.4 Emergency Preparedness

Emergency preparedness procedures for the SSSB D&D project are detailed in the APP.

5.5 Fire Protection

The fire protection system that currently exists on board the SSSB will be non-operational once the vessel is disconnected from shore power, and transferred to APTIM at Colonna's Shipyard, since the vessel will be towed in a cold and dark state, and no persons will be on board at that time.

For the time period during which APTIM is preparing the vessel for sea tow, combustibles will either be removed from the vessel, or placed in a location on the vessel making them safe and not susceptible to ignition sources or fire. Prior to the sea tow, the vessel will be inspected by a Marine Surveyor to ensure the vessel is properly secured to make the sea voyage safely, including an inspection of interior securements, housekeeping, combustibles on board, and them being rendered safe for the tow.

While personnel are performing interior securement activities that involve flame, fire, or spark producing activities, we will employ a fire watch program, which involves completing a task specific hot work permit, that addresses the specific task(s) to be performed, the spark, fire, or flame-producing activity, and the abatement actions to be employed during the task. A fire watchmen equipped with an appropriately sized and rated fire extinguisher will be in place at every such location, and will remain in place for 30 minutes following completion of the fire, flame, or spark producing activity to ensure no fire results from the activities, or flares up after completing the activity.

During the sea tow, the SSSB will be monitored from the main tow tug for a safe steady state. If a fire develops on board the SSSB during the sea tow, the Captain of the main tow tug will immediately notify the Coast Guard for assistance, and the vessel will divert to the nearest safe harbor for the fire to be extinguished. Once extinguished, a Marine Surveyor will perform a vessel inspection and determine whether the vessel is safe to continue the tow. If repairs are necessary, they will be performed prior to resuming the tow.

Once the SSSB arrives at ASY, fire prevention will be conducted by means of fire lines connected to ASY's facility fire suppression piping, which will be at the ready at all times at the SSSB work zone, along with performing daily housekeeping activities, task specific hot work permitting, and fire watches deployed at all flame, fire, or spark producing activity. If a fire

occurs on board the SSSB during dismantlement activities, workers will use the ASY fire lines as well as extinguishers to conduct an initial response to the fire, and to evacuate personnel to safety. If the fire cannot be immediately extinguished during this initial response, the local fire department will be called for response to the ASY facility. Additional details on the fire protection controls, procedures, and equipment for the SSSB project are provided in the APP.

5.6 Soil – N/A

5.7 Surface Water and Ground Water – N/A

5.8 Schedule

A project schedule is provided in Figure 5-19. Of particular interest relevant to D&D activities are the MARSAME surveys for Ballast and Wing Tanks 3 and 9 and the D&D Execution activities. Once the SSSB is at ASY (activity # 30004010) there are two primary parallel activities:

- Removal of the most contaminated systems and equipment from the mid-section of the SSSB using existing infrastructure as containment. This includes the following major activities:
  - 30004090, Remove and Dispose of Items in Pump Room
  - 30004110, Remove Equipment from Wet Pit
  - 30004150, Rubblize or Wire Saw Wet Pit Steel/Concrete (Finish 12-Aug-22)
- Removal of the forward and aft ends of the SSSB using the Goliath crane for unrestricted release or for size reduction and packaging as LLRW in the CS. This includes the following major activities:
  - 30004072, Prep and Remove (unrestricted release) Centerline Ballast Tank #3 and #3 Wing Tanks
  - 30004075, Prep and Remove Ballast Tank #4 and place in CS (Centerline and wing tanks)
  - 30004076, Size-Reduce Ballast Tank #4 in CS (Centerline and wing tanks)
  - 30004140, Prep and Remove Upper Clean House and place in CS
  - 30004142, Size-Reduce Upper Clean House in CS
  - 30004171, Prep and Remove Ballast Tank #9; move to recycle area
  - 30004166, Prep and Remove Ballast Tank #8 (Centerline and wing tanks)

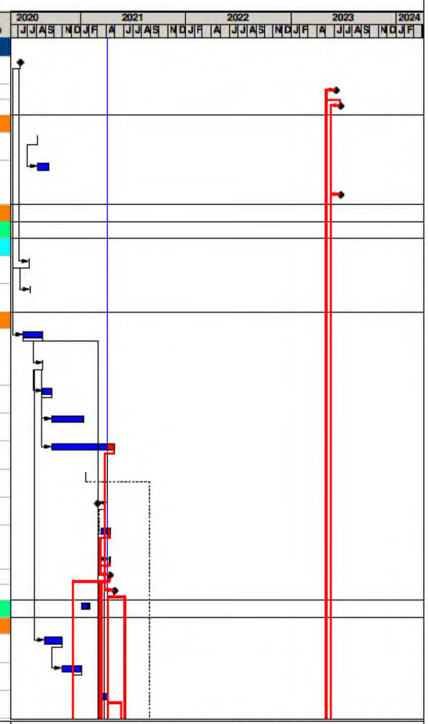
- 30004167, Size-Reduce Ballast Tank #8 in CS (Centerline and wing tanks) (Finish 31-Aug-22)

Those two parallel activities are completed within weeks of one another. At that time the CS is moved on rails to cover the mid-section of the SSSB (activity #30004168) and it is size-reduced for disposal as LLRW in the containment (activity #30004169).

Figure 5-19
SSSB Decommissioning Schedule

Surface Ship Support Barge (SSSB) Working Schedule

#	Activity ID	Activity Name	Start	Finish	Original Duration	Remaining Duration	Actual Duration
1	**SSSB - Working Schedule**		09-Jun-20 A	24-Jun-23	1119	810	301
2	00_NTP	Notice to Proceed	09-Jun-20 A		0	0	0
3	01_POP	Period of Performance (36 Months)		08-Jun-23*	0	0	0
4	05_COMP	Project Complete		24-Jun-23	0	0	0
5	**Project Milestones**		07-Aug-20 A	24-Jun-23	1053	0	38
6	Schedule	Submit Baseline Schedule	07-Aug-20 A	07-Aug-20 A	5	0	0
7	Schedule10	NAVSEA Review and Agree to Baseline Schedule	07-Aug-20 A	14-Sep-20 A	14	0	38
8	MS_94	Project Milestone: Final Project Report		24-Jun-23	0	0	0
9	**0001: Decommissioning Work Plan**		08-Jul-20 A	09-Jul-20 A	6	0	1
10	**Initial Meetings and Abbreviated Plans**		08-Jul-20 A	09-Jul-20 A	6	0	1
11	**Kick-Off Meeting**		08-Jul-20 A	09-Jul-20 A	6	0	1
12	1AA00100	Kick-Off Meeting	08-Jul-20 A	08-Jul-20 A	1	0	0
13	1AA00110	Prepare/Submit Kickoff Meeting Minutes	09-Jul-20 A	09-Jul-20 A	5	0	0
14	**0001AA: Submit Decommissioning Work Plan**		15-Jun-20 A	30-Apr-21	436	25	295
15	1AA00300	Prepare and Issue Decommissioning Work Plan	15-Jun-20 A	25-Aug-20 A	60	0	72
16	1AA00301	APTIM Submits Decommissioning Work Plan to NRC	25-Aug-20 A	25-Aug-20 A	5	0	0
17	1AA00301_R	NRC Accepts DWP and Begins Tech Evaluation Report and EA	26-Aug-20 A	23-Sep-20 A	30	0	28
18	1AA00302	NRC Informational Requests and APTIM Response	24-Sep-20 A	14-Jan-21 A	184	0	112
19	1AA00303_Z	NRC EA and FONSI Complete	24-Sep-20 A	30-Apr-21	120	25	194
20	1AA00309	Provide Easement or Contract for LLRW Disposal	22-Jan-21 A	22-Jan-21 A	1	0	0
21	1AA00307	NRC Reviews and Recommends Custody Transfer		02-Mar-21 A	0	0	0
22	1AA00307_Tow	NNS Transfer Preparations	13-Mar-21 A	15-Apr-21	5	10	24
23	1AA00308	Provide Performance Bonding	12-Apr-21*	15-Apr-21	4	4	0
24	1AA00307_A	APTIM Accepts SSSB Custody		15-Apr-21*	0	0	0
25	1AA00302_A	Decommissioning Work Plan Approval		30-Apr-21	0	0	0
26	**Request for Vessel Transfer (RVT)**		04-Jan-21 A	04-Feb-21 A	34	0	22
27	**Transportation and Tow Plan**		31-Aug-20 A	26-Apr-21	239	21	218
28	20000001	Prepare and Issue Draft Transportation and Tow Plan	31-Aug-20 A	28-Oct-20 A	45	0	58
29	20000002	Stakeholder Review Draft Transportation and Tow Plan	29-Oct-20 A	08-Jan-21 A	30	0	71
30	20000002A	Prepare and Issue Wet Tow Plan	15-Mar-21 A	09-Apr-21	5	4	22



Remaining Level of Effort | Remaining Work | ◆ Milestone
Actual Work | Critical Remaining Work

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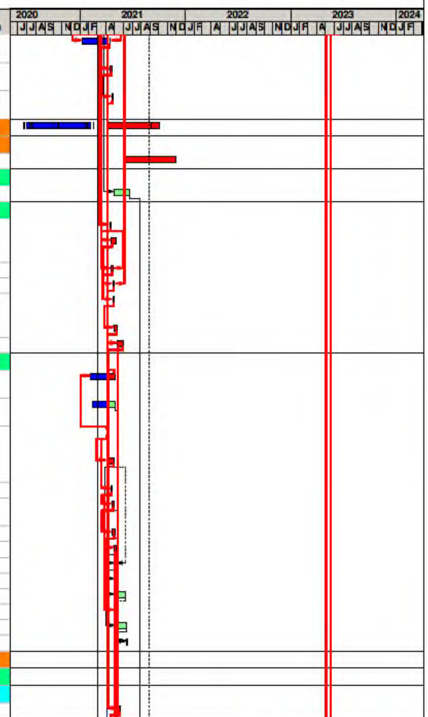
Surface Ship Support Barge (SSSB) Working Schedule

#	Activity ID	Activity Name	Start	Finish	Original Duration	Remaining Duration	Actual Duration
31	20000003	RTC on Draft Transportation and Tow Plan and Re-Submit	11-Jan-21 A	16-Apr-21	7	1	85
32	20000005	Stakeholder Review Draft Final Transportation and Tow Plan	17-Apr-21	21-Apr-21	5	5	0
33	20000006	RTC on Draft Final Transportation and Tow Plan and Re-Submit Final	22-Apr-21	26-Apr-21	5	5	0
34	**Procurement/Issue Subcontracts**		18-Jun-20 A	05-Oct-21	461	181	280
35	**0002: Transport SSSB to Dismantlement Site**		08-Feb-21 A	30-Nov-21	286	239	57
36	Hurricane	Hurricane Season	01-Jun-21*	30-Nov-21	183	183	0
37	**License and Permits**		01-May-21	23-Jun-21	54	54	0
38	20000020	License and Permitting	01-May-21	23-Jun-21	54	54	0
39	**Hampton Roads, VA Tow**		14-Apr-21	01-Jun-21	49	49	0
40	20002010	Mobilization to Colonna's Shipyard	14-Apr-21	19-Apr-21	6	6	0
41	20002200	Tow Prep for Ocean Transport (APTIM Interior Securement)	19-Apr-21	07-May-21	14	14	0
42	20002000	Prepare Drydock	19-Apr-21	26-Apr-21	5	5	0
43	20002500	Surveys and Certifications at Hampton Roads	26-Apr-21	30-Apr-21	5	5	0
44	20002300	Load SSSB onto Transport Barge via SPMT (Including Pre-Rad Survey)	26-Apr-21	29-Apr-21	3	3	0
45	20002400	Complete Sea Fastening (BERARD Deck Barge)	29-Apr-21	12-May-21	9	9	0
46	20002600	Dry Tow to Shipyard in Mobile, AL	12-May-21	01-Jun-21	20	20	0
47	**Alabama Shipyard Site Prep**		08-Feb-21 A	16-Jun-21	119	72	57
48	20003600	SSSB Cut Plan Development	08-Feb-21 A	03-May-21	20	18	40
49	20003105	Install Electrical for SSSB Project Power	15-Feb-21 A	03-May-21	90	28	50
50	20003100	Initial Mobilization for Alabama Shipyard Site Prep	05-Apr-21 A	07-Apr-21	2	2	1
51	20003110	Mobilize Trailers/Prep Existing Office Space (Inc. for NRC and NAVSEA)	05-Apr-21 A	30-Apr-21	21	19	1
52	20003200	Baseline RAD Survey	19-Apr-21	22-Apr-21	4	4	0
53	20003300	Containment Area/Membrane (Liner) in Place Before SSSB Set	23-Apr-21	29-Apr-21	5	5	0
54	20003400	Setup Air Monitoring	23-Apr-21	03-May-21	7	7	0
55	20003700	Place Blocks (On Containment/Membrane)	30-Apr-21	06-May-21	5	5	0
56	20003120	Hookup Temporary Power at Pier	03-May-21	04-May-21	2	2	0
57	20003130	Laydown Area and Staging Area	03-May-21	04-May-21	2	2	0
58	20003140	Temporary Fencing	03-May-21	07-Jun-21	25	25	0
59	20003500	Plan Waste Staging, Sorting and Transport	04-May-21	06-May-21	3	3	0
60	20003700A	Erect Containment Berms	07-May-21	11-Jun-21	25	25	0
61	20003510	Alabama Shipyard Site Prep Complete	12-Jun-21	16-Jun-21	5	5	0
62	**0003: Dismantlement and Disposal of the SSSB**		15-Jun-20 A	24-Jun-23	844	810	295
63	**D&D Planning, Mobilization and Training**		15-Jun-20 A	12-Aug-22	629	494	295
64	**Training**		14-May-21	21-May-21	5	5	0
65	30001200	Training of Site Personnel	14-May-21	21-May-21	5	5	0



Remaining Level of Effort — Remaining Work — ◆ Milestone
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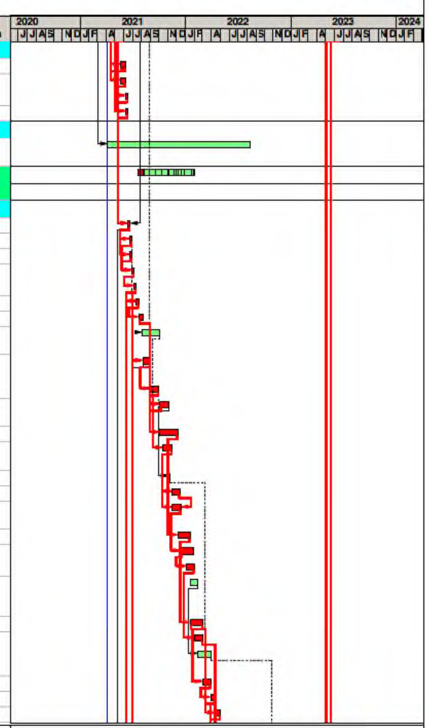
Surface Ship Support Barge (SSSB) Working Schedule

#	Activity ID	Activity Name	Start	Finish	Original Duration	Remaining Duration	Actual Duration
66	**Mobilization**		21-May-21	14-Jun-21	15	15	0
67	30001300	Mobilization of Personnel	21-May-21	07-Jun-21	10	10	0
68	30001400	Mobilization/Setup of Temporary Office Space	21-May-21	07-Jun-21	10	10	0
69	30001410	Utilities Hookup	07-Jun-21	14-Jun-21	5	5	0
70	30001420	Communications Setup	07-Jun-21	14-Jun-21	5	5	0
71	**Public Notifications**		15-Jun-20 A	12-Aug-22	629	494	295
72	30001500	Pubic Notifications	15-Jun-20 A	12-Aug-22	629	494	295
73	**MARSAME Surveys**		20-Jul-21	30-Jan-22	195	195	0
74	**D&D Field Execution**		14-Jun-21	14-Dec-22	548	548	0
75	**Remove Water Processing Equipment and Dry Pit, Heavy Equipment Show and Hot Tunn**		14-Jun-21	14-Dec-22	548	548	0
76	30004010	Offload SSSB	14-Jun-21	23-Jun-21	7	7	0
77	30004012	Prep and Clean Deck Barge before Demob	23-Jun-21	30-Jun-21	5	5	0
78	30004020	Install Gangways	23-Jun-21	30-Jun-21	5	5	0
79	30004030	Powerup Lights and HVAC	30-Jun-21	08-Jul-21	5	5	0
80	30004040	Setup RCAs and Control Points	08-Jul-21	15-Jul-21	5	5	0
81	30004060	Certify Bridge Cranes	15-Jul-21	22-Jul-21	5	5	0
82	30004065	Recondition Hatch Covers	22-Jul-21	05-Aug-21	10	10	0
83	30004013	Prepare Site and Construct Containment Structure (CS)	02-Aug-21	05-Oct-21	45	45	0
84	30004050	Initial HAZMAT Removal (Loose ACM, Peeling Lead Paint)	05-Aug-21	02-Sep-21	20	20	0
85	30004055	Install Temporary Lighting and Power	02-Sep-21	01-Oct-21	20	20	0
86	30004080	Remove and Dispose of Items in Heavy Componenet Shop	05-Oct-21	03-Nov-21	20	20	0
87	30004090	Remove and Dispose of Items in Pump Room	05-Oct-21	06-Dec-21	40	40	0
88	30004070	Prep and Remove Machine Shop, FR 63-68, and Place in CS	15-Oct-21	15-Nov-21	20	20	0
89	30004082	Prep Temporary Cover	03-Nov-21	08-Nov-21	5	5	0
90	30004071	Size-reduce Machine Shop in CS	15-Nov-21	13-Dec-21	18	18	0
91	30004073	Prep and Remove Fan room 1 & Offices to FR 65 and Place in CS	15-Nov-21	15-Dec-21	20	20	0
92	30004100	Remove Two Bulkhead Aft of Clean House	06-Dec-21	18-Jan-22	20	20	0
93	30004074	Size-Reduce Fan Room 1 & Offices to FR 65 in CS	15-Dec-21	27-Jan-22	20	20	0
94	30004075	Prep and Remove Ballast Tank #4 and Place in CS	03-Jan-22	01-Feb-22	20	20	0
95	30004072	Prep and Remove CL Ballast Tank #3, Port Wing Tank #3, Fwd Wing Tank #3 (FWD) and #3; Move to Recycle	18-Jan-22	14-Feb-22	20	20	0
96	30004110	Remove Equipment from Wet Pit	18-Jan-22	02-Mar-22	30	30	0
97	30004076	Size-Reduce Ballast Tank #4 in CS	01-Feb-22	02-Mar-22	20	20	0
98	30004170	Recycle CL Ballast Tank #3, Port Wing Tank #3, Fwd Wing Tank #3 (FWD) and #3	15-Feb-22	29-Mar-22	30	30	0
99	30004120	Wet-Vacuum Wet Pit, Pump & Treat	02-Mar-22	30-Mar-22	20	20	0
100	30004125	Clean Wet Pit Floor	30-Mar-22	13-Apr-22	10	10	0
101	30004115	Build Temporary Cover	13-Apr-22	04-May-22	15	15	0



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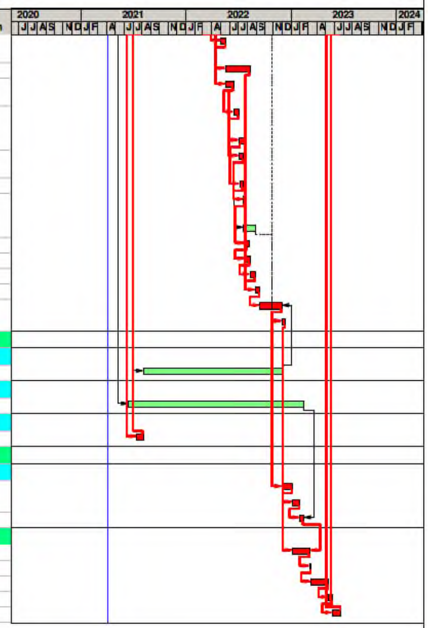
Surface Ship Support Barge (SSSB) Working Schedule

#	Activity ID	Activity Name	Start	Finish	Original Duration	Remaining Duration	Actual Duration
102	30004140	Prep and Remove Upper Clean House and Place in Containment Structure	04-May-22	18-May-22	10	10	0
103	30004150	Rubble-ize or Wire Saw Wet Pit Steel/Concrete	18-May-22	12-Aug-22	60	60	0
104	30004142	Size-reduce Upper Clean House in CS and Containerize as LLRW	18-May-22	16-Jun-22	29	29	0
105	30004161	Prep and Remove Heavy Component Shop and Place in Containment Structure	16-Jun-22	05-Jul-22	12	12	0
106	30004162	Size-reduce Heavy Component Shop and Place in CS	05-Jul-22	27-Jul-22	16	16	0
107	30004171	Prep and Remove Ballast Tank #9; Move to Recycle Area	05-Jul-22	19-Jul-22	10	10	0
108	30004163	Reconfigure Control Point, change Room, Ventilation	07-Jul-22	18-Jul-22	7	7	0
109	30004164	Prep and Remove Fan Room 2 & Change Area to FR 53 and Place in CS	19-Jul-22	26-Jul-22	5	5	0
110	30004172	Recycle Ballast Tank #9	19-Jul-22	30-Aug-22	30	30	0
111	30004165	Size-reduce Fan Room 2 & Change Area to FR 53 in CS	26-Jul-22	09-Aug-22	10	10	0
112	30004166	Prep and Remove Ballast Tank #8 and Place in CS	27-Jul-22	10-Aug-22	10	10	0
113	30004167	Size-reduce Ballast Tank #8 in CS	10-Aug-22	31-Aug-22	15	15	0
114	30004168	Move CS to Cover Remainder of SSSB (FR 53 - 62)	31-Aug-22	15-Sep-22	10	10	0
115	30004169	Size-reduce remainder of SSSB within CS	15-Sep-22	30-Nov-22	50	50	0
116	30004180	Receive Certificate of Disposal	30-Nov-22	14-Dec-22	10	10	0
117	**D&D Monitoring, Surveying and Waste**		14-Jun-21	13-Feb-23	402	402	0
118	**Waste T&D**		05-Aug-21	30-Nov-22	320	320	0
119	30006500	Waste T&D	05-Aug-21	30-Nov-22	320	320	0
120	**Environmental Monitoring**		14-Jun-21	13-Feb-23	402	402	0
121	30006100	Environmental Monitoring	14-Jun-21	13-Feb-23	402	402	0
122	**Radiological Survey Characterization**		15-Jul-21	05-Aug-21	15	15	0
123	30006400	Radiological Survey Characterization	15-Jul-21	05-Aug-21	15	15	0
124	**Site Restoration**		30-Nov-22	13-Feb-23	45	45	0
125	**Demobilization**		30-Nov-22	13-Feb-23	45	45	0
126	30007100	Site Restoration	30-Nov-22	06-Jan-23	20	20	0
127	30007200	Final Status Survey	06-Jan-23	30-Jan-23	15	15	0
128	30007300	Demobilization	30-Jan-23	13-Feb-23	10	10	0
129	**Final Reporting**		07-Jan-23	24-Jun-23	169	169	0
130	30008101	Prepare and Issue Draft Final Project Report	07-Jan-23	07-Mar-23	60	60	0
131	30008102	NAVSEA Submits Draft Final Project Report to NRC	08-Mar-23	12-Mar-23	5	5	0
132	30008105	Stakeholder Review Draft Final Project Report	13-Mar-23	11-May-23	60	60	0
133	30008106	RTC on Draft Final Project Report	12-May-23	25-May-23	14	14	0
134	30008107	Prepare and Issue Final Project Report	26-May-23	24-Jun-23	30	30	0



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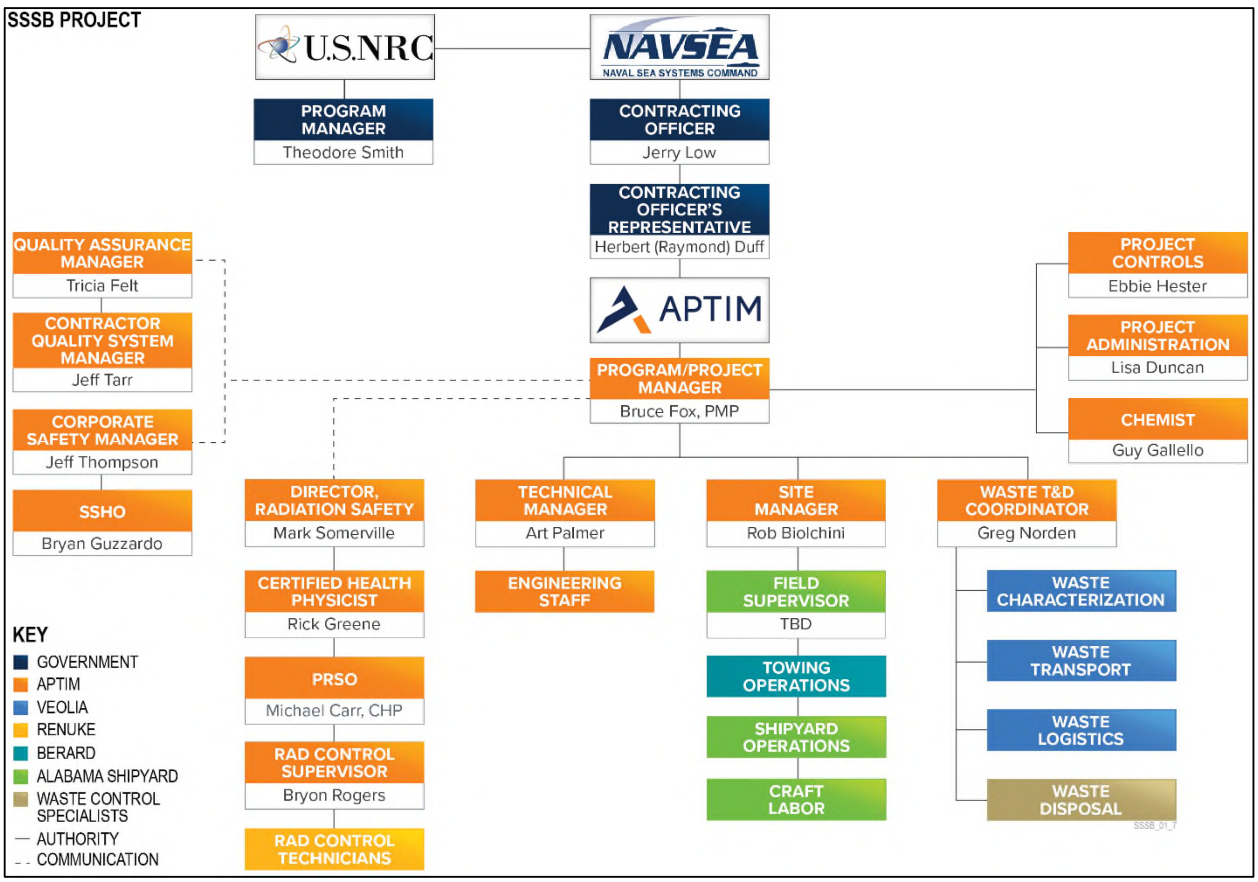
6.0 Project Management and Organization

6.1 Decommissioning Task Management/Organizational Chart

Figure 6-1 shows the overall project organization and the key project personnel for SSSB decommissioning activities. The figure includes position titles and show clear lines of authority and communication for managing the decommission efforts. More detailed description of the roles and responsibilities of management staff is included in Chapter 10.0 of this DWP.

Figure 6-1
Project Organization



6.2 Decommissioning Management Positions and Qualifications

6.2.1 Program/Project Manager

The SSSB Program/Project Manager (PM) will report to APTIM senior management and be the key team point of contact with NAVSEA and NRC personnel. The PM is trained in corporate administrative, safety, and health procedures, technically qualified, and possesses the necessary

level of experience to manage the project in a manner that satisfies all contractual obligations related to safety, quality, cost, and schedule. The PM is responsible for overseeing the development of the project's technical approaches and ensuring the SSSB team is meeting the level of effort required to fully address each task. The PM is also responsible for the day-to-day conduct of work, including integration of input from supporting disciplines and subcontractors and reporting appropriate information to NAVSEA and NRC.

6.2.2 Site Manager

The Site Manager (SM) reports directly to the PM. The SM is responsible for the overall direction and management of field project tasks associated with decommissioning during implementation. This includes oversight of field staff and subcontractors and ensuring that procedures for field activities are executed in the proper manner, activities are properly documented, and the prescribed decommissioning is completed.

6.2.3 Certified Health Physicist

The Project CHP is responsible for overall oversight of the Radiation Protection Program. For the SSSB project, this person reports to the Corporate Director of Health Physics. Importantly, while the Radiation Safety Organization will support and coordinate with the Project Manager to accomplish the SSSB D&D, their organizational independence is maintained via a formal reporting relationship to the Corporate Environmental Safety, Health and Quality organization. Specific qualifications are specified in Chapter 2.0 of the RPP (see Attachment 1 of this DWP).

6.2.4 Waste Transportation and Disposal Coordinator

The APTIM Waste Transportation and Disposal Coordinator (WTDC) is responsible for supervising activities associated with the transportation and disposal of radioactive, hazardous, mixed, and nonhazardous wastes and other materials that will be transported off the project site for disposal or unrestricted release. The WTDC will communicate and coordinate decommissioning activities with the PM and SM. The WTDC is responsible for verifying that waste transportation, disposal, and documentation requirements are followed. The WTDC shall have current DOT and Resource Conservation and Recovery Act (RCRA) waste training and will hold Certified Hazardous Materials Manager certification or equivalent.

6.2.5 Corporate Safety Manager

The APTIM Corporate Safety Manager (CSM) is responsible for managing all health, safety and environmental aspects of company operations. The CSM is responsible for developing, implementing, and administering health, safety & environmental protection programs affecting

occupational health, employee and public safety, fire protection and prevention, incident investigation and loss control, responsible environmental practices and equipment & property protection. The CSM shall have a minimum of a baccalaureate degree in Safety, Environmental, Engineering, or related field and 15 years of progressive Health, Safety, and Environmental (HSE) Supervisory and Management experience, including experience in working with U.S. Government clients and their associated HSE requirements. The CSM reports directly to APTIM's Chairman and Chief Executive Officer.

6.2.6 Contractor Quality System Manager

The Contractor Quality System Manager (CQSM) has the responsibility and authority for implementing the SSSB quality assurance (QA) program at the project level. Working onsite, the CQSM will conduct surveillances and inspections on the work that is being performed. The CQSM has the authority to identify deficiencies while work is in process and has authorization to stop work that fails to meet quality standards. If the deficiency cannot be resolved at that time, the CQSM has the authority to advance the issue to the next level of management for resolution.

6.2.7 Quality Assurance Staff

In addition to the Quality Assurance Manager (QAM) and CQSM, the entire SSSB team including the PM, SM, technical and supervisory management and field personnel (including subcontractor personnel) are considered to be an integral part of the SSSB QA organization. With the support of upper level management, the entire SSSB team is responsible for achieving and maintaining quality. All workers have the responsibility (and authority) to "stop work" if imminent risks to safety, environment, or mission are identified. The worker has the responsibility to identify and notify their management of the discrepant conditions so that appropriate corrective action can be taken.

6.2.8 Project Radiation Safety Officer

The APTIM PRSO is responsible for oversight and review of all radiological decommissioning activities and radiological surveying data collected for the purpose of radiation safety or contamination assessment (see Chapter 11.0 of this DWP). For the SSSB project the PRSO reports to the PM through the CHP. Specific qualifications are specified in Chapter 2.0 of the RPP.

6.3 Training

Personnel will be mobilized to the site prior to the SSSB arriving at ASY in order to receive proper and appropriate training prior to dismantlement activities commencing

A training plan will be developed in accordance with the APP and RPP. The RPP for the SSSB project is included as Attachment 1 of this DWP. Orientation training (Radiological, Safety and Security) will be provided to all individuals before being allowed unescorted access to the SSSB. Training will be administered by the Site Safety and Health Officer (SSHO)/Project Radiological Safety Officer and the PRSO and will include topics to the extent appropriate to the individual's prior training, work assignments, and degree of exposure to potential safety, industrial hygiene, and radiological hazards. The orientation training will be defined in the APP.

Training will be mandatory for all personnel and a written examination will be administered. A minimum grade of 80% is required for APTIM and subcontracted personnel to join the SSSB workforce.

6.3.1 Site Briefing

The site briefing is presented to site visitors who may access the site. The briefing consists of a description of site-specific hazards, locations on site that these visitors are allowed to access, emergency response and evacuation routes, potential exposure to radiation and hazardous or radioactive material and other applicable information. Visitors must also complete a visitor access control form in accordance with site-specific work instructions.

6.3.2 Radiation Worker Training

Site-specific annual radiation worker training is required for all individuals who may access RCAs without escort. Radiation worker training contains the following in addition to the training required by the APP:

- Review and acknowledgment of the project RPP
- Principles of ionizing radiation
- Health effects from exposure to radioactive material
- Radiation emissions and associated risks of the types of radioactive material that have been found on the SSSB
- ALARA work principals and techniques, such as methods used to minimize exposure, purposes, and functions of protective devices
- Purpose and proper use of dosimetry
- Storage, transfer, or use of radioactive material
- Radiologically controlled area restrictions and postings

- Applicable regulations and licenses for the protection of personnel from exposure to radioactive material
- Recognition of site-specific radiation hazards
- Notification procedure for radioactive material found in an area where it is not anticipated
- Notification procedure and expected actions in the event of an emergency, breakage, or spill of radioactive material
- Contamination control
- Radiation survey instrumentation
- Responsibilities of employees and management.

A written examination will be given to each radiation worker. Successful completion of radiation training requires 80 percent or higher on the examination.

6.3.3 General Safety Training

The work force will also receive general and specific safety training in accordance with APTIM requirements as specified in the APP. Training for the SSSB workforce will include our standard construction training that includes (as a minimum):

- Asbestos and Lead Awareness Training
- Powered Industrial Trucks – Forklifts
- Crane and Rigging Operations
- Hazard Communication
- Personal Protective Equipment (PPE) and Respiratory Protection
- Confined Space and Enclosed Space Entry
- Lock out Tag out
- Hearing Conservation
- Fall Protection and Ladder Safety
- Fire Extinguisher Use
- Electrical and arc flash safety
- Welding, cutting, and brazing safety
- Heat and cold stress
- Ergonomics.

In addition, the workforce specific to asbestos-containing material (ACM) abatement will also receive asbestos worker training and Hazardous Waste Operations and Emergency Response (HAZWOPER) training.

6.4 Contractor Support

6.4.1 Quality Assurance Manager

The QAM is APTIM's corporate management representative for quality and will report to senior management with lines of communication to the SSSB PM. The QAM will be responsible for ensuring that the SSSB project team implements both the Corporate as well as the site-specific policies and procedures required under the contract and that corrective actions are taken when performance does not meet internal requirements. The QAM will work closely with the PM and SM to ensure that established protocols and quality procedures are implemented and that the work is performed in accordance with the contract and this DWP. The QAM is responsible for directing, planning, implementing, and tracking quality activities and maintaining internal project and corporate communication on quality. They are responsible for auditing the project records and periodically reviewing the control measures and contents of the SSSB project SharePoint portal. Additionally, the QAM will ensure adequate personnel are assigned to the project and that data evaluation, data verification, and reporting procedures are followed. The goal of these activities is to perform work and produce data that satisfies the decommissioning objectives as defined in this DWP.

6.4.2 Program Health, Safety, and Environmental Manager and Site Safety and Health Officer

The APTIM HSE Manager and SSHO will provide health and safety oversight and will communicate and coordinate decommissioning activities with the PM and SM. The SSHO is responsible for verifying that site safety and health requirements are followed and that site personnel are appropriately trained as required.

6.4.3 Project Chemist

The APTIM Project Chemist is responsible for overseeing all sampling and analytical activities associated with the SSSB project. The Project Chemist will communicate and coordinate decommissioning activities with the PM and SM and liaison with all subcontracted analytical laboratories. The Project Chemist is responsible for writing and maintaining the project Sampling and Analysis Plan (SAP), verifying that sampling equipment and procedures are correct and documentation requirements are followed. The Project Chemist will coordinate with the laboratories on incoming samples, analytical methodology, and data and reporting requirements. The Project Chemist will also receive and review analytical reports and oversee and manage laboratory-provided electronic data.

7.0 Health and Safety Program During Decommissioning: Radiation Safety Controls and Air Monitoring for Workers

APTIM will administer a comprehensive RPP (Attachment 1) in support of the SSSB D&D project. The RPP abides by the elements of the APTIM Radiation Safety Program (see Attachment 2) that are applicable to this work. The RPP contains the list of implementing procedures to be used for the SSSB radiation protection program.

As part of the RPP, Emergency Response is an integral part of the program. This is detailed in APTIM procedure APTIM-SSSB-002, *Emergency Response*, and covers the requirements of 10 CFR 20, Subpart M and will be covered in detail as part of radiation worker training. Specifically, it addresses the response and notification requirements for incidents including personnel injury, radiological spills, personnel over-exposure and off-scale dosimetry, loss or theft of radioactive material, fire in radiologically controlled areas and releases to the environment and the public. Notification requirements are specified in the procedure and will include both the NRC and NAVSEA. The NRC and NAVSEA will also be included in incident reporting to other regulatory or government entities such as non-radiological incidents. All reportable incidents including any as outlined in the DWP and RPP will be included in the APTIM Radiological Improvement Report for corrective action reporting.

This section provides details of the radiological health and safety program elements from the RPP as called out in NUREG-1757, Rev 1, Appendix D.2, Decommissioning Plan Checklist.

7.1 Workplace Air Sampling Program

As part of the radiation protection program during D&D of the SSSB, a comprehensive air monitoring program will be implemented to monitor project personnel. This will include a combination of low volume general area air sampling where radiological work is being performed and areas where is discharged surrounding areas as determined necessary by project health physics personnel. This may also include low volume breathing zone air samples and high-volume air samples when breaking into systems where there may be a higher potential for resuspension of radioactivity.

Air samplers will be appropriately placed to best represent the workforce breathing zones. If there is a high potential for generating airborne contamination or if respiratory protection is

being worn for radiological protection purposes, a breathing zone air sampler may be used to be more representative of the workers breathing zone.

Generally, air samples will run for sufficient duration to monitor workers exposure during the task performance and to achieve a detection limit of 10% of the Derived Air Concentration (DAC) for the nuclide of interest, Co-60. High-volume air samples will run for a period of time as designated by the project health physicist or radiation safety officer to ensure adequate volume to meet detection sensitivities (i.e., 10% of the DAC) during higher risk activities.

Air samples will be analyzed on-site by gross alpha/beta counting following adequate time (up to 72 hours) to allow radon daughters to decay. Air sample results will then be compared to the 10 CFR 20 Appendix B Table 1 Column 3 limits for occupational exposure for the most limiting radionuclide of concern, Co-60 at 1E-08 µCi/ml. Detection sensitivities for air samples will be set at 10% of the occupational DAC to the maximum extent practical depending on the air sampling volume. Any sample results exceeding 10% of the DAC will be investigated and the sample sent for off-site analysis as directed by the project health physicist or radiation safety officer. This investigation will include a review of the work being performed at the time of the elevated air sample, radiological controls implemented and additional controls and work practices that could be implemented to further control the generation of airborne activity. An incident evaluation will be performed and documented on a Radiological Improvement Report for unplanned exposures resulting in more than one DAC-hr of exposure. Corrective actions will be tracked for completion. If necessary, a dose assessment will be performed for any individual that may have been exposed to airborne activity in excess of the exposure limits.

Considering airborne contamination is not anticipated, continuous air monitoring using continuous air monitors will not be utilized. All air sampling equipment will be calibrated annually, and the flowmeter checked daily when in use. If the flow meter is out of tolerance, the air sampler will be removed from service and replaced.

7.2 Respiratory Protection Program

The use of respiratory protection for radiological purposes is not anticipated during the SSSB decommissioning and dismantlement. Based on historical documentation of prior decontamination efforts, the levels of residual contamination remaining, other than the wet pit and associated systems, is anticipated to be low. Residual contamination levels will be verified during characterization surveys upon APTIM taking possession of the SSSB. Radiological controls will be implemented such that the resuspension of any residual contamination will be

minimal. This will be accomplished through the use of localized HEPA ventilation, survey and monitoring surfaces prior to any cutting operations, use of containment where applicable, good housekeeping practices and contamination control such as HEPA vacuuming, application of fixatives, and surface decontamination. In addition, the wet pit and associated systems are wet and the potential for any resuspension is low.

Although respiratory protection is not anticipated, a comprehensive air sampling program will be implemented as part of the radiation protection program including general area air sampling to assess airborne radioactivity representative of the workers breathing zone, or as determined necessary, low volume breathing zone samplers.

Throughout the project, all planned work and air sampling data will be reviewed and assessed whether respiratory protection will be needed. If it is determined that any individual is expected to receive an intake in excess of 10% of the allowable limit of intake through inhalation over the course of the calendar year (i.e., 200 DAC-hours) or an intake of 12 DAC-hours in a week, the implementation of a respiratory protection program may be necessary. Considering the use of respiratory protection reduces worker efficiency, an assessment will be made whether the individual will receive more dose by wearing respiratory protection from external sources from the extended work time versus the potential dose from inhalation. If it’s determined that wearing a respirator will save occupational dose and there is not significant additional safety risk as a result of wearing a respirator, the respiratory protection program will be implemented.

If needed, a respiratory protection program will be implemented for airborne particulate using respirators with HEPA filters. Depending on airborne concentration levels, appropriate respiratory protection will be selected on the protection factors necessary. The respiratory protection program will include additional worker training and field implementing procedures or work instructions for the proper selection and use, decontamination and survey, issue, storage and maintenance of respirator protection.

Prior to placing anyone in a respirator, each individual will go through a physical and medical evaluation to determine if the individual can wear a respirator. They will be fit tested using a quantitative fit testing for the specific type and size respirator that they will be issued.

The radiological air sampling and respiratory protection programs are described in Sections 5.5, 11.0, and 13.0 of the RPP and in the following project procedures:

- APTIM-SSSB-016, *Air Sampling and Analysis*

- APTIM-SSSB-021, *Respiratory Protection Program*
- APTIM-SSSB-022, *Respirator Fit Testing*
- APTIM-SSSB-023, *Selection and Use of Respiratory Protection Equipment*
- APTIM-SSSB-024, *Inspection, Maintenance and Control of Respiratory Protection Equipment*.

These procedures incorporate the requirements and guidance contained in 10 CFR 20, Subpart H – Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas; *Manual of Respiratory Protection Against Airborne Radioactive Materials* (NUREG/CR-0041) (NRC, 2001); and *Regulatory Guide 8.15, Acceptable Programs for Respiratory Protection* (NRC, 1999). Topics addressed include, but are not limited to, medical evaluations, personnel training, fit testing, use of equipment, protection factors, and air monitoring approved by the National Institute for Occupational Safety and Health.

7.3 Internal Exposure Determination

Internal exposure is not anticipated to be of concern for the SSSB D&D. Significant internal exposure risks, specifically the risk of exposure through ingestion or inhalation, are not expected to be encountered during decommissioning activities, as most of the radioactivity is part of a “wet” system. Although not anticipated, work will be routinely evaluated by use of work area monitoring including contamination surveys and air monitoring to determine if internal dose assessment by in-vitro or in-vivo monitoring is required.

If personnel are part of a respiratory protection program for airborne radiological hazards a bioassay program or DAC-hr tracking system will be implemented to document internal exposure to personnel.

7.4 External Exposure Determination

For the majority of the SSSB decommissioning and dismantlement, external exposure is not anticipated to be of significant concern other than during the removal of the wet pit and associated systems and components. However, as a precaution, external exposure monitoring will be performed throughout the duration of the project for all project personnel trained as radiation workers entering radiologically controlled areas. The requirements to wear dosimetry on entry will be specified in the Radiological Work Permit (RWP). External exposure monitoring will be performed in accordance with the project RPP and in accordance with 10 CFR 20.1502(a) and 20.1601.

External monitoring will be performed by issuing a whole-body thermoluminescent dosimeter (TLD). A National Voluntary Laboratory Accreditation Program accredited dosimetry service will be utilized to provide dosimetry. Dosimeters will be exchanged and read quarterly. As additional information is assessed during vessel characterization and work area monitoring, more frequent TLD exchange may be required, as determined by the project health physicist and/or project radiation safety officer, if there is a potential for workers to receive in excess of 25% of their allowable dose in a quarter.

Based on initial assessments, it is not anticipated that there will be non-uniform dose fields requiring multiple dosimetry or extremity dosimeters with the possible exception of handling components and waste streams from the wet pit. As necessary, an assessment will be made whether extremity dosimetry (finger rings) will be required if the contact dose rates exceeds the general area whole body dose rates by a factor 10 and the potential extremity dose is anticipated to exceed 10% of the extremity dose limits.

The use of electronic dosimeters with dose rate and cumulative dose alarms is not anticipated. However, an assessment will be made as additional information is obtained relative to tasks where there may be potentially higher dose work.

To support external dose monitoring, routine surveys will be performed of the work areas including dose rate surveys and air sampling. These will be performed in accordance with the project RPP to support area postings and entry requirements. Survey results will be made available to all project personnel entering a posted area, as applicable, such that they aware of the radiological conditions and can maintain their exposure ALARA, and to support any dose assessments in the event of a lost dosimeter or radiological event.

Qualified visitors and project personnel not routinely entering a posted RCA requiring dosimetry may either be issued a TLD or self-reading dosimeter to monitor external exposure in accordance with the project RPP.

All project dose will be actively monitored to ensure project personnel do not exceed the dose limits and to provide project management notice when any individual is approaching their allowable dose such that the dose may be managed appropriately.

7.5 Summation of Internal and External Exposure

As part of the personnel monitoring program, each individual’s total dose from internal and external exposure shall be monitored and summed as applicable. Occupational and project dose

limits are based on a total effective dose equivalent to an individual which is the cumulative dose from external and internal exposures.

7.6 Contamination Control Program

Contamination controls will be implemented during the D&D of the SSSB. This will include a combination of engineering controls to contain or reduce the levels of contamination present and administrative controls to minimize the potential spread of contamination. This will ensure a controlled process to ensure the safety of project personnel and prevent any impact to the public and environment.

Prior to siting the vessel for D&D, the work area will have a baseline survey performed to document background levels of radiation. This will provide a baseline on which to compare the FSS data on completion of the project to ensure the site was not impacted by project operations.

Upon taking possession of the vessel or once it is sited at ASY, characterization surveys of the vessel will be performed. Areas of the vessel will be properly controlled and posted to communicate the hazards present. As described in Section 11.4 of this DWP and in the RPP, routine surveys will be implemented once sited at ASY to monitor work areas to assess contamination levels and to ensure the proper radiological controls have been implemented.

To help minimize contamination levels, good housekeeping practices will be implemented. If routine surveys (as specified above) indicate an increase in contamination within a work area, efforts will be made to reduce contamination levels such as HEPA vacuuming or the use of fixatives, foaming, or strippable coatings. When removing systems, plastic drapes and/or containments will be used as appropriate to prevent the spread of contamination. To the maximum extent practical, non-aggressive techniques will be used during dismantlement of systems such as disassembly at mechanical joints. When destructive techniques are required for dismantlement such as burning or cutting, the cut/burn line will be identified and surveyed and decontaminated as necessary prior to cutting or burning.

RWPs will be implemented for all work in RCAs and when entering or accessing an unknown system. The RWP will specify the necessary radiological controls, level of PPE, level of health physics coverage and personnel monitoring and survey requirements.

Each RCA will have a control point where area access is controlled. Equipment, materials and personnel will access and egress the RCA through the control point. All personnel leaving an RCA shall doff any PPE and perform a whole-body frisk in accordance with the RWP. All M&E

leaving an RCA shall be surveyed/frisked for release for unconditional use in accordance with the RPP.

Action levels will be established to help determine when additional radiological response (e.g., PPE upgrades or changed work techniques) and/or investigation may be necessary. The action levels for radiological controls are given below.

Measured Parameter/ Threshold	Alpha [a] Removable Contamination (dpm/100 cm^2)	Alpha [a] (Fixed + Removable) Contamination (dpm/100 cm^2)	Beta/Gamma [a] Removable Contamination (dpm/100 cm^2)	Beta/Gamma [a] (Fixed + Removable) Contamination (dpm/100 cm^2)
Unrestricted Release [b]	<20	<100	<1,000	<5,000
Administrative Controls Required [c]	≥20	≥100	≥1,000	≥5,000
Engineering Controls Required [d]	≥2,000	≥10,000	≥20,000	≥100,000

Notes:
[a] Not applicable to volumetric contamination.
[b] Unrestricted release means there is no detectable activity. No detectable activity means that the measured radioactivity is not statistically different than background variations when determined using instrumentation that have the sensitivities listed in this table. Material found to exceed the unrestricted release criteria is segregated from material that does not exceed the free release criteria by a Contamination Area boundary.
[c] Minimum administrative controls include establishment of physical boundaries, postings, controls for access and egress, Radiological Work Permits, and the use of personal protective equipment.
[d] Engineering controls supplement administrative controls, are specified in the applicable Radiological Work Permit, and though not required, are applied at lower values.

When an action level is exceeded, the measurement is confirmed to ensure that the initial measurement/sample actually exceeds the particular action level. This may involve collecting additional measurements of the same type as the original measurement to confirm the initial result and, as appropriate, to quantify and/or remove the area of elevated residual radioactivity.

Periodic leak tests (upon receipt and every three months for alpha-emitting sources and every six months for beta-gamma emitting sources) will be performed on non-exempt sealed sources used at the SSSB project. Leak testing consists of collecting a smear sample collected on the source (encapsulated sources only) or the source storage container of electroplated sources and counting the smear. The smear counting instrument is able to detect less than 0.005 microcuries of activity. Results of the leak test are documented as a contamination or on a leak test record.

7.7 Instrument Program

Radiation detection instruments will be selected to detect the radionuclides of concern with adequate detection sensitivities based on the method and purpose of the measurement. For the SSSB project, instruments will be used for collecting direct alpha and beta measurements,

surface scans for beta activity, measurements for removable alpha and beta activity and general area dose rates. Samples collected for isotopic analysis or the analysis for hard to detect radionuclides will be sent to an off-site accredited lab for analysis. This may include analysis by liquid scintillation for gross low energy beta or isotopic analysis by gamma spectroscopy or other specific isotopic analysis methods.

A general list of on-site instrumentation to be used is provided in Table 7-1, or equivalent, along with the types of radiation detected, types of measurements to be performed, and estimated detection sensitivities. Instrument detection sensitivities for static and scan measurements will be calculated in accordance with procedure or work instruction following the guidance of NUREG-1507 and as described in Appendix A of NRC NUREG-1757, Vol. 2, Rev. 1, *Consolidated NMSS Decommissioning Guidance*.

Table 7-1
Site Instrumentation

Detector	Type of Radiation	Calibration Source	Estimated Efficiency [a]	Estimated MDC [b]	Use
Ludlum Model 44-9	Beta (GM)	Tc-99	29 %	3,400 dpm/100 cm^2	Frisking
Ludlum Model 44-40	Beta (GM)	Tc-99	29 %	2,300 dpm/100 cm^2	Frisking
Ludlum Model 44-116	Beta (Plastic)	Tc-99	23 %	1,200 dpm/100 cm^2 (fixed) 3,600 dpm/100 cm^2 (scan)	Direct Measurement and Scans
Ludlum Model 43-90	Alpha (ZnS)	Pu-239	31%	75 dpm/100 cm^2	Direct Measurement
Ludlum Model 43-37	Alpha/Beta (GFP)	Tc-99	31 %	340 dpm/100 cm^2 (fixed) 1,100 dpm/100 cm^2 (scan)	Direct Measurement and Scans
Ludlum Model 43-37-1	Alpha/Beta (GFP)	Tc-99	31 %	280 dpm/100 cm^2 (fixed) 900 dpm/100 cm^2 (scan)	Direct Measurement and Scans
Ludlum Model 3002 (43-147 x 2)	Alpha/Beta (ZnS / Plastic)	Tc-99	23 %	580 dpm/100 cm^2 (fixed) 1,900 dpm/100 cm^2 (scan)	Direct Measurement and Scans
Ludlum Model 2929 / 3030	Beta (Dual Phosphor)	Tc-99	25 %	15 dpm/100 cm^2 (smear) 1E-12 μCi/ml (Air Sample)	Smear and air sample counting
Ludlum Model 2929 / 3030	Alpha (Dual Phosphor)	Th-230	30 %	30 dpm/100 cm^2 (smear)	Smear
Ludlum Model 44-10	Gamma (NaI[Tl])	Cs-137			Surface Scans
Eberline HP-270	Gamma (GM)	Cs-137		0.1 mR/hr	Dose Rates / Shipping
Eberline RO-20	Gamma (Ion Chamber)	Cs-137		0.05 mR/hr	Dose Rate Surveys
Ludlum Model 78	Gamma (GM)	Cs-137		0.1 mR/hr	Dose Rates/Shipping
Ludlum Model 19	Gamma (NaI[Tl])	Cs-137		0.1 μR/hr	Dose Rate Surveys

[a] The estimated instrument efficiencies as listed for field instruments used for direct measurement and surface scans are the 2 pi surface efficiencies calculated from the manufacturers reported 4 pi efficiency assuming a 30% backscatter.

[b] Detector sensitivities for beta are based on 1-minute background and sample counts and a one-detector-width scan speed using a surface efficiency of 25% with the exception of the air sample MDCs and smears. Smear MDCs are based on a 20-minute background and 1-minute sample count and air samples are based on a 20-minute background and a 10-minute sample count with a 4-hour sample collection volume using the manufactures reported 4 pi efficiency with no surface efficiency correction. Alpha counting assumed 3-minute sample counts for smears and a 2-minute count for direct alpha.

MDC – minimum detectable concentration.

GM – Geiger–Müller.

The detectors as listed, or equivalents, may be paired with a variety of analog or digital counters. Examples include the Ludlum Models 3, 12, 2221, 2350-1, and 2360 depending on use and availability. The estimated detector sensitivities provided are based on the table footnote. Detection sensitivities may vary based on actual background, background and sample count times, and scan speeds. It is anticipated that the actual background as measured on the vessel at the project site will be less than the background used in the MDC calculation which assumed a 10 μR/hr field.

To support project operations, an adequate number of instruments will be maintained on-site to support all radiological operations, control points and surveys. An adequate instrument reserve will also be maintained in the event an instrument is removed from service and to enable continued operations without interruption.

Instruments will be stored in a centralized location to ensure their protection from damage when not in use. Instruments will be initially set up (i.e., baseline) to establish background levels and instrument response to a check source in accordance with procedure or work instruction. These baseline measurements (minimum of 10) will be used to establish performance criteria against which the instrument will be source checked daily when in use to ensure the instrument is operating properly and within the established acceptance criteria. If an instrument fails the source check, it will be removed from service and tagged for repair and recalibration if necessary.

All portable survey instruments will be calibrated on an annual basis. When an instrument is due for calibration, the instruments will be sent to an off-site accredited facility for calibration in accordance with American National Standards Institute Standard N323A-1997, *American National Standard, Radiation Protection Instrumentation, Test and Calibration, Portable Survey Instruments*. Air samplers used for environmental and general area sampling will be calibrated annually. Breathing zone samplers are calibrated on-site before and after each day of sampling using an electronic flow calibrator (e.g., Gilian Gilibrator, Bios Defender, Buck Calibrator).

7.8 Nuclear Criticality Safety

Nuclear criticality is not applicable to the D&D of the SSSB. The radionuclides of concern consist of activation and mixed fission products only. No alpha-emitting isotopes, specifically fissionable isotopes, are anticipated.

7.9 Health Physics Audits, Inspections and Recordkeeping Program

To ensure effective implementation of the Radiation Protection Program and ensure worker safety, workplace surveillances and inspections will be implemented for the SSSB project. This will include monthly surveillances of work areas, work practices and radiological controls, area postings and records by the PRSO and/or health physics staff (e.g., project health physicist, Radiological Control Supervisor, Radiological Control Technicians [RCT]). Depending on work activities being performed and associated radiological risk, higher risk activities will receive more frequent review and inspection as determined by the PRSO. In addition, all work activities will be actively monitored by the health physics staff as specified on the RWPs based on radiological risk ranging from part time to full RCT coverage. The RCTs will be responsible for actively monitoring work activities, performing surveys and ensure the project staff use good radiological control practices and are properly monitored.

An annual review of the Radiation Protection Program as a whole will be performed by radiation safety management or their designee. This will be an overall review of all Radiation Protection Program elements to ensure proper implementation.

All inspections, surveillances and audits will be documented and reviewed by the PRSO and/or project management and maintained with the project records. Any deficiencies will be identified, tracked and appropriate corrective actions identified and implemented. Follow-up inspections and surveillances will be performed to ensure any corrective actions have been implemented and that the deficiencies have been remedied. Any deficiencies requiring regulatory notification will be identified and the appropriate notification made within the necessary time limits.

8.0 Environmental Monitoring and Control

As part of the SSSB decommissioning, the work shall be controlled to eliminate site emissions as a result of project activities to the maximum extent practical. The project site and decommissioning work will be actively monitored and evaluated to assess any potential impact to the public and surrounding environment to ensure any public exposure is maintained within and well below the regulatory limits as established in 10 CFR 20.

The exposure limits for members of the general public to radioactive materials are provided in 10 CFR 20.1101, *Radiation Protection Programs,* and 10 CFR 20.1301, *Dose Limits for Individual Members of the Public*. 10 CFR 20.1301 (a) (1) specifically states that operations shall be conducted such that:

> *"The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year, exclusive of the dose contributions from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under § 35.75, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive materials into sanitary sewerage in accordance with § 20.2003."*

Additionally, 10 CFR 20.1101 (d) states that the Radiation Protection Program shall:

> *"implement the ALARA (as low as reasonably achievable) requirements of § 20.1101(b), and notwithstanding the requirements in § 20.1301 of this part, a constraint on air emissions of radioactive material to the environment, excluding Radon-222 and its daughters, shall be established by the licensees other than those subject to § 50.34a, such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent (TEDE) in excess of 10 mrem (0.1 mSv) per year from these emissions."*

10 CFR 20.1301 and 10 CFR 20.1302 further state that the effective dose equivalent in any unrestricted area may not exceed two mrem per hour and that the maximum allowable dose to the public from effluents is 50 mrem per year as listed in Appendix B of 10 CFR 20. It also states that the 100 mrem per year dose limit includes doses from all pathways, including direct radiation, liquid effluents (other than permitted sanitary sewer disposal), and air emissions.

8.1 Environmental ALARA Evaluation Program

In general, the primary dose pathways during the SSSB decommissioning will be from potential direct exposure, air emissions, and site run-off from rain events. Soil and groundwater are not anticipated to be dose pathways as the SSSB will be located on a concrete pad and any radiological work contained to the maximum extent practical in an area equipped with a berm and a liner.

8.1.1 Description of ALARA Goals for Effluent Control

The ALARA goals for the SSSB decommissioning project are to prevent any release to the environment and minimize any potential exposure to the public.

8.1.2 Description of Procedures, Engineering Controls, and Process Controls to Maintain Doses ALARA

Although, the potential dose pathways from effluent have been identified to be primarily from air emissions, surface water runoff, and direct exposure, release, or exposure to the public and environment is not anticipated.

Upon arrival at ASY, the SSSB will be placed on blocks atop an impermeable liner. The berm will be placed around the perimeter of the SSSB work area liner. During the initial stages of the project, most contaminated structures, systems, equipment and remaining wet pit water will be packaged and removed using the existing SSSB containment structure and ventilation system. Since contaminated surfaces interior to the vessel will not be exposed to the weather, storm water will not be collected during this time.

Once removal of SSSB structural surfaces commences and potentially contaminated surfaces are exposed, the berm surrounding the perimeter of the SSSB work area liner will be closed and storm water coming in contact with the vessel will be collected, sampled and properly disposed. These engineering controls are intended to control potential releases to the environment via surface water runoff. Although surface water run-off is listed as a potential public exposure pathway it is not anticipated to be. The monitoring of any potential run-off as collected in the stormwater drains and potential discharge locations is summarized in the Environmental Monitoring Plan.

The controls to be established to safely perform the decommissioning work while protecting the public and the environment include but are not limited to the following:

- Established security boundary limiting public access to the work area;

- Installation of an impermeable liner over the SSSB work area,
- Installation of berm around the perimeter of the work area liner.
- Performing work in accordance with a comprehensive radiation protection program and implementing procedures and work instructions;
- Performing radiological work in containment or within the confines of the vessel to the maximum extent practical;
- Use of a negative-pressure containment for sizing SSSB sections;
- Establishing contamination controls and performing routine surveys to ensure adequate controls;
- Use of HEPA-filtered ventilation and exhaust air flow from controlled areas;
- Surface water diversion, control, and management

Building exhaust air will be HEPA filtered and operated to ensure air flow is directed from areas with less potential for contamination to areas with more potential for contamination. Movable air equipment and local ventilation will be installed to maintain building and system pressure at approximately -0.1 inches of water or more and tested or monitored using air flow meters or pressure gauges. All air-handling equipment will be operated and maintained in accordance with the manufacturer's recommendation.

The CS ventilation will include roughing filters, pre-filters, and a HEPA filter bank. Roughing and pre-filters will be routinely changed to protect downstream HEPA filters. Differential pressures for the CS will be established and openings tested using smoke testing or flow meters to ensure adequate flow through sized openings and into exhaust ducts, with minimum capture velocities of approximately 100 linear feet per minute.

Aerosol testing of HEPA filter banks will be done on initial installation or operation. If a test fails to achieve the require removal efficiency, the system seals will be inspected, resealed, and the system retested until it passes. Additionally, if negative pressures cannot be maintained, operations will be stopped until the ventilation and air-handling systems can be restored to meet operating specifications.

8.1.3 Description of ALARA Reviews and Reports to Management

Environmental monitoring will be performed and the sample results routinely reviewed by health physics personnel to ensure all site emissions are within the regulatory limits. Additionally, the

data will be reviewed on a quarterly basis and a trend analysis performed to ensure the adequacy of project controls and to identify any potential control problems that need to be addressed before becoming a significant problem. All environmental sample results will then be reported to project management and reported quarterly with an annual public exposure report.

8.2 Effluent Monitoring Program

An Environmental Monitoring Plan has been developed specifying the environmental monitoring requirements for the SSSB D&D project (see Attachment 3 of this DWP). Based on the potential dose pathways, sampling locations, frequencies, and detection limits are specified to ensure regulatory compliance.

1. Demonstration that background and baseline concentrations of radionuclides in environmental media have been established through appropriate sampling and analysis:

To ensure adequate project controls, a site baseline shall be established to determine natural background levels in the area and an Environmental Monitoring Plan established to monitor potential site emissions over the course of the project.

The Baseline Survey shall be performed at established sampling locations prior to the arrival and siting of the SSSB for decommissioning. The baseline survey will serve two purposes:

- Establish baseline survey and sample data for comparison with the final survey data on completion of project activities to ensure the site was not impacted by project operations
- Establish baseline survey and sample data for soil/sediment (i.e., run-off areas) against which environmental monitoring data will be compared to verify any potential public exposure is maintained within all regulatory limits and ALARA during execution of the project.

The Baseline Survey Plan for the SSSB D&D project is included as Attachment 4 of this DWP.

2. Description of the known or expected concentrations or radionuclides in effluents:

The anticipated dose pathways are air emissions and direct exposure with a potential for surface water runoff. Air emissions from the containment structures (i.e., the SSSB and the CS) will be HEPA filtered prior to discharge to public areas and a secured perimeter established to restrict access of members of the public to project operations. All emissions are anticipated to be at background or near background levels.

3. Description of the physical and chemical characteristics in effluents:

Any site effluent would be the result from the resuspension and emission of contamination or the spread of contamination from the lack of contamination controls. Contamination will be particulate or solid oxide form and not be easily dispersed. Any potential for emission will be routinely evaluated as part of the radiological protection program to ensure adequate project controls.

4. Summary or diagram of all effluent discharge locations:

As part of the Environmental Monitoring Plan, site discharge points, and sampling locations will be identified. Surface water drainage will be mapped out and sanitary and stormwater discharge locations identified and controlled. Air samplers will be located near air discharge locations and at positions around the site perimeter based on a review of wind rose data with samples collected at a minimum of four perimeter locations with one in the predominant downwind and one in the upwind directions. The other two will be placed as directed by health physics. Additional sampling locations may be specified and/or existing sample locations moved as necessary depending on the time of the year and predominant wind directions.

5. Demonstration that samples will be representative of actual releases:

Samples will be collected at locations that will be representative of potential releases. Sample locations are specified in the Environmental Monitoring Plan. Air samples will be collected near air discharge locations and along the site perimeter in primary wind directions around the perimeter of the site where the public can access and dosimeters will be posted around the site perimeter

6. Summary of the sample collection and analysis procedures, including the minimum detectable concentrations of radionuclides:

Samples will be collected and controlled in accordance with SAP to ensure proper collection techniques, sample quantity, sample control and custody and QA measures are met. Detection sensitivities for sample analyses shall be specified and communicated to the analytical lab to ensure the regulatory monitoring and project action limits are met.

7. Summary of the sample collection frequencies:

Perimeter dosimeters will be exchanged on a quarterly basis. Perimeter environmental air samplers will be operated continuously and changed weekly. All other environmental samples such storm water and sediment samples will be collected on a quarterly basis.

8. ***Description of the environmental monitoring recording and reporting procedures:***

All environmental monitoring sampling results will be reviewed and reported on a quarterly basis. This will include a summary of all environmental sample results and any trend analyses.

9. ***Description of the quality assurance program to be established and implemented for the effluent monitoring program:***

QA measures will be specified in the SAP including the collection of split/duplicate samples, instrument quality control (QC) sample quantities, detection sensitivities and reporting.

8.3 Effluent Control Program

1. ***Description of the controls that will be used to minimize releases of radioactive materials to the environment:***

Controls will be implemented to minimize any potential for release of radioactive materials. This will include both administrative and engineering controls. The types of controls are summarized in Section 8.1.

2. ***Summary of the action levels and description of the actions to be taken, should a limit be exceeded:***

Action levels below the regulatory limits will be established requiring investigation to ensure the proper radiological controls and measures are being implemented. These action limits will be established at 50% of the applicable effluent limits for the radionuclides of concern as listed in 10 CFR 20 Appendix B Table 2. However, for air emissions, the Action limit will be 20% of the Appendix B Table 2 Column 1 limits as these are based on a committed effective dose equivalent of 50 mrem/year and the 10 CFR 20 ALARA limit for air emissions is not to exceed 10 mrem/year.

3. ***Description of the leak detection system for ponds, lagoons, and tanks:***

There are no impacted ponds, lagoons or tanks that require leak detection.

4. ***Description of the procedures to ensure that releases to the sewer systems are controlled and maintained to meet requirements of 10 CFR 20.2003:***

Sewer discharge is not permitted over the course of the project without a discharge permit. Surface water drainage patterns will be evaluated and surface water diverted or controlled from entering the public or storm water sewer systems. Additionally, as radiological work will be performed within the confines of the vessel or within containment, any surface water from the project site should not be impacted.

5. Summary of the estimates of doses to the public from effluents and a description of the method used to estimate public dose:

As specified above, an annual public dose assessment will be performed and reported as part of the annual environmental monitoring report using the environmental monitoring data as collected in accordance with the Environmental Monitoring Plan, including perimeter TLD and air monitoring data. The report will include a summary of the sample results and a determination of the estimated exposure to the critical member of the public including dose assessment methods. This will include a review of the perimeter dosimeter results against background samples at a remote location, direct comparison of effluent sample concentrations against the applicable 10 CFR 20 Appendix B effluent limits. As necessary, occupancy factors may be used as a member of the public will not be continuously located at the site perimeter; however, the concentrations within any site effluent are anticipated to be at background levels so this should not be necessary.

9.0 Waste Management Plan

9.1 Purpose and Objective

The objective of this Waste Management Plan is to provide a systematic approach to the management of waste generated on the SSSB and describe how the various forms of waste generated during dismantlement will be handled and eventually disposed of or released for unrestricted use.

The Waste Management Plan provides an overall strategy for waste management activities implemented for all primary wastes generated by the dismantlement of the SSSB. In addition, this document describes the proper management of waste from generation to disposal, including characterization and segregation to meet the applicable disposal facility WAC. All waste generated during the decommissioning of the SSSB will be managed in accordance with all applicable federal and state laws and other documents that pertain to this project.

This Waste Management Plan is being prepared to address the following:

- Removal of all waste streams resulting from the demolition of the SSSB and its contents.
- Characterization, including sorting and sizing of waste in order to meet disposal site WAC and processing to meet state and federal disposition requirements
- Waste profile generation for the different waste streams being generated and submitted to the treatment, storage, and disposal facility (TSDF) to which the waste will be transported for final disposition
- Packaging of waste streams for compliant processing treatment and disposal.

9.2 Waste Management

All radiological and/or hazardous waste streams will be collected and stored within the confines of the SSSB until transported to the disposal facility. During the early stages of the project and prior to the initiation of LLRW-generating activities, an LLRW storage area will be established within the SSSB. This area will be sized to accommodate several IMCs. Packages of hazardous or LLMW will not be stored for a period exceeding 90 days; therefore, a RCRA storage permit will not be required for the project.

The APTIM Team will apply for and obtain a U.S. Environmental Protection Agency (EPA) identification (ID) number from the Alabama Department of Environmental Management

(ADEM) for the hazardous waste that will be generated during the SSSB D&D project via EPA RCRA Subtitle C Site Identification Form, EPA 8700-12. Because the proposed receiving TSDF, Waste Control Specialists, LLC (WCS), is located in Texas, APTIM will complete additional forms and send them to the Texas Commission on Environmental Quality (TCEQ) as well, including the following:

- Notification for Hazardous or Industrial Waste Management, TCEQ 00002
- TCEQ Core Data Form, TCEQ 10400.

These forms will have NAVSEA assigned as a generator of hazardous waste and the owner and operator of the site. Since the quantity of waste that will be generated from the decommissioning process will exceed 2,200 pounds in a given month, the forms will indicate that the ID Number is for a Large Quantity Generator. Large Quantity Generator requirements can be found at 335-14 of the ADEM Land Division-Hazardous Waste Program.

Once these forms are complete, draft versions will be provided to the NAVSEA for review and approval. Once approved, the finalized forms will be signed by the designated generator and provided to TCEQ, Permitting and Registration Support Division; Registration and Reporting Section (all three forms) and the TCEQ Central Registry Program (Form TCEQ 10400, only).

Packaged waste materials will be off-loaded from the SSSB and may be either placed directly on transport conveyances or staged for shipment in the SSSB Dismantlement and Survey area. The majority of waste will be shipped to WCS in Andrews, Texas. WCS has provided all appropriate easements and agreements for receiving the LLRW and LLMW streams that meet the Class A definition or for any waste streams that may exceed the Class A limit.

During the D&D of the vessel, the APTIM team will characterize waste in accordance with the applicable regulations, NAVSEA guidance, waste profile and procedural requirements, and the applicable TSDF WAC. Sampling and laboratory analysis will be performed as necessary when existing information is inadequate to make an accurate waste classification determination. All newly generated sampling and analysis data, documented field surveys, and historical process knowledge will be collected in the APTIM Team Electronic Data Management System.

APTIM will provide a WTDC to oversee all waste-related activities. This individual will establish waste management plans, characterization strategies, and implement all throughout the project. The WTDC will be supported by qualified staff and technicians dedicated to the project site on a day to day basis. These qualified and trained personnel will be on site observing the

waste items that are being packaged to ensure that they conform to the waste profile that has been assigned for the waste being loaded into the shipping containers. Characterization data will correlate to each waste stream. Supporting samples will be traceable to areas within the SSSB and will be used for confirming compliance with the waste profiles. Personnel will be trained and have knowledge of acceptable conditions for the TSDF to which the waste will be shipped for final disposition.

In an effort to minimize worker exposure to the hazardous and radioactive materials, the APTIM team will evaluate the components to be removed and remove them in the largest sections possible while maintaining compliance with packaging limitations and the disposal site WAC, thus reducing worker exposure, and the duration of the overall project. Chapter 5.0 of this DWP describes the general dismantlement, removal, and sizing sequence that will take place during the SSSB D&D. Hazardous material coatings such as lead-based paint or asbestos will be removed from the segregation or cutting points prior to any cutting being performed in that area. The removed constituents will be collected, characterized, and managed accordingly.

Pre-existing liquid waste streams may be present within the SSSB ballast, bilge tanks, pipes, sumps, pumps, motors, or holds. Any liquids collected or generated will be carefully controlled to minimize the potential for migration outside of the specified containment boundaries. The plan for management of the wet pit waters will be to collect representative sample(s) and conduct waste characterization testing on the water. The resulting characterization report will determine whether the wastewater will need an on-site filtration/treatment phase prior to disposal. After the SSSB is staged at ASY, the wet pit waters will be removed, filtered if necessary, and stored in either a bulk interim storage tank or containerized in 300-gallon totes. The wet pit wastewater will be profiled and shipped off site for treatment and disposal based on radiological, chemical, physical properties and regulatory waste status interpreted from the waste characterization results. All other liquid wastes generated during the dismantlement will be accumulated and stored appropriately and sampled for waste characterization and managed offsite per radiological, chemical and physical properties and regulatory waste status interpreted from the waste characterization results.

Some M&E on the SSSB will be free of chemicals or radioactivity and will be disposed as nonhazardous and nonradioactive waste designated for unrestricted use as appropriate. M&E will be accurately characterized to substantiate this designation. M&E deemed nonhazardous/solid waste will be subjected to exemption by rule processes as applicable and TSDF and state waste

acceptance and permit conditions. Unrestricted release M&E will be released per the requirements of the MARSAME process.

Waste PPE generated will be placed in plastic bags, marked and labeled, and placed in the containers of debris and other wastes destined for disposal.

9.3 Waste Characterization

The APTIM team will provide compliant characterization, dismantlement, waste segregation, packaging, treatment, and/or disposal of the various waste streams that will be generated during the decommissioning of the SSSB. All pieces of the SSSB will be characterized and categorized for appropriate disposition as LLRW, LLMW, hazardous waste, or unrestricted release.

Characterization data used to categorize waste and materials will be obtained from historical data (process knowledge), on-site surveys, and analysis and off-site laboratory analysis. The extent and type of data needed for disposition of a waste stream is dependent on the WAC or material acceptance criteria of the specific TSDF and dictated by the state in which the facility operates. The type of characterization data needed to disposition a waste or material will be described in the individual waste profiles.

The APTIM Team shall have controls in place to trace each sample number to a specific package number. The APTIM team has developed an Electronic Data Management procedure that describes that tracking process in detail. APTIM will evaluate sampling and analysis documentation to ensure that the samples will be representative of each waste stream and meet the regulatory and waste profile requirements for compliant disposal.

Characterization strategy and parameters for testing will primarily involve the SSSB RCOPCs discussed previously in Chapter 4.0 and summarized below in Section 9.5. However, other chemicals of concern or materials will be included as necessary in characterization strategies. Other potential chemicals of concern include metals (lead and chromium), polychlorinated biphenyls (PCB), and asbestos. Volatile organic compounds are also potential contaminants associated with oils and/or leftover or residual solvents that may be generated.

Universal Waste removed from the vessel may be packaged, stored, and released for unrestricted use per regulations found at 40 CFR 273. Examples of Universal Waste include mercury-containing equipment (switches, thermometers, thermostats, manometers), batteries, lamps, and aerosol cans. Universal Waste will be securely containerized, labeled with the words “Universal

Waste," and the contents of the container (e.g., mercury-containing equipment). Universal Waste may be accumulated onsite for no longer than one year from the date of generation.

APTIM waste management staff will work closely with receiving TSDFs to determine appropriate sample frequency and the compliant combination of analytical method and generator knowledge in accurately characterizing each waste stream.

9.4 Disposal Site Options

Scrap metal for unrestricted release will be collected using steel roll-off boxes located at the SSSB dismantlement site. Metals shall be segregated to the maximum extent possible by type. The disposition path for LLRW and LLMW will be to the WCS facility located in Andrews, Texas. Table 9-1 provides further details on the off-site disposal and recycle facilities.

Table 9-1
SSSB Disposal Site Options

Waste Classification	Proposed TSDF
Class A Low-Level Radioactive Waste (LLRW) Low-Level Mixed Waste (LLMW) Solids/Liquids	**Waste Control Specialists, LLC** 9990 W. State Hwy. 176 Andrews, TX 79714 LLRW/LLMW (License #: R04100 and Permit #: HW-50397) EPA #: TXD988088464
LLRW Exempt-by-Rule Solid Waste Determined to be Hazardous Waste Solids/Liquids	**US Ecology Texas** 3277 County Road 69 Robstown, TX 78380 EPA #: TXD069452340 **Chemical Waste Management** 36964 Alabama Highway 17 N. Emelle, AL 35459 EPA #: ALD000622464 **Clean Harbors Deer Park** 2027 Independence Parkway South La Porte, TX 77571 EPA ID #: TXD055141378

9.5 Radiological Contaminants of Potential Concern

A list of RCOPCs for the SSSB is provided in Table 9-2. This list was developed as part of the review of historical Navy barge characterization and operating records.

Table 9-2
Radiological Contaminants of Potential Concern

Isotope	Half-life (years)	2006 Ratio to Co-60	2006 Fraction of Total Activity (Normalized to 1 curie)	Total Activity after decay to 2021 (curies)	2021 Fraction of Total Activity (Normalized to 1 curie)	2021 Ratio to Co-60
Co-60	5.27E+00	1.00E+00	4.184E-01	6.635E-02	5.699E-01	1.000E+00
Co-58	1.94E-01	1.90E-01	7.950E-02	1.539E-23	1.322E-22	2.319E-22
Fe-55	2.70E+00	1.00E+00	4.184E-01	1.150E-02	9.876E-02	1.733E-01
Ni-63	1.00E+02	8.00E-02	3.347E-02	3.038E-02	2.610E-01	4.579E-01
Ni-59	7.50E+04	8.00E-04	3.347E-04	3.347E-04	2.875E-03	5.044E-03
C-14	5.73E+03	1.50E-02	6.276E-03	6.266E-03	5.382E-02	9.444E-02
Mn-54	8.54E-01	8.00E-02	3.347E-02	3.895E-07	3.346E-06	5.871E-06
Zn-65	6.68E-01	8.00E-03	3.347E-03	1.642E-09	1.411E-08	2.475E-08
Sb-125	2.76E+00	5.00E-03	2.092E-03	6.215E-05	5.339E-04	9.368E-04
Cs-137	3.01E+01	4.00E-03	1.674E-03	1.212E-03	1.041E-02	1.827E-02
Cs-134	2.06E+00	4.00E-04	1.674E-04	1.505E-06	1.293E-05	2.269E-05
Ag-110m	6.84E-01	6.00E-03	2.510E-03	1.745E-09	1.499E-08	2.631E-08
Sr-90	2.88E+01	2.00E-04	8.368E-05	5.974E-05	5.132E-04	9.005E-04
Nb-94	2.03E+04	2.00E-04	8.368E-05	8.364E-05	7.185E-04	1.261E-03
Tc-99	2.11E+05	4.00E-04	1.674E-04	1.674E-04	1.438E-03	2.522E-03
I-129	1.57E+07	2.00E-07	8.368E-08	8.368E-08	7.189E-07	1.261E-06
Sum		2.39E+00	1.000E+00	1.164E-01	1.000E+00	

These RCOPCs will serve as a baseline suite of analytes to initiate characterization activities. However, the combination of real time data and as generator/process knowledge becomes available the RCPOC could change. Any change to this list that may apply to a particular waste stream will be discussed, documented, and approved by all the appropriate generators parties and the receiving TSDF technical staff.

9.6 Waste Stream Descriptions

Estimates for the volumes and weights of the waste that will be generated during the decommissioning of the SSSB were taken from the SSSB Technical Manual. The estimates include assumptions on past characterization efforts as they pertained to the types, volumes, radiological properties, and classes of waste expected to be generated during decommissioning. Consequently, as real time characterization data and information become available quantities and classifications could vary from the following projections.

SOLID RADWASTE			
Waste Description	**Estimated Volume**	**Waste classification**	**Packaging and Treatment**
Metal, structural, material and equipment debris	177,849 cubic feet	LLRW/Class A (or) Exempt by Rule Solid Waste	IMC, Flat Bed with IP-1 soft sided bag Direct Land Disposal
Solid Contaminated Media such as dust, sediment, residual, filter media	2,160 cubic feet	LLRW/Class A (or) Exempt by Rule Solid Waste	IMC, Direct Land Disposal
PPE, project expendables, plastic, wood	8,100 cubic feet	LLRW/Class A (or) Exempt by Rule Solid Waste	IMC, soft sided bags Direct Land Disposal
Components and ancillary equipment	5,670 cubic feet	LLRW/Class A (or) Exempt by Rule Solid Waste	IMC, Flat Bed with IP-1 soft sided bag. Direct Land Disposal

LIQUID RADWASTE			
Waste Description	**Estimated Quantity**	**Waste Category**	**Packaging and Treatment**
Decontamination Waters/Liquids	12,000 gallons	Class A Or Exempt by Rule Solid Waste	Drums, Totes, Frac Tanks Wastewater Treatment Or Solidification and Land Disposal
Vessel Waters/Liquids	13,000 gallons	Class A Or Exempt by Rule Solid Waste	Drums, Totes, Frac Tanks Wastewater Treatment Or Solidification and Land Disposal

MIXED WASTE			
Waste Description	**Estimated Volume**	**Waste Category**	**Packaging and Treatment**
Metal Debris with lead shielding, shot or lead based paint	2,430 cubic feet	Class A Or Exempt by Rule Solid Waste	IMC, MACRO Bag satisfying the LDR treatment standard via microencapsulation And subsequent Land Disposal
Component with lead shielding, shot or lead based paint	3,240 cubic feet	Class A Or Exempt by Rule Solid Waste	IMC, MACRO Bag satisfying the LDR treatment standard via microencapsulation And subsequent Land Disposal
Lead Based Paint dust, chips, residual and contaminated media	1,620 cubic feet	Class A Or Exempt by Rule Solid Waste	Drum, B-12, B-25 MACRO Bag satisfying the LDR treatment standard via microencapsulation And subsequent Land Disposal Or Off-site Stabilization or Microencapsulation

Upon characterization the material will either be deemed radiologically impacted or non-radiologically impacted. Material that is radiologically impacted will be disposed at WCS in Andrews, Texas, as LLRW as shown in Tables 3-1, 3-2, 5-1, and 5-2. There will be no contaminated soils generated during the D&D of the SSSB.

9.7 Waste Handling and Loading

9.7.1 Packaging for Bulk Radiological Debris

LLRW debris waste will be packaged or containerized as it is generated. The unpackaged or packaged LLRW debris will be placed into IMCs. LLRW debris will be sized as needed prior to packaging or placing into IMCs. However, some debris items or concrete pieces will not be able to be sized and, for handling efficiency, may be placed individually into soft-sided bags to assist in safe handling. Placement of bags into IMCs may take place on the vessel or bags may be removed from the vessel and placed into IMCs on the ground within the D&D project site at ASY. Loaded IMCs on the SSSB will be lowered onto the ground for subsequent placement onto a transport vehicle.

IMCs or roll-off boxes will be IP-1-rated containers and conform to the following requirements:

- Bulk packaging must, at a minimum, meet the applicable requirements contained in 49 CFR 173.24, *General Requirements for Packaging and Packages*, and 49 CFR 173.410, *General Design Requirements*.
- Bulk packaging must be covered. The top must be completely enclosed with no opening along the sides or openings in the top.
- Bulk packages must also be tightly sealed to prevent waste from leaking out or water from leaking into the package.
- Bulk packages must not have any waste material or other material that could be mistaken for waste material on the outer surface.

These containers will undergo a receipt inspection prior to use to comply with all applicable DOT requirements. IMCs will be placed on flatbed trucks for waste shipments going to the rail transfer yard. These containers will be equipped with tie-downs or anchor points by which large items can be secured to prevent loads from shifting during transport. Outbound containers filled with waste will also undergo appropriate inspections to satisfy DOT requirements and Best Management Practices.

9.7.2 LLMW Debris and Components

LLMW debris and components will be placed into a MacroBag® on the vessel, if feasible. The MacroBag® will then be placed into an IMC either on the vessel or on the ground within the D&D project site at ASY. Individual MacroBags® will be braced and secured within the IMC for safe transport.

9.7.3 Wastewater

Existing contaminated vessel water, decontamination waters, and any other waters generated during the D&D activities will either be handled in liquid totes (sized at 275-330 gallons) or will be handled in bulk. If utilizing totes, the water will be pumped into the totes and the totes will be staged in interim storage on the ground within the D&D project site at ASY. When approved for shipping, the totes will be loaded onto flatbed trucks or tractor trailers and shipped over the road to the receiving TSDF. If the water is shipped by bulk, it will be pumped and stored in a temporary bulk tank (frac tank) on the ground within the D&D project site at ASY until approved for shipping. The water will be transferred to a 5,000-gallon tanker for over-the-road shipments. Alternatively, if the water is bound for WCS, eurotainers/isotainers may be utilized and shipped by rail utilizing the same logistics set up for the LLRW IMCs.

9.7.4 Small-Volume Waste Streams

Small-volume waste streams (e.g., radioactively contaminated lead paint chips and PCB-containing items and hazardous waste) will be packaged into metal drums, soft-sided bags, B-12 or B-25 boxes, and/or possible combinations of these. Waste will be placed in these non-bulk containers near the point of generation. If needed, Satellite Accumulation Areas will be established and used for storage on the vessel until the container is full. Once the container is full it will be staged in a designated interim storage area.

9.8 Waste Storage

All bulk radiologically contaminated waste will be stored in designated areas on the ground within the D&D project site at ASY. Non-bulk and/or hazardous waste will be stored in <90-day storage areas and will comply with regulations found at 40 CFR 262.17. This includes, but is not limited to, labeling all hazardous waste containers with the words “Hazardous Waste” and indicating the waste accumulation start date on all containers. APTIM will conduct weekly inspections of the <90-day storage areas and include necessary documentation. Each waste will be packaged and stored in compliance with applicable local and state, RCRA, DOT, and NRC requirements.

9.9 Waste Transportation

All IMCs of LLRW and LLMW (in MacroBags®) and eurotainers/isotainers of bulk wastewater will be loaded onto conveyances such as flatbed trucks at the Alabama Shipyard, properly secured, and shipped to a trans-shipment facility in Mobile, Alabama. Once at the trans-shipment facility, the shipping containers will be transferred onto railcars for rail shipment to WCS.

Non-bulk containers and totes may be shipped over the road utilizing tractor trailers and flatbed trucks directly from the SSSB project site to the receiving TSDF.

9.10 Documentation and Record Keeping

The waste management activities associated with the SSSB D&D project will be documented by APTIM from the point of waste characterization, through generation, to final packaging and disposition. Historical and newly generated characterization data will be used for each waste stream, as needed, that is being removed from the SSSB. This data will include waste container inspection, inventory, and closure information. The entire life cycle of each waste stream will be documented.

9.10.1 Field Activities Documentation

APTIM will account for and document all materials removed from the SSSB for disposal and/or unrestricted use. Field personnel will use waste inventory sheets to collect the information near the work area. As waste is deposited into a container, package, or conveyance, the field technician will enter the pertinent waste characteristics (e.g., waste description, source, hazardous or nonhazardous, asbestos) onto the waste inventory sheet. Once completed, the waste inventory sheet will be available for review and future use in preparing shipping and disposal papers.

Waste package movement from generation to disposal will be tracked and documented. Off-site tracking will be implemented through logging of shipping manifests, supplementary transportation data, and documentation.

9.10.2 Disposal Documentation

Documents and data collected will provide the capability to identify for each waste container, the type of waste contained, container type, volume of waste contained, pertinent waste stream profile, date loaded, date disposed, related container or waste material certifications, etc. Each package and/or conveyance will have a unique identifier that is traceable back to the waste origin. The unique waste container, package, or conveyance identifier will be linked to all chemical and radiological characterization data, package surveys, disposal location, shipment

identification and shipment/manifest documents, certification of disposal, and any other federal/state requirements.

All waste that is designated as LLRW will be manifested pursuant 10 CFR 20, Appendix G requirements by completing Forms 540, 541, and 542. APTIM will complete these forms and provide necessary back-up data and/or rationale to substantiate the DOT, EPA, and NRC shipping names and DOT classifications or when proper shipping names are not required. In the event Hazardous Waste or LLMW is generated, APTIM will complete EPA Form 8700-22 pursuant to 40 CFR 262.20. Additionally, all DOT manifesting requirements pursuant to 49 CFR 172 (C) for Class 7 and/or Class 9 materials, when applicable, will be satisfied.

10.0 Quality Assurance Program

10.1 Quality Assurance Program

A robust QA program will be implemented throughout the planning, execution, and reporting phases of the SSSB project. APTIM will manage and direct all QA activities. The following section describes aspects of the program including quality organization, the applicable elements of the QA program, document control, control of measure and test equipment, corrective action process, QA records and management, and audit and surveillance procedures. Refer to Chapter 11.0 of this DWP for the specific radiological surveying methodology and associated QA.

10.2 Organization

The SSSB Project Management and Organization are discussed in Chapter 6.0 of this DWP. APTIM will coordinate all QA efforts for the SSSB project including teaming partners, subcontractors, and suppliers. Before beginning work, subcontractors will receive training by APTIM QA personnel on applicable project-specific policies and procedures.

10.2.1 QA Program Management Organization

All levels of authority, lines of communication, and functional responsibilities shall be defined to ensure that all decommissioning activities that affect quality are controlled. The organizational structure and assignment of responsibility shall be such that:

- Quality is achieved and maintained by those who have been assigned responsibility for performing the work.
- Quality work will be conducted under the guidance of approved work plans and project-specific procedures.
- Quality achievement is verified through audits, inspections and surveillance by persons or organizations not directly responsible for performing the work.

The organization shall have sufficient authority to access work areas, establish effective lines of communication with senior management, and provide organizational freedom to identify quality problems; initiate, recommend, or provide solutions; and to assure that further processing or project delivery is controlled until proper disposition has occurred. This authority shall include stop work. The QA organization shall report to a level of management that provides sufficient authority and organizational freedom to assure that appropriate action can be taken to resolve

conditions adverse to quality and shall have sufficient independence from cost and schedule considerations.

Quality issues that cannot be resolved on the lowest appropriate management level will be escalated to the next higher level.

10.2.2 Duties and Responsibilities for Quality Program

For the SSSB QA program, the specific quality responsibilities for the key individuals listed in Chapter 6.0 are summarized in this section.

10.2.2.1 Quality Assurance Manager

The QAM is APTIM's corporate management representative for quality and will report to senior management with lines of communication to the SSSB PM and NAVSEA. The QAM will be responsible for ensuring that the SSSB project team implements the policies and procedures required under the contract and that corrective actions are taken when performance does not meet internal requirements. The QAM will work closely with the PM to ensure that established protocols and quality procedures are implemented and that the work is performed in accordance with the contract and DWP. The QAM is responsible for directing, planning, implementing, and tracking quality activities and maintaining internal project and corporate communication on quality. They are responsible for auditing the project records and periodically reviewing the control measures and contents of the SSSB project SharePoint portal. Additionally, the QAM will ensure adequate personnel are assigned to the project and that data evaluation, data verification, and reporting procedures are followed. The goal of these activities is to perform work and produce data that satisfies the decommissioning objectives as defined in this DWP.

10.2.2.2 Site Contractor Quality System Manager

For the SSSB, the Site CQSM will report to the QAM and have lines of communication with the PM, SM, PRSO, as well as NRC and NAVSEA personnel. The CQSM will assist the SM in project compliance and is responsible for day-to-day compliance with the project plans and associated procedures, including records filing and archiving, and provides operational support to the SM and on-site personnel. The CQSM will provide and maintain an effective quality system for all decommissioning activities, monitoring these activities to ensure conformance with authorized policies, procedures, contract specifications, and approved DWP. The CQSM will also compile, prepare and record field activities using the Daily Quality Report.

10.2.2.3 Project Manager

The SSSB PM will report to APTIM senior management and be the key team point of contact with NAVSEA and NRC personnel. The PM has direct authority over the SM and works in parallel with lines of communication to the QAM during implementation of the field program. The PM is trained in corporate administrative, safety, and health procedures, technically qualified, and possesses the necessary level of experience to manage the project in a manner that satisfies all contractual obligations related to safety, quality, cost, and schedule. The PM is responsible for evaluating the appropriateness and adequacy of the technical services provided for the decommissioning, overseeing the development of the project's technical approaches, and ensuring the SSSB team is meeting the level of effort required to fully address each task. The PM is also responsible for the day-to-day conduct of work, including integration of input from supporting disciplines and subcontractors and reporting appropriate information to NAVSEA and NRC.

Specific duties of the PM (or designee) include the following:

- Regularly promoting project quality program within the SSSB team (including subcontractors), provides opportunities for personnel training and necessary resources
- Ensuring that project quality personnel are involved and stay informed in all aspects of work and they have been given access to all areas of the site, all sources and storage of documentation, reports, and subcontractor records, as applicable
- Participating in quality planning while preparing for and directing project activities
- Ensuring that trained, qualified technical personnel are assigned to the various tasks (including subcontractors) and that all project personnel are trained on applicable quality procedures and requirements before starting work
- Identifying and fulfilling equipment and other resource requirements in compliance with the contract and DWP
- Working in coordination with the QAM and CQSM to monitor ongoing project activities, ensuring compliance with established requirements, scopes, schedules, and budgets and to verify overall technical quality and consistency of all project activities and deliverables

10.2.2.4 Site Manager

The SM reports directly to the PM and has lines of communication to the CQSM. The SM is responsible for the overall direction and management of field project tasks associated with decommissioning during implementation. This includes oversight of field staff and

subcontractors and ensuring that procedures for field activities are executed in the proper manner, activities are properly documented, and the prescribed decommissioning is completed. The SM ensures that all project communication protocols are followed including project management, quality, safety, subcontractors, and supply chain personnel.

- For the quality program, the SM is responsible for:
- The quality of all work performed in the field by all labor forces, including both APTIM's and those of subcontractors working on the project and under APTIM's control
- Participating in quality planning while preparing for all project field activities
- Managing activities in accordance with this DWP, monitoring work progress and schedule
- Advising the PM and working with the CQSM, PRSO, SSHO, NRC and NAVSEA personnel to identify, analyze, and resolve any identified variances or nonconformances
- Assisting in the preparation of work progress schedules, project reports, drawings, and required compliance submittals

10.2.2.5 Certified Health Physicist

The Project CHP is responsible for overall oversight of the Radiation Protection Program. For the SSSB project, this person reports to the PM through the SM with lines of communication to NAVSEA and NRC oversight personnel.

As part of the QA program, the CHP will:

- Participate in quality planning while preparing for project radiation protection related activities
- Conduct reviews and audits of the RPP during implementation
- Work with the CQSM and NRC personnel on radiological procedures and data reviews and help identify, analyze, and resolve identified variances and nonconformances.

10.2.2.6 Project Radiation Safety Officer

The APTIM PRSO is responsible for oversight and review of all radiological decommissioning activities and radiological surveying data collected for the purpose of radiation safety or

contamination assessment (see Chapter 11.0). For the SSSB project, the PRSO reports to the PM through the SM.

As part of the QA program the PRSO will:

- Participate in quality planning while preparing for project radiological safety and data gathering activities
- Be responsible for implementing RPP, reviewing radiological data deliverables from analytical laboratories, interfacing with the laboratory client services coordinators, and coordinating the resolution of laboratory problems
- Be authorized to direct such activities such as stop work (and restart based on consultation with the PM, CHP, and SSHO) and take appropriate actions, as required
- Work daily with the CQSM and NRC QA personnel on radiological procedures, data reviews, and help identify, analyze, and resolve identified variances and nonconformances.

10.2.2.7 Program Health, Safety, and Environmental Manager and Site Safety and Health Officer

The APTIM HSE Manager and SSHO will provide health and safety oversight and will communicate and coordinate decommissioning activities with the PM and SM. The SSHO is responsible for verifying that site safety and health requirements are followed and that site personnel are appropriately trained as required.

As part of the QA program the HSE Manager and SSHO will:

- Participate in quality planning while preparing for all project field activities
- Conduct safety reviews and audits of ongoing work
- Oversee decommissioning activities that involve potentially hazardous substances, including PCBs (transformer, switch gear, and floor paint), lead paint, and ACM; work with the SSSB project chemist to ensure sampling and offsite physical and chemical testing is performed and reported correctly
- Work with the CQSM and SM on safety procedures and training documentation, perform air and waste sample sampling/data reviews and assist with identifying, analyzing and resolving identified variances and nonconformances.

10.2.2.8 Waste Transportation and Disposal Coordinator

The APTIM WTDC is responsible for supervising activities associated with the transportation and disposal of radioactive, hazardous, mixed, and nonhazardous wastes and other materials that will be transported off the project site for disposal or recycling. The WTDC will communicate and coordinate decommissioning activities with the PM and SM. The WTDC is responsible for verifying that waste transportation, disposal, and documentation requirements are followed.

As part of the QA program the WTDC will:

- Participate in quality planning while preparing for project waste T&D activities
- Conduct reviews and audits of ongoing T&D work
- Oversee disposal activities that involve potentially hazardous substances, including PCBs (transformer, switch gear, and floor paint), lead paint, and ACM; work with the SSSB project chemist to ensure sampling and offsite physical and chemical testing is performed and reported correctly
- Work with the CQSM and SM on waste T&D procedures and documentation, perform waste sample sampling/data reviews and assist with identifying, analyzing and resolving identified variances and nonconformances.

10.2.2.9 Project Chemist

The APTIM Project Chemist is responsible for overseeing all sampling and analytical activities associated with the SSSB project. The Project Chemist will communicate and coordinate decommissioning activities with the PM and SM and liaison with all subcontracted offsite analytical laboratories. The Project Chemist is responsible for writing and maintaining the project SAP, verifying that sampling equipment and procedures are correct and documentation requirements are followed. The Project Chemist will coordinate with the laboratories on incoming samples, analytical methodology, data and reporting requirements. The Project Chemist will also receive and review analytical reports and oversee and manage laboratory-provided electronic data.

As part of the QA program the Project Chemist will:

- Participate in quality planning while preparing for project sampling and analysis activities
- Conduct reviews and audits of ongoing sampling and analysis work

- Coordinate sampling activities with the field team management to ensure sampling methods and equipment specified in the SAP are used
- Coordinate with offsite physical and chemical testing laboratories to ensure SSSB sample analyses are performed and reported as specified in the SAP
- Work with the CQSM and sampling/laboratory staff on sampling and analysis procedures and documentation, perform data reviews and assist with identifying, analyzing, and resolving identified variances and nonconformances.

10.2.2.10 Quality Assurance Staff

The SSSB's QA organization shall be adequately staffed throughout the lifecycle of the project. The project scope shall be reviewed by the QAM and PM initially and periodically throughout implementation to determine personnel requirements to support QA activities and the staff to provide required support.

10.2.2.11 Teaming Partners

Because there is more than one organization involved in the execution of the SSSB decommissioning activities, the responsibilities, interfaces, and authority of each organization will be clearly defined and documented. APTIM's teaming partners and subcontractors are presented in Chapter 6.0 of this DWP. For the SSSB QA program, all subcontracted personnel, material suppliers, and service providers will fall under the requirements specified in this QAP.

10.2.3 Evaluation of Work Performance

The performance of work, whether performed internally or externally delegated to other organization, will be evaluated using a system of audits, surveillances, and inspections. Inspections will be conducted at the onset of the project (and major work tasks as necessary) to ensure readiness to start work. Follow-up inspections and surveillance will be conducted while the work is in process to ensure that the ongoing work is being implemented in accordance with this DWP. Once the project (or major work task) is complete, a final inspection will be conducted at the conclusion of the field activities to identify if any outstanding issues remain. At least one audit will be conducted per major work task depending upon the duration of the field activity. The methods that will be utilized are presented in Section 10.8.

10.2.4 Organizational Chart

Figure 6-1 shows the overall project organization and the key project personnel for SSSB decommissioning activities. The figure includes position titles and show clear lines of authority and communication for managing the decommission efforts.

10.3 Quality Assurance Program

The purpose of this section is to communicate the applicable elements of APTIM's QA policy and the commitments to develop and implement procedures; conduct training where appropriate; and perform quality assessments under this program. Should additional procedures associated with decommissioning activities be needed, APTIM will develop, implement, and maintain those procedures.

10.3.1 Quality Program Objectives and Metrics

The QA program involves the following basic elements:

- Commitment to quality through this this approved project DWP
- Submittals
- Project Quality Meetings
- Tests/Inspections
- Surveillance, Audits
- Documentation
- Notification of Changes and/or Noncompliance

The CQSM will work closely with additional staff such as the PRSO or SSHO on radiological status of contaminated structures, areas, systems, and equipment within the SSSB, including radiation surveying as described in Chapter 11.0 of this DWP. Additional qualified staff may be used to assist the CQSM in the various activities within their specialty field(s) to accommodate variations in workload and/or specific areas of technical expertise, however, the CQSM is ultimately responsible for ensuring the quality of all work. The quality objectives for this project include the following:

Submittal Management. Submittals will be used and are defined on the Contract Data Requirements List (CDRL) and will be provided electronically via email to NAVSEA personnel in accordance with Exhibit A of Contract No. N00024-18-R-4339. The CDRL is provided in Attachment 5.

Testing. Testing is discussed in detail in Section 10.5. Results of tests performed will be documented in the project logs and kept as part of the QA records.

Deficiencies and Changes. Deficiencies are discussed in detail in Section 10.6. Deficiencies will be recorded on the required forms and, as required, their associated corrective action are presented in a Corrective Action Report (CAR). All documents will be tracked to correction. All completed deficiency-related forms will be kept in the SSSB QA records.

10.3.2 Commitment to Quality

It is the policy of APTIM to conduct decommissioning in such a manner as to ensure the health and safety of the public, our personnel on site, and to protect the environment.

This QAP communicates the general QA policies and APTIM's commitments to develop the implementing SSSB project-specific procedures. The QA program for SSSB is designed to meet the requirements and guidance set forth in the NUREG 1757, Volume 1 - Revision 2, subsection 17.6.2, *Quality Assurance Program*, and shall be applied in accordance with contract requirements.

Quality training for the project team will be scheduled, conducted, and documented on the applicable policies, manuals, and procedures as determined by the QA staff and PM. Audits will be periodically performed to ensure that the project quality requirements are implemented as follows:

- Activities affecting quality shall be documented, as appropriate, in drawings, specifications, instructions, and procedures.
- Activities affecting quality shall be conducted under controlled conditions. These shall include appropriate equipment, such as tools and test equipment, suitable environmental conditions, and assurance that all specified conditions have been met.

One of the fundamental aspects of this QA program is that the individuals performing the work will largely determine the quality that is achieved. Each individual will receive quality training and will be provided with appropriate guidance from their manager, the CQSM, and QAM to help them achieve the highest quality possible during performance.

10.3.3 Quality Procedures

This SSSB QAP relies on the APTIM Management System (AMS) for the framework that organizes and provides standard procedures and processes governing the company. AMS includes most of the normal business processes of APTIM such as planning, implementation, measuring, monitoring, checking, reviewing and improving performance for wide range disciplines such as project management and controls, human resources, procurement, quality, safety, construction, engineering, and nuclear safety. It is comprised of a series of policies, procedures, work instructions, guidelines, and standardized forms. APTIM commits to implementing the applicable quality requirements using the AMS as the foundation.

10.3.4 Project Quality Control Meetings

SSSB quality meetings will be conducted initially and then periodically throughout the course of the project. The initial meeting will first establish the means and methods that will be used to monitor quality related to the project, and later meetings subsequently will verify that the program is being properly implemented. Quality meetings will be chaired by the CQSM (or designee) and attended by members of APTIM's management, field staff, and if warranted, representatives from its subcontractors, suppliers, purchasing agents, and/or fabricators.

10.3.5 Project Changes and Procedural Controls

Workers will be provided with and instructed in the most current procedure for them to conduct their specific task. Should changes be required to written procedures, the changes will be controlled and subject to the same level of technical and management reviews as the original document. When concurrence has been granted by all reviewers, the controlled, revised procedure will be provided and revised instructions given to the affected workers. Additional training will be provided as necessary.

10.3.6 Management Assessments and Responsibilities

Planned and periodic assessment of project activities will be conducted and will involve SSSB project management at all levels and may include the QAM and PM.

Management assessments of the SSSB project occur through a review of project-related activities. They will focus on elements that affect work processes and the achievement of project goals and may include elements of quality, health and safety, strategic planning, organizational interfaces, training, qualifications, and supervisory oversight/support.

It is the responsibility of management to ensure that all work guidance documents are current and the latest version of available work instructions are provided to the workers to ensure that all work activities are controlled and implemented in accordance with the appropriate guidance document(s).

10.3.7 Indoctrination and Training

Indoctrination, training, and job qualification programs shall be established and implemented to familiarize workers with the procedures and systems developed to govern and support quality and QA activities. This training will be documented and the appropriate certification or attendee list will be maintained on site where it will be available for inspection upon request. Examples of training required in preparation for this decommissioning effort include but is not limited to the

following: Site-Specific Awareness Indoctrination, Radiation Worker training, Initial 40-hour and subsequent 8-hour OSHA HAZWOPER training.

10.3.8 Acceptance Criteria

Quality procedures will be reviewed by the CQSM and/or the identified project subject matter experts (SME) prior to work assignment and then periodically reviewed during the work to ensure compliance. “Acceptable” quality of work is defined by how the work conforms to the requirements of the applicable plans, procedures and methods. When work fails to meet this standard of acceptance then it is immediately stopped, documented as a deficiency, and corrected through the corrective action process as discussed in Section 10.6.

10.4 Document Control

To manage and maintain SSSB project documents efficiently, APTIM will use an Electronic Document Management System called SharePoint. SharePoint is a Microsoft® collaboration software program and it will be used throughout the project to electronically maintain project data for real-time use by the project team. All project data and records will be protected and controlled within SharePoint by limiting access to only those project team members who need access to such data.

10.4.1 Submittal Documents Included in QA Program

The CDRLs (Attachment 5) are listed in the SSSB contract and include this DWP and Tow Plan Submission Report.

10.4.2 Document Life Cycle Process

The PM is responsible for identifying required documents, assigning individual(s) to be responsible for each document, and establishing the review and approval authority for each. The PM has committed the necessary resources for developing this DWP as the primary applicable work plan and requirements. Documents shall be prepared so that they are accurate, technically defensible, and properly reviewed and approved.

The document preparer(s) leads the effort to fully define the work description and, with the assistance of SMEs, leads the effort to identify all associated and significant hazards (if any). The documents will be prepared to effectively identify and communicate the hazards, and associated controls to mitigate them to the project personnel. Final documents are reviewed, signed, distributed to all stake holders, and posted on SharePoint portal for access.

During plan implementation, the CQSM will review the plans against the work and any significant changes will be noted and, if required, the plan may be modified as discussed in Chapter 14.0 of this DWP. Revised plans will be so indicated numerically on the cover and title page with the date of revision included.

Revised, superseded, or obsolete documents that are directed to be retired shall be identified and removed from the work area in a timely manner to prevent inadvertent usage.

10.5 Control of Measuring and Test Equipment

The CQSM will be responsible for the tracking, verification, and documentation of all test and inspection activities and data. Information related to chemical and radiological testing is documented in the project SAP and Chapter 11.0 of this DWP.

Testing. APTIM will perform specified or required tests on its own work to verify that control measures are adequate to meet contract requirements.

APTIM will perform the following activities and record and provide the following data through surveillance/inspection:

- Verify that testing procedures comply with contract documents
- Verify that facilities and testing equipment are available, maintained, and comply with testing standards
- Check test instrument calibration procedure, frequency, and data against the prescribed method and certified standard
- Verify that a test identification control number system, data recording, and test documentation requirements have been met and personnel are trained in their appropriate usage

All results of the tests taken, both passing and failing tests, will be documented on the testing log forms and results summarized on the DQCR. If testing passes requirements, the test results will be certified by the responsible certified engineer or inspecting party. Testing and associated results will be stored in the SSSB QA records.

Specification paragraph reference, location where the sample/tests were taken, and the sequential control number identifying the sample/test shall be verified by the CQSM. Actual test reports such as analytical laboratory data may be submitted later with a reference to the test number and testing date or date the samples were collected.

10.5.1 Test and Measurement Equipment

Various types of instruments and equipment are being used over the course of the project to support testing and measurement activities during the SSSB decommissioning effort.

The PRSO, SSHO, WTDC, and designated subcontractor personnel, aided by the Project Chemist, as appropriate, will select field sampling equipment/media, testing and measuring equipment, safety instruments, and laboratory analytical instruments. This equipment will be as specified in the approved measuring and testing methods presented in the SAP and within task-specific planning documents for radiological testing methods (see Chapter 11.0 of this DWP).

Examples of testing and measuring equipment and instrument types include (but are not limited to):

- Radiological instruments used for radiation protection and performing surveys
- Radiological dosimetry
- Air monitoring equipment radiological/on-site or offsite
- Wipe, waste, chip, solid, and/or liquid sampling equipment used to collect representative test samples for physical parameter and/or chemical analysis at the project-approved subcontracted laboratory
- Specialty physical testing equipment used to perform a specific test
- Global positioning system (GPS) and laser surveying instruments

All off-site subcontracted physical, chemical, and radiological analysis laboratories are listed in the SAP and will be pre-approved by APTIM. With few exceptions for specialty methods, the laboratories will hold current Environmental Laboratory Accreditation Program (ELAP) certification. The designated dosimetry provider for SSSB will participate in National Voluntary Laboratory Accreditation Program through the U.S. Department of Commerce and National Institute for Standards and Testing. All laboratories must be able to produce hardcopy and electronic data deliverables necessary to meet project and government requirements.

The SSSB SAP and Chapter 11.0 of this DWP identify laboratory and field safety instruments or equipment that is anticipated for use on the project and provides their specific quality requirements including calibration, maintenance, testing and inspection needs and requirements.

10.5.2 Calibration Methods and Frequency

The SSSB SAP and Chapter 11.0 of this DWP (for radiological equipment) identify the equipment calibration, maintenance, testing, and inspection requirements. Generally, all testing and measuring equipment will be received onsite with calibration certification included from the instrument manufacturer, rental company, or other provider.

The CQSM will work with the PRSO and SSHO and other assigned personnel to check instrumentation usage in the field and conduct routine surveillances during testing to ensure that proper calibration/documentation procedures have been fully implemented and any failing instruments have been removed from service. Only personnel trained by the PRSO or SSHO will operate and calibrate onsite equipment. Training documentation will be included in the SSSB QA files.

Offsite laboratories have a dedicated quality officer that controls their calibration documentation and training records of analyst personnel. Records of calibration and training are subject to review by APTIM prior to award and/or during audits. The project chemist (and/or engineer, as appropriate) will be responsible for verifying any outside analysis equipment calibration has been properly logged and reported by the laboratory as part of their testing data package. The CQSM (or designee) will review the data package to verify this calibration information has been included and has been correctly documented.

10.5.3 Daily Calibration Checks

Generally, all testing and measuring equipment will be checked at a minimum of daily or before use (and after use, as required) by the manufacturer’s instructions and/or the approved method. The SAP and Chapter 11.0 of this DWP (for radiological equipment) specify daily calibration requirements for the anticipated instruments used on the SSSB project. These daily checks will include performing internal calibration and routine start up checks, and if successful, they are followed by an external calibration. External calibration can include comparing the instrument measurement response to a “blank” having zero response (or background response), and then compared to a series of known (certified) calibration check standards. If the instrument performance compared to the blank and check standards fall within established method acceptance criteria, then the instrument is then released for use to the analyst to record unknown samples or record readings. For instrumentation that fails the initial calibration check, the analyst will adjust, repair, or maintain the instrument as recommended in the manufacturer’s instructions and/or approved method and the calibration process is repeated. If the instrument continues to

fail calibration, then it will be red-tagged and not used for testing or measuring until it can be repaired or serviced and passes calibration.

For some instrumentation, the method may call for an after use (or during use) calibration checks as well to verify the instrument response is still within expected performance limits and the unknown samples or readings are bracketed by acceptable performance checks. In this case if the instrumentation passes the initial check but fails the continuing check, then the sample data recorded since the last previously successful check is considered invalid, the instrument calibration is repeated until acceptable, and then those affected samples or readings can be repeated. If calibration checks are not acceptable, then all affected samples or readings will be invalidated and will be repeated using a different instrument with an acceptable calibration or sent to an alternate laboratory for analysis.

10.5.4 Measuring and Test Equipment Documentation

Instrument usage and calibration will be documented using a combination of logbooks, calibration forms, instrument labels (including red tags for unusable, failing equipment), and instrument usage log forms. All documentation will be completed daily (or as required) by the analysts and delivered to the PRSO or SSHO for review and approval. The CQSM will review all incoming documentation.

The measurements and testing results will be recorded by the analyst as required on standardized forms, logbooks, and/or electronically on the instrument data logger. If electronically logged, the raw data will be downloaded as soon as possible and archived. Copies of the raw data (manual and/or electronic) will be reviewed, validated, and reported per the established procedure by the analyst and then secondarily reviewed by a designated person (i.e., the PRSO, SSHO, SM, Project Chemist, Engineer) before general release and project use. The CQSM will not serve as a secondary data reviewer but instead independently review the entire data reporting process during field surveillances.

10.5.5 Quality Test Planning and Reporting

The SAP and Chapter 11.0 of this DWP for chemical/radiological testing will be reviewed by the CQSM, PRSO, SSHO, and project chemist during the preliminary phase of each major work element as necessary to identify what sampling and/or testing is required. The CQSM will track and report the status of activities related to chemical/radiological sampling and analysis to the QAM and PM as these testing efforts are being reported by the project chemist and monitored by the CQSM.

10.6 Corrective Action

10.6.1 Self-Assessment, Identification, and Tracking of Deficiencies

While the effort is led by the CQSM, self-assessment is not exclusively a QA function. The entire SSSB team through implementation of APTIM's self-assessment program will constantly evaluate activities (as well as incoming materials, outgoing wastes, and completed documentation), to determine if work complies or does not comply with the established project requirements, plans and standard procedures. Once any non-compliant materials/conditions or deficiencies have been identified by any individual they are responsible for stopping that activity immediately and formally conveying its existence to management and/or the CQSM. The CQSM will then evaluate and document the condition, and along with input from others, begin to assess the impact.

Existence of the deficient condition will be documented as either a nonconformance or variance in the SSSB QA records. The project team will utilize standard APTIM procedures and forms for tracking and documenting non-compliances from identification through acceptable corrective action. Nonconformances are identified and processed through two systems depending on the type of noncompliance. Nonconforming items or materials (either before or after installation) are documented through the Nonconformance Report (NCR) process. Activities or processes that are found to be noncompliant (noncompliant conditions) are documented through the corrective and preventive action process. A noncompliant condition is documented on the Corrective/Preventive Action Request (CAR) Form. A variance is a deviation from a specific process, procedure or task. Variances will be tracked on the variance log form. The forms are structured to assist in collecting critical information relating to the deficiency, such as the work task involved, as well as when, where, and by whom the deficiency was identified. The forms are managed by the CQSM who:

- Assigns a unique identification by issuing the next consecutive number from the nonconformance or variance log to document the existence of the deficiency
- Advises SSSB project management of the deficiency

The CQSM then notifies and communicates the existence of the deficiency with the appropriate project individual(s) responsible for the work while gathering input from all parties. An analysis of the root cause of the deficiency will be identified through a process of reviewing the work plan, the condition(s) encountered, interviewing appropriate personnel, reviewing work procedures and documentation, and obtaining feedback from the government, project

management, and subcontractor(s), as needed. Additional support from SMEs or other third parties may be consulted as required.

10.6.2 Corrective Action Plan and Meeting

Once a root cause analysis has been performed for a deficiency and the nature of the condition is fully understood, then a corrective action plan can be developed. Once the corrective action plan is drafted, APTIM will conduct a meeting with the involved parties to review the work impacted by the deficiency, the plan of proposed corrective steps to be taken and changes in procedures, protocols, or work plans. The means and methods for evaluating the success of the corrective action is also discussed. All attendees will have the opportunity to present ideas and feedback on the corrective action plan and discuss any additional training requirements or coaching needed to ensure the changes have been effectively communicated to and understood by the individuals implementing the corrective action and the management team overseeing the work. The CQSM will participate in and document on the CAR the results of the discussion including any necessary training to fulfill the corrective action plan requirements and finalize the CAR. Training documentation will be included with the CAR.

10.6.3 Corrective Action Implementation, Evaluation, Documentation, Ongoing Monitoring and Close Out

APTIM management including the PM, CQSM, and the involved subcontractor’s or suppliers’ management (if applicable) will review the condition that caused the deficiency and inspect the condition after corrective action has been implemented. Most importantly, the team will assess the success of the corrective action and document the implementation by gathering examples of documentation, testing forms, and photographs (as necessary). All inspection and documentation obtained during the assessment phase will be attached to the CAR and ultimately stored in the SSSB QA records.

If the corrective action is determined successful at addressing the condition and preventing future occurrence, the CAR will be closed out. Completed deficiency report and CAR forms and all resulting documentation is assembled and included in SSSB QA records.

The CQSM and APTIM management team will continue to track the corrective action for the remainder of the task (or project, as necessary) and monitor its implementation by conducting periodic, ongoing inspections and surveillances. If new employees or subcontractors are brought into the project, they will be required to attend site-specific training as necessary to continue the

corrective action implementation. Documentation of ongoing training will be maintained in the SSSB QA records.

10.6.4 Lessons Learned/Process Improvement

Through self-assessment, deficiency identification and root cause analysis, corrective action planning, implementation, and closeout, APTIM will gain insight into what caused the condition and how to prevent them in the future through a continual improvement process. The CQSM will generate a Lessons Learned Report that will document improved methods for executing the work. Lessons learned will be kept in the SSSB QA records. Lessons will be reviewed periodically throughout the project lifecycle but especially during planning and before beginning similar work. The lessons can be discussed with the SSSB team during ongoing safety, progress, or daily planning meetings.

10.7 Quality Assurance Records

10.7.1 QA Records Management

The QA records, data, and related information listed in this section will be managed by the CQSM with assistance by supporting staff. It is anticipated the bulk of the hardcopy QA records will be produced and managed in the field. The PM and office staff will also produce project records such as the correspondence records, plans and drawings, schedules, invoices, and reports. Hardcopy QA and project records will be inventoried and combined to create the SSSB project file for archiving.

Electronic versions of all hardcopy files as well as the project photographic record will be created and managed using SharePoint software. SharePoint will allow APTIM to create a controlled access data portal for the SSSB project to organize, inventory, and share the critical documents, project photographs, video, data, and report files. The SharePoint site and all the contents securely stored there will be copied and backed up onto remote APTIM file servers daily to help prevent data loss.

Although the CQSM is onsite during field operations, documentation is required daily from various supervisors including the SM, PRSO, SSHO, project engineer, and foreman directly responsible for the various project teams and subcontractors. The documentation received daily from supervisors will be organized and summarized. These details will serve as a summary of the major work accomplishments including quality-related activities, labor, materials, safety, and wastes. Supporting documentation including production and quality documents and site

photographs will be included in the DQCR. Hardcopy documentation will be scanned to create an electronic version. The hardcopy version of these will be stored onsite in the field project files and the electronic DQCR uploaded to the SharePoint portal.

10.7.2 QA Records Storage Facility

The hardcopy field files will be temporarily stored onsite in a designated SSSB project office. All hardcopy records will be scanned and stored on SharePoint portal prior to filing to maintain an electronic backup. Hardcopy office documentation and files will be maintained in the APTIM Office in Knoxville, Tennessee. As the project nears completion, all field records will be inventoried, boxed, and sent for secure storage to the APTIM Office.

All project electronic records will be maintained via the SSSB SharePoint portal which is secured and maintained by APTIM information technology personnel. Portal files are backed up daily onto secure APTIM file servers to preserve these electronic records.

10.8 Audits and Surveillances

The purpose of the project auditing and surveillance program will be to help ensure the SSSB team is delivering and performing work that meets all contract requirements during implementation. To meet that goal, the APTIM CQSM will institute and manage an ongoing auditing and surveillance program as part of their field quality responsibilities. The auditing program will encompass all aspects of the work including but not limited to procurement/delivery of onsite materials and provision of services, the preparation and shipment of wastes, testing and measuring activities, project recordkeeping and training. The program will include the quality aspects and review of the responsibilities of the SM, PRSO, SSHO, engineering, procurement, and the various project subcontractors. Surveillances will be conducted more frequently than audits and consist of ongoing checks performed throughout the implementation of often repeated functions such as radiological surveying or sampling.

Additionally, as discussed in Section 10.2.2, the APTIM QAM will audit the quality records maintained by the CQSM to verify the program is properly implemented including documentation of actual project conditions.

10.8.1 Description of Audit Program

Project system QA audits will occur at a periodically by the QAM or designee. In so doing they will use various auditing checklists to aid in their review and verify implementation of plans and procedures during all phases of field work. The CQSM will perform audits by observing and

using checklists that are tailored as needed to fit the current work tasks. Checklists are designed to be comprehensive but will serve only as a starting point for the auditing process. Auditor personnel will also investigate through a review of records and conducting interviews. The CQSM will observe and record photographs and video documentation showing compliance or recording instances of non-compliance with requirements. In instances of non-compliance, the CQSM will be notify the SM and stop work as necessary to examine the discovered condition. Observations will be documented in the findings of the audit. Deficiencies found during an audit will be resolved as discussed in Section 10.6.

The CQSM/auditor(s) will prepare an audit report documenting the work procedures observed, a completed checklist, the audit findings, and a determination if the quality system is either performing as expected or underperforming. The CQSM will work with the project team to make recommendations to the PM who will then work to resolve the issues found during the audit.

The QAM will perform audits of the CQSM, periodically reviewing the quality program as implemented and verifying through records review, interviews, and observation if the quality program is either performing as expected or underperforming. If deficiencies are discovered by the QAM during their system audit, the work will be stopped as necessary and reviewed, documented, and resolved via the deficiency resolution process. The QAM will work with the PM and corporate management team to resolve any high-level project quality issues as necessary. The QAM will also be responsible for periodically reviewing and verifying the status of APTIM corporate quality systems audits, procurement, and overall internal procedures for project-applicable updates.

10.8.2 Audit Documentation and Records Management

Auditing onsite will involve the use of tailored checklists and result in a written audit report. The completed checklists will be augmented by records which were reviewed during the audit, interview notes, and recorded photographs. Audit reports will be generated to provide evidence that the quality program is being implemented as prescribed in the individual documents. If any deficiencies were found during the audit, then documentation and resolution of those issues will also be included in the audit report. All audit and surveillance record findings will be noted and summarized in DQCRs and incorporated into the SSSB QA records for reference and storage.

10.8.3 Audit and Surveillance Follow Up

As discussed, the CQSM will generate an audit report at the conclusion of the audit which will summarize the results. Any underperforming systems or deficient conditions will require action

and resolution. Once resolved, these issues will be subject to ongoing review and additional follow up by the CQSM, QAM, and project management. Deficiency resolution process and the resulting lessons learned are discussed in Section 10.6.

10.8.4 Audit, Surveillance Tracking and Trend Analysis

The CQSM (supplemented by the QAM) will undertake the responsibility to compile the audit report findings to look for trends. Underperforming trends could indicate potential procedural issues or need for increased training/coaching of the individuals performing the work. Likewise, consistently high performing systems should also be evaluated to determine if any Lessons Learned could be generated from their success and if those could be passed on to other areas of the project.

11.0 Facility Radiation Surveys

This chapter describes the purpose, methods, and techniques to be employed for conducting radiological surveys for decommissioning activities. Surveys will be performed for release of M&E, segregating waste materials, assessing the nature and extent of contamination (scoping and characterization surveys and media sampling), defining and verifying radiological and verifying the adequacy of radiological controls, guiding remedial actions, and demonstrating compliance with established release criteria. In general, radiological surveys will consist of instrument scans, direct measurement surveys, and wipe sampling of removable contamination.

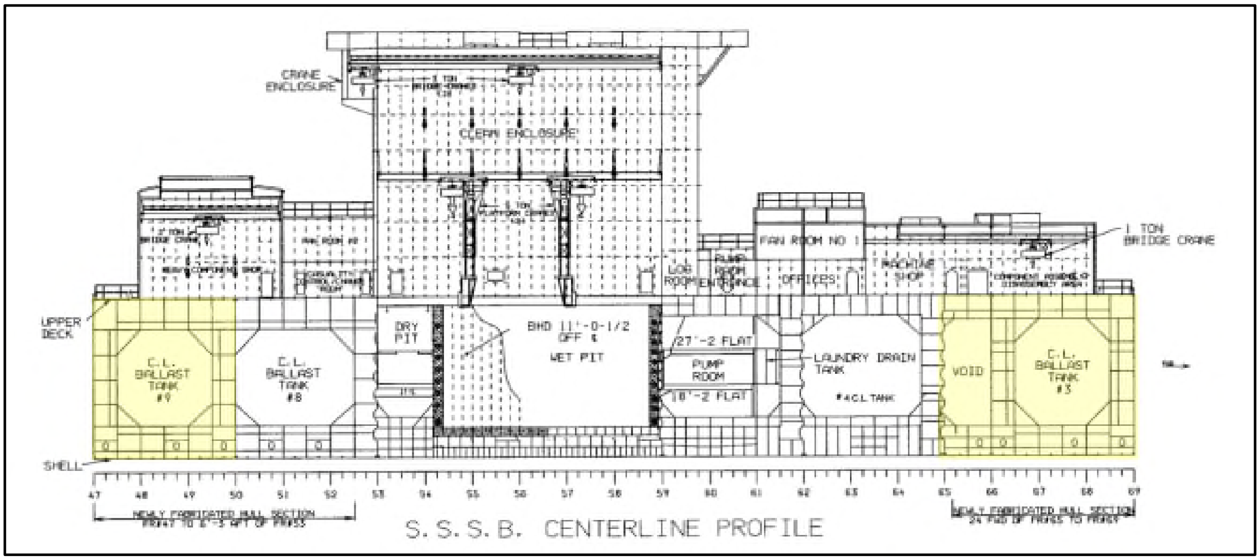
Radiological disposition surveys will be performed in accordance with this DWP for all M&E removed during decommissioning that are to be released from radiological controls. Survey locations, methods, and findings will be documented.

Decommissioning activities will take place at the ASY in Mobile, Alabama. A pre-decommissioning baseline survey will be performed within the project site footprint prior to placement of the SSSB on the ASY worksite. The location of the approximate project site footprint is identified as the SSSB Dismantlement and Survey area in Figure 11-1. The area is approximately 200 feet wide and 1,000 feet long (200,000 square feet). The purpose of the survey is to document the baseline conditions of the project site prior to commencing SSSB D&D activities and provide data for comparison to FSS data that will be collected following completion of the D&D activities. The purpose of the FSS is to document the final status of the project site after decommissioning activities have been completed. The FSS will be used to demonstrate that the site meets unrestricted release criteria at the completion of the SSSB D&D project operations. The FSS will be designed using the guidance provided in the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (NUREG-1575) (NRC, 2000).

Approximately 85% of the SSSB SSCs will be disposed of as LLRW, roughly 15% will be surveyed for radiological unrestricted release and will be dispositioned through disposal at a hazardous waste landfill, a non-hazardous industrial waste landfill or recycled; and, less than 1% is expected to be disposed as LLMW. The entire SSSB will be dispositioned via one of these pathways. Figures 11-2 and 11-3 show the portions of the SSSB structure presently designated for unrestricted release; the areas are defined as the structures below the upper deck forward of Frame 65 and aft of Frame 50. There are seven specific compartments intended for release, namely 3 Port, 3 Centerline, 3 Starboard, 3 Void, 9 Port, 9 Centerline, and 9 Starboard. The remainder of the SSSB will be disposed at the WCS facility in Andrews, Texas.

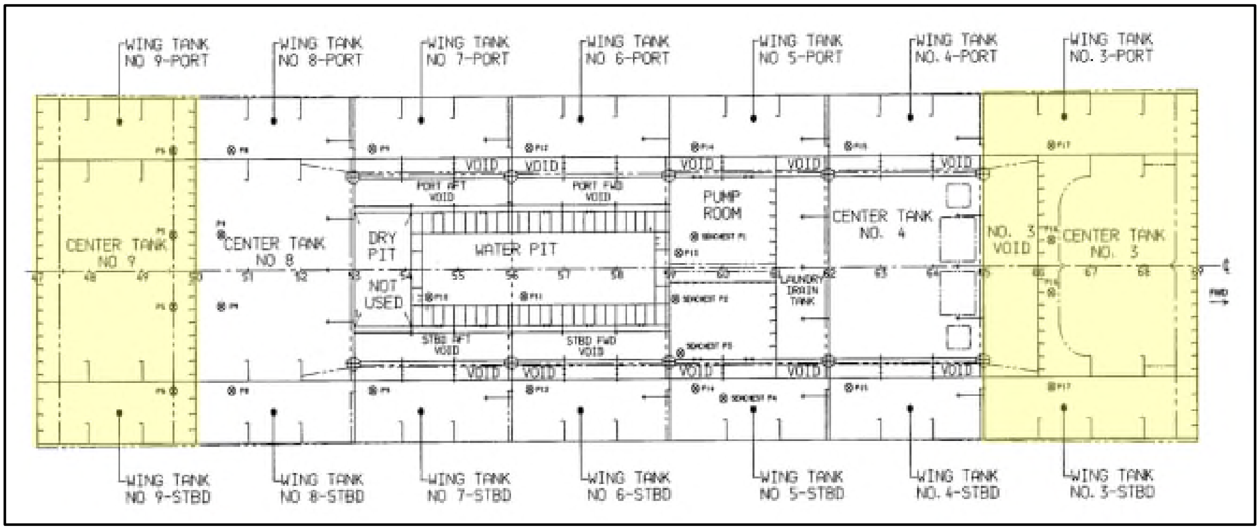
Figure 11-1
SSSB Dismantlement and Survey Location

Figure 11-2
SSSB Elevation View Showing Areas Intended for Unrestricted Release



Note: areas for unrestricted release are highlighted in yellow.

Figure 11-3
SSSB Plan View Showing Areas Intended for Unrestricted Release



Note: areas for unrestricted release are highlighted in yellow.

Surveys of the sections of the SSSB intended for unrestricted release will follow the guidance for the design and implementation of surveys for the release of M&E in accordance with Supplement 1 of NUREG-1575, MARSAME (NRC, 2009). Survey methods and Action Levels for the MARSAME surveys are described below. M&E will be assessed using MARSSIM-type surveys as described in MARSAME.

Surveys to support decommissioning activities will be performed in accordance with APTIM-SSSB-009, *Performance of Radiological Surveys*.

11.1 Release Criteria

11.1.1 SSSB Project Site

The basis for release of the project site is to demonstrate that the portion of the ASY used for the SSSB D&D meets the unrestricted release criteria of 10 CFR 20.1402 (<25 mrem per year total effective dose equivalent and ALARA using screening level criteria contained in NUREG 1757 Appendix B). While the screening level criteria of NUREG-1757 are considered to be ALARA due to the conservative assumptions incorporated in their development (specifically, scenario identification and parameter value selection) an additional ALARA object for the SSSB D&D site will be to demonstrate that the FSS results are not statistically different from the baseline survey results.

The SSSB D&D site consists of paved/concrete surfaces and unpaved soil/crushed limestone surfaces. The paved surfaces have embedded steel platens that support stands cradling the vessel. The D&D site will be treated as both a structure and open land area for the purposes of the baseline and FSS. This area will be surveyed (i.e., baseline survey) before the SSSB is placed and an FSS will be performed after SSSB dismantlement is completed. For the SSSB D&D the RCOPCs and their respective screening criteria are listed in Table 11-1.

Table 11-1
Building Surface and Soil Contamination Screening Values

Radionuclide	Symbol	Surface DSV (dpm/100 cm^2)	Soil DSV (pCi/g)
Cobalt-60	Co-60	7,100	3.8
Iron-55	Fe-55	4,500,000	10,000
Nickel-63	Ni-63	1,800,000	2,100
Carbon-14	C-14	3,700,000	12
Cesium-137	Cs-137	28,000	11

The unrestricted release criteria for the decommissioning site is compliance with the Co-60 DCGLs based on surface or soil screening criteria as applicable with an ALARA goal of no statistical difference between baseline and post D&D measurements.

Based on currently available information on radionuclide fractional abundance and published NRC DSVs, Co-60 is the limiting (bounding) isotope. Co-60 is the bounding radionuclide because, for other radionuclides present, either the radionuclide's fractional abundance is very low (e.g., C-14 and Cs-137); the DSV is very high (e.g., C-14 surface, Fe-55, and Ni-63 soil and surface) or the combination of both lower abundance and higher DSV indicate they are not limiting (e.g., C-14 and Cs-137 soil). This will be reviewed and confirmed following completion of SSSB characterization.

Consequently, non-isotope-specific beta and gamma measurements are attributed to Co-60. That is, gross beta activity and gross gamma activity above background reference is considered to be due to Co-60.

11.1.2 SSSB Materials and Equipment

There are no SSCs in the SSSB that were exposed to significant neutron flux. Consequently, there are no SSCs containing induced radioactivity resulting from activation of the matrix material, being considered for unrestricted release as part of the SSSB D&D. The unrestricted release criteria for structural M&E released from the SSSB for unrestricted use is "no detectable activity" on surfaces of the M&E. "No detectable activity" is defined as less than 5,000 dpm/100 cm^2 total and 1,000 dpm/100 cm^2 removable beta-gamma activity from nuclear power reactors as defined in Inspection and Enforcement (I&E) Circular 81-07.[1]

The I&E Circular also states, "If alpha contamination is suspected, appropriate surveys and/or laboratory measurements capable of detecting 100 dpm/100 cm^2-fixed and 20 dpm/100 cm^2 removable alpha activity should be performed." Alpha emitting radionuclides are not anticipated to be present on the SSSB; however, this will be confirmed during characterization and through periodic monitoring for alpha contamination during M&E release surveys. On-going monitoring for alpha contamination will consist of counting 10% of the wipes collected for beta-gamma monitoring for alpha contamination.

The unrestricted release criterion is lower than the NRC building surface screening values contained in NUREG -1757 *Consolidated Decommissioning Criteria*, Vol. 1 Appendix B Table

B.1, Acceptable License Termination Screening Values of Common Radionuclides for Building-Surface Contamination. Default building surface and soil screening values for the RCOPCs are listed in Table 11-1.

11.2 Project Work Site Baseline Survey

A baseline survey will be performed prior to siting the SSSB at the ASY site in accordance with the Baseline Survey Plan (see Attachment 4). The approximate location and boundaries of the SSSB D&D project work area at ASY are identified as “SSSB Disassembly and Survey Area” in Figure 11-1. It includes an area approximately 50 feet east of the common fence between ASY facilities and the parking lot to support loading containers onto trucks for transportation. The GPS coordinates of the exact area boundary will be recorded as part of the baseline survey. The baseline survey will consist of a combination of gamma walk-over survey with a 2-inch by 2-inch NaI detector (2x2 NaI) equipped with a GPS location transmitter (e.g., Trimble System). During the baseline survey, the paved surfaces will also be surveyed with a large area gas flow proportional counter (e.g., Ludlum Model 43-37).

The anticipated detection limits for the baseline surveys will be consistent with the post-D&D FSS as defined in Section 11.5 of this DWP. If the SSSB Disassembly and Survey Area is expanded beyond the initial area boundaries, the expansion area will also receive a baseline survey.

11.3 SSSB Characterization Surveys

The limited information available in SSSB historical documents was used for preliminary classification of SSSB SSCs. Final characterization is pending recommendation from the NRC to transfer custody of the SSSB to APTIM in order to gain access to perform the necessary additional radiological surveys and sampling. Characterization surveys will be performed in accordance with APTIM work instructions APTIM-SSSB-009, *Performance of Radiological Surveys,* and APTIM-SSSB-011, *Sample Collection.*

Characterization surveys of the SSSB will be performed to meet the following objectives:

- Identify all radionuclides present, radionuclide concentrations and scaling factors,
- Develop adequate information to establish necessary and effective radiological controls during SSSB D&D to ensure worker and public health and safety,
- Develop adequate information for waste characterization and classification for waste disposal,

- Develop appropriate survey unit (SU) classifications and boundaries for the FSS, and
- Develop information necessary to verify and confirm the Disposition Survey design parameters.

11.3.1 Description and Justification of Survey Measurements for Impacted Portions of SSSB Planned for Disposal as LLRW

As identified in Figures 11-2 and 11-3, approximately 85% of the SSSB SSCs, including the wet pit, will be disposed of as LLRW. Characterization of areas planned for disposal as LLRW will consist of radiation and contamination surveys necessary to gather the radiological data needed for work planning and to establish radiological controls for worker health and safety and radioactive material control during SSSB D&D. Typically these surveys include general area and contact beta-gamma direct radiation levels, and beta-gamma and alpha total and removable contamination measurements. Alpha contamination is not expected to be present on the SSSB; however, to confirm this expectation, 100% of the wipes taken during characterization will be analyzed for alpha contamination in addition to beta-gamma activity.

Characterization of the portions of the SSSB intended for disposal as LLRW will also include collection of samples for waste characterization in accordance with 10 CFR 61, 2015 Branch Technical Position on Concentration Averaging and the SSSB D&D project Waste Management Plan. Sample matrices to be sampled include wet pit deposits (e.g., sludge), resin beds, filter media, dry active wastes and water processed by solidification.

11.3.2 Portions of SSSB Planned for Unrestricted Release

Portions of the SSSB designated for unrestricted release will be surveyed in accordance with the SSSB project Materials Categorization, Survey, and Release Plan (MCSRP), which is included as Attachment 6 of this DWP. Surveys including sentinel measurements of portions of the SSSB SSCs planned for unrestricted release will consist of instrument scans, direct measurement surveys, and wipe sampling. Surveys will consist of measurements of both removable (H-3 and gross alpha/gross beta) and total contamination (gross alpha/gross beta).

Radionuclide scaling factors (i.e., radionuclide relative abundances) will be developed to ensure that monitoring for easily detectable radionuclides (i.e., Co-60) adequately accounts for hard-to detect radionuclides. This includes verification that action levels are appropriately established.

When possible, the characterization survey will be designed to meet the objectives of the Disposition Survey. Instrumentation and procedures sufficient to meet Disposition Survey

objectives will be used. The discussion below addresses the characterization surveys that will be performed to support decommissioning activities.

The characterization will also include paint sampling. Paint will be sampled during characterization and analyzed for Co-60 because of its predominance in SSSB nuclide mixture, easy detectability due to high energy gamma emissions, and is not naturally occurring. Each paint sample will be collected from a 12-inch by 12-inch area (900 cm^2). The required Co-60 analytical detection limit equivalent to 5,000 dpm/100 cm^2 is 0.02 µCi per sample. Samples will be collected from four locations in each of the seven compartments intended for unrestricted release. Two samples will be collected from the floor or deck and two samples will be collected from walls or bulkheads. The locations sampled will be directed by the highest readings from scans and direct measurements during characterization.

Paint samples will be analyzed by gamma spectroscopy at an off-site commercial radioanalytical laboratory.

Description of the field instruments and methods used for measuring concentrations and the sensitivities of those instruments and methods

Portable instruments planned to be used for Final Status and Disposition Surveys are listed in Table 11-2.

- Field instruments and methods used for characterization surveys will be the same as those used for final status and disposition surveys.
- Gross surface activity will be measured with beta scintillation detectors (e.g., Ludlum Model 44-116), alpha scintillation detectors (e.g., Ludlum Model 43-90) and gas flow proportional counters (Ludlum Model 43-37 and 43-68) and/or pancake GM detectors (e.g., Ludlum Model 44-9). No reliable survey instruments are available for scanning or static measurement of H-3; however, H-3 is expected to be present as less than 1% of the radionuclide mix. Detectors and detector efficiencies will be calculated based on the radiation being measured.
- Scan surveys will be used during the characterization and disposition surveys to detect small areas of elevated activity that may not be detected by systematic and random static measurements.
- Wipes to measure removable H-3 and C-14 will be collected at each direct measurement location. Smears will be counted on liquid scintillation counter (e.g., Packard TriCarb 2900 or counter of similar efficiency).

- The MDCs meet the design objectives (static MDC should be below the I&E Circular 81-07 detectability standard of 5,000 dpm/100cm^2 beta-gamma and 100 dpm/100 cm^2 alpha).

Table 11-2
Radiological Survey Instrumentation

Description	Application	MDC (dpm/100 cm^2)	Scan MDC (dpm/100 cm^2)
Ludlum Model 3 Ratemeter with Model 44-9 2" GM detector	Scanning and static beta measurements	3,400	10,300
Ludlum Model 2360 Scaler/ratemeter with Model 44-116 Plastic Scintillator (with 0.4 mg/cm^2 window)	Scanning and static beta surveys	1,150	3,630
Ludlum Model 2360 Scaler/ratemeter with Model 43-37 GFPD (with 0.8 mg/cm^2 window) floor monitor	Beta floor scanning	1,950	6,220
Ludlum Model 2360 Scaler/ratemeter with Model 43-90 ZnS	Scanning and static alpha survey	75	270
Ludlum Model 2929/3030	Smear counting	15 dpm/wipe (alpha); 85 dpm/wipe (beta/gamma)	N/A

When completed, the characterization survey will provide a detailed assessment of the nature and extent of contamination in all impacted areas intended for unrestricted release. The surveys will include surface scanning, static measurements, and smears. Scanning will be conducted in areas likely to contain residual activity. Systematic and biased static measurements will be performed. Biased measurements/sampling will be performed in areas of elevated activity as determined by scanning and at locations likely to contain elevated levels such as expansion joints, stress cracks, and wall/floor interfaces.

Characterization surveys will be performed in accordance with APTIM-SSSB-009, *Performance of Radiological Surveys*. Potentially contaminated inaccessible or not readily accessible areas in or coming from impacted areas will be investigated.

11.4 In-Process Surveys

11.4.1 SSSB Dismantlement and Survey Site

In-process surveys will be used to monitor SSSB work areas and the portion of the ASY dedicated to the D&D of the SSSB as part of the project routine radiological monitoring program. This includes regular periodic radiation and contamination monitoring of radiologically

restricted areas, restricted area boundaries, unrestricted areas (e.g., lunch and break rooms), contamination area entrances and exits and work area perimeter. The frequency for radiological surveys is based on the area classification and activities taking place in the area and are scheduled on a planned survey frequency.

Once the SSSB is sited in the dismantlement area at ASY, a routine survey schedule and survey frequencies will be established and posted in the PRSO office. Survey areas will include:

- Control Points
- Radiological Work Areas
- Uncontrolled Areas and buffer zones
- Personnel break areas
- Site perimeter.

Routine surveys will be conducted at frequencies and locations dependent on the work activities performed. Contamination surveys will be performed of all control points at a frequency (daily or weekly) dependent on the contamination potential in the work area as determined by the PRSO. The purpose of the surveys is to ensure contamination is not tracked out of controlled areas. Weekly surveys will be performed of general radiological work areas as well as contamination surveys and egress routes, personnel break areas, and the count room. Monthly and/or quarterly surveys of general office spaces and support areas and site perimeters will be performed as verification of project controls.

The survey schedule may be revised as work progresses and radiological hazards change. The routine survey schedule will be implemented during the time that dismantlement activities are being conducted at the site.

11.4.2 SSSB Vessel

In-process surveys for portions of the SSSB vessel intended for disposal as LLRW will include radiation, contamination and airborne radioactivity monitoring necessary to minimize worker and public radiation exposure and to demonstrate compliance with 10 CFR 20 requirements and the APTIM Radiation Safety Program and implementing procedures.

These surveys consist of radiation and contamination surveys to establish work area conditions before, during and after D&D tasks are performed to plan and confirm the efficacy of radiological controls during task performance and to monitor actual and potential worker radiation exposures.

In-process surveys for portions of the SSSB intended for unrestricted release consist of those surveys necessary to ensure that radioactive material is not spread from the portions of the SSSB intended for disposal as LLRW to the parts of the vessel planned for unrestricted release. These include monitoring contamination levels in compartments during the process of physically separating the SSSB into LLRW and unrestricted release partitions. Detailed information on the procedures to be used for the unrestricted release of SSSB M&E is provided in the MCSRP (see Attachment 6 of this DWP).

11.5 Final Status Survey Design

11.5.1 SSSB Dismantlement and Survey Site

Upon completion of all D&D activities, an FSS will be performed over the SSSB Dismantlement and Survey Site. The FSS approach and methods will be documented in a written FSS Plan designed in accordance with MARSSIM guidance. A preliminary summary of the planned FSS for the SSSB D&D project is provided in Attachment 7 of this DWP. Final FSS details will be presented in the FSS Plan, which will be prepared at a later date following completion of the baseline survey.

11.5.2 SSSB Vessel

Disposition surveys for the portions of the SSSB vessel intended for recycle were designed in accordance with NUREG-1575 (MARSSIM) and Supplement 1 to NUREG 1575 (MARSAME) as documented in the MCSRP. Areas of the SSSB intended for unrestricted release include seven compartments designated 3 Port, 3 Centerline, 3 Starboard, 3 Void, 9 Port, 9 Centerline and 9 Starboard. The compartments will be treated as a MARSAME Class 2 SU. Each compartment will be divided one or more SUs such that no single SU is greater than 1,000 m^2.

Disposition surveys will consist of “scan-only” surveys of 100% of the surfaces in the SU with a Ludlum Model 2360 scaler/ratemeter paired with a Ludlum Model 44-116 beta plastic scintillation detector. The required detection limit for unrestricted release is 5,000 dpm/100 cm^2 The scan MDC of this instrument is 3,630 dpm/100 cm^2.

The SU fails to meet unrestricted release criterion if any measurements exceed 5,000 dpm/100 cm^2 total contamination. All SUs within a compartment must meet the non-detectable unrestricted release criterion of 5,000 dpm/100 cm^2 for the compartment to be released for unrestricted use.

11.6 Final Status Survey Report

The SSSB project FSS Report will be produced in two volumes. The first volume will provide details of the overall design and implementation of the MCSRP for the SSSB vessel. The MCSRP design and implementation portion of the report will be followed by additional sections detailing the implementation of the MCSRP for each SU. The SU section will include information on instrument operability, raw data collected, data reduction, summary statistics, investigation conducted and a conclusion as to whether the SU met the unrestricted release criterion. The SSSB vessel report must be completed and the SSSB dispositioned before the FSS for the Dismantlement and Survey Area can be completed.

The second volume of the FSS Report will provide details of the overall design and implementation of the FSS for the SSSB Disassembly and Survey Area. The FSS design and implementation portion of the report will be followed by additional sections detailing the implementation of the FSS Plan for each SU. The SU section will include information on instrument operability, raw data collected, data reduction, summary statistics, investigation conducted and a conclusion as to whether the SU met the unrestricted release criterion.

12.0 Financial Assurance

APTIM is an industry leader in nuclear remediation, facility D&D, and waste management. Our experience and successful completion of the STURGIS project highlights our qualifications in the nuclear vessel D&D field.

12.1 Cost Estimate / Awarded Value:

This project is 100% fully funded by the project owner, NAVSEA, and payment milestones from NAVSEA to APTIM for this project based on performance, have been established in the contract, and shown below.

NAVSEA SSSB Dismantlement Funding Summary

As Sold Price $ 129,174,167.00

CLIN	Description	SLIN	Payment event	%	Price	Amount Invoiced	Status
1	Decommissioning work plan, facilities and licensing requirements, physical security	0001AA	Submit DWP	10%	$ 12,917,416.70	$ -	DWP development in progress.
		0001AB	NRC Recommends Custody Transfer	10%	$ 12,917,416.70	$ -	Pending DWP Submittal and approval
2	Transport SSSB to dismantlement site	----------	Transport SSSB to dismantlement site	10%	$ 12,917,416.70	$ -	Pending NRC Custody Transfer
3	Dismantlement and disposal of the SSSB	0003AA	Remove water processing system and radioactive in the dry pit, heavy equipment ship and hot tunnel (does not include any bulkheads, decks, or other structures in these spaces)	10%	$ 12,917,416.70	$ -	Pending successful completion of CLINS 0001 and 0002
		0003AB	Remove and dispose of all water from the wet pit	10%	$ 12,917,416.70	$ -	Pending successful completion of CLINS 0001 and 0002
		0003AC	Remove wet pit walls, floor and associated shielding	15%	$ 19,376,125.05	$ -	Pending successful completion of CLINS 0001 and 0002
		0003AD	Receive NRC recommendation that remainder of SSSB can be released from further regulatory oversight	10%	$ 12,917,416.70	$ -	Pending successful completion of CLINS 0001 and 0002
		0003AE	Complete all SSSB material recycle and disposal	15%	$ 19,376,125.05	$ -	Pending successful completion of CLINS 0001 and 0002
		0003AF	Receive NRC recommendation that the dismantlement site can be released	10%	$ 12,917,416.70	$ -	Pending successful completion of CLINS 0001 and 0002
4	Data Items	----------	Not separately Priced	-----		$ -	-
Subtotal					**$ 129,174,167.00**	**$ -**	
5	Incentive Fee for CLIN 0003	----------	Successful completion of SSSB dismantlement and disposal without NRC violation	2%	$ 2,583,483.34		Pending successful completion of CLINS 0001, 002, and 0003.
Total					**$ 131,757,650.34**	**$ -**	

12.2 Certification Statement

APTIM is financially stable and fully secure to meet the financial obligations of project performance.

APTIM, as the prime contractor, has performed $292.7M of radiological work under NRC license and regulation within the past five years.

Team members Veolia, ReNuke, and WCS bring an additional $254M as prime contractors in relevant radiological work under NRC license and regulation within the past 5 years.

The APTIM Team's radiological experience demonstrates successful past accomplishment of every aspect of our proposed scope of work.

APTIM. APTIM will manage the D&D project and provide the corporate agreement and bonding capacity. APTIM will self-perform regulatory compliance, health and safety, QC, radiological vessel dismantlement, and radiological and environmental monitoring.

APTIM brings additional value from the highly relevant STURGIS nuclear vessel D&D project.

Waste Control Specialists. WCS is providing the easement to ensure NAVSEA sufficient waste disposal capacity at their licensed 1,338-acre disposal facility for Class A/B/C LLRW and LLMW. They received all STURGIS radiological waste as part of the APTIM Team for that project.

Veolia. Veolia will provide solid and liquid radiological waste processing and treatment, and waste packaging at Alabama Shipyard. Veolia has managed the decommissioning of several nuclear submarines and designed and commissioned the radioactive cooling water treatment facility for the Fukushima nuclear plant.

ReNuke. ReNuke, a Veteran-Owned Small Business, has been supporting the nuclear fuel cycle industry with high-quality staffing services and turnkey project execution on over 150 projects since 2006, and will provide trained radiological technicians to the SSSB project.

In addition to exceeding the requirements of this project, our team provides expertise in nuclear ship Dismantlement and Disposal that is highly relevant to the SSSB project.

STURGIS MH-1A Barge Decommissioning, Dismantlement and Disposal

APTIM planned and performed the $65M D&D of the Sturgis MH-1A Barge and disposed of the Class A and Class B LLRW and MLLW at team member WCS's facility. Although not under an NRC license, the project offers close similarities in size, scope, and complexity to the SSSB project. Both projects require transfer of possession, transport from Virginia to a dismantlement site on the Gulf of Mexico, decontamination, dismantlement, waste disposal, and recycling.

Veolia French Navy Nuclear Submarines Dismantlement and Disposal

In 2018, Veolia was awarded a contract by the French Defense Ministry to dismantle five decommissioned French Navy nuclear submarines. Each dismantlement will take 18 months to complete. The first project started in September 2018 on the submarine "Le Tonnant" – 120 meters long and weighing over 6,100 metric tons. Veolia expects to recover a total of 5,300 metric tons of material from each vessel, including 1,500 metric tons of hull, 2,000 metric tons of scrap iron, 800 metric tons of lead and 1,000 metric tons of non-ferrous metals such as copper and stainless steel. The remaining materials will be sent through classified processing channels for treatment.

12.3 Financial Mechanism/Guarantee

In addition to being highly qualified to perform this project, APTIM is financially stable, secure, and committed to complete this project, under contract with NAVSEA. APTIM is required to post a performance bond during performance of the SSSB project, and we have secured commitment from our surety for that bond, and the bond as evidenced below. The performance bond is required to be provided upon APTIM taking possession of the SSSB following DWP approval, and NRC recommendation to transfer possession from NAVSEA to APTIM.

ARGO SURETY
Member Argo Group

January 31, 2020

Naval Sea Systems Command (HQ)
1333 Isaac Hull Ave SE
Washington Navy yard, DC 20376-2030

Re: Naval Surface Ship Support Barge (SSSB) Dismantlement and Disposal
Solicitation # N0002418R4339

Dear Sir/Madam:

It has been the privilege of Argonaut Insurance Company ("Argo Surety")[1] and/or its underwriting team to have provided surety bonds for Aptim Federal Services, LLC. Aptim Federal Services, LLC is an account in good standing with our company.

It is our opinion that Aptim Federal Services, LLC is qualified to perform the above captioned project. At their request we will provide a performance bond valued at 20% of the total proposed price to be effective the date the Contractor takes possession of the SSSB.

Please note that the decision to issue surety bonds is a matter between Aptim Federal Services, LLC and Argo Surety, and will be subject to our standard underwriting at the time of the final bond request, which will include but not be limited to the acceptability of the contract documents, bond forms and financing. We assume no liability to third parties or to you if for any reason we do not execute said bonds.

Argo Surety is "Treasury Listed" by the U.S. Department of the Treasury with an underwriting limitation expressed therein of over $89,568,000.00. The A.M. Best Company has assigned Argo Surety a rating of "A" with Financial Size Category of XIV. Argo Surety is fully licensed and authorized to write bonds of this size and type in the State of Alabama.

If you have any questions or need any additional information, please do not hesitate to contact me.

Sincerely,

Argonaut Insurance Company

Frances Rodriguez
Attorney-in-Fact

[1] Argo Surety is an A (Excellent) A.M. Best rated insurance company (Financial Size Category XIII ($1 billion to $1.25 billion).

13.0 Restricted Use – Alternate Criteria

At the conclusion of the SSSB D&D project the SSSB will be dispositioned via one of four pathways

1. LLRW
2. LLMW
3. Hazardous waste
4. Non-hazardous industrial waste.

The site on which the SSSB D&D is performed will meet the license termination screening criteria contained in 10 CFR 20.1402 as demonstrated by the FSS showing compliance with the screening criteria contained in NUREG 1757 Appendix B. Consequently, the restricted use and alternate criteria of 10 CFR 20.1403 and 20.1404 are not applicable to the project.

14.0 Changes to Decommissioning Work Plan

APTIM will implement and maintain in effect all provisions of this DWP, as approved by the NRC, subject to and as amended by the following stipulations. APTIM may make changes to the DWP without prior approval provided the proposed changes do not meet any of the following criteria:

- Result in the potential for significant environmental impacts that have not previously been reviewed.
- Detract or negate the reasonable assurance that adequate funds will be available for decommissioning.
- Decrease an SU area classification (i.e., impacted to not impacted; Class 1 to Class 2; Class 2 to Class 3; or Class 1 to Class 3) without providing NRC a minimum 14-day notification before implementing the change in classification.
- Increase the derived concentration guideline levels and related MDCs for both scan and fixed measurement methods. If MDCs are increased (relative to what was approved) APTIM will request NRC concurrence.
- Increase the radioactivity level, relative to the applicable derived concentration guideline level, at which an investigation occurs.
- Change the statistical test applied to a test other than the Sign test or Wilcoxon Rank Sum test.
- Increase the approved Type I decision error when using Scenario A or the Type II error when using Scenario B.
- Change the approach used to demonstrate compliance with the dose criteria (e.g., change from demonstrating compliance using derived concentration levels to demonstrating compliance using a dose assessment that is based on final concentration data).
- Change parameter values or pathway dose conversion used to calculate the dose such that the resultant dose is lower than in the approved DWP and if a dose assessment is being used to demonstrate compliance with the dose criteria.
- Change the location of any of the D&D operations described herein.

Proposed changes to the DWP shall be reviewed and concurred with by the PM, SM, PRSO, SSHO, and QAM. Final approval authority for DWP changes resides with the PM.

15.0 References

10 Code of Federal Regulations Part 19 (10 CFR 19), ***Notices, Instructions and Reports to Workers: Inspections and Investigations***.

10 Code of Federal Regulations Part 20 (10 CFR 20), ***Standards for Protection Against Radiation***.

10 Code of Federal Regulations Part 61 (10 CFR 61), ***Licensing Requirements for Land Disposal of Radioactive Waste***.

40 Code of Federal Regulations Part 268 (40 CFR 268), ***Land Disposal Restrictions***.

40 Code of Federal Regulations Part 761 (40 CFR 761), ***Polychlorinated Biphenyls (PCB) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions***.

49 Code of Federal Regulations Part 173.24 (40 CFR 173.24), ***General Requirements for Packaging and Packages***.

49 Code of Federal Regulations Part 173.410 (40 CFR 173), ***General Design Requirements***.

Aptim Federal Services LLC (APTIM), 2021a, ***Wet Tow Plan, Surface Ship Support Barge Dismantlement and Disposal***, Rev. 0, April (or most recent revision).

Aptim Federal Services LLC (APTIM), 2021b, ***Transportation and Dry Tow Plan, Surface Ship Support Barge Dismantlement and Disposal***, Rev. 0, April (or most recent revision).

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ATTACHMENT 1

SSSB PROJECT RADIATION PROTECTION PLAN

RADIATION PROTECTION PLAN

SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL

Project Number: 501513
Contract Number: N00024-20-C-4139

Prepared for

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April 2021

Revision 1

RADIATION PROTECTION PLAN

SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL

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April 2021

Revision 1

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Record of Revisions

Revision No.	Description of Revision	Date
0	Radiation Protection Plan	August 2020
1	Radiation Protection Plan - Various revisions throughout based on NRC comments on Rev. 0 document.	April 2021

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Acronyms and Abbreviations

ALARA	As Low as Reasonably Achievable
ANSI	American National Standards Institute
BZ	breathing zone
C-14	carbon-14
APTIM	Aptim Federal Services, LLC
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
cm^2	square centimeter
Co-60	cobalt-60
CRZ	contamination reduction zone
Cs-137	cesium-137
D&D	dismantlement and disposal
DAC	Derived Air Concentration
DOT	U.S. Department of Transportation
dpm	disintegrations per minute
DRS	Director, Radiation Safety
DWP	Decommissioning Work Plan
Fe-55	iron-55
H-3	hydrogen-3
HEPA	high-efficiency particulate air
HTD	hard to detect
M&E	materials and equipment
MARSAME	*Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual*
MDA	minimum detectable activity
MDC	minimum detectable concentration
µR/hr	microroentgens per hour
mR/hr	milliroentgens per hour
mrem	millirem
NAVSEA	Naval Sea Systems Command
Ni-63	nickel-63
NRC	U.S. Nuclear Regulatory Commission
PM	Project Manager

PPE	personal protective equipment
PRSO	Project Radiation Safety Officer
RCA	radiologically controlled area
RCOPC	radiological contaminant of potential concern
RCS	Radiological Controls Supervisor
RCT	Radiological Control Technician
RPP	Radiation Protection Plan
RWP	Radiation Work Permit
SSSB	Surface Ship Support Barge

1.0 Introduction

This Radiation Protection Plan (RPP) covers all radiological activities involving the dismantlement and disposal (D&D) of the Surface Ship Support Barge (SSSB) once Aptim Federal Services, LLC (APTIM) takes possession in Newport News, Virginia through completion of D&D activities at the Alabama Shipyard, LLC in Mobile, Alabama.

The decommissioning of the SSSB involves the removal of hazardous and radioactively contaminated materials and equipment (M&E) followed by systematic vessel dismantlement. Equipment, material, and dismantled sections of SSSB will either be disposed of as radioactive, hazardous, or mixed waste, as appropriate, with limited portions being surveyed for release for unrestricted use.

The SSSB was a dockside facility used to support refueling of nuclear-powered surface combatants at Newport News Shipbuilding. The SSSB houses a shielded fuel pool for the temporary storage of spent fuel and workspace for the maintenance of radiological components during refueling operations. The primary radiological contaminants of potential concern (RCOPC) during D&D activities of the SSSB are cobalt-60 (Co-60), hydrogen-3 (H-3), iron-55 (Fe-55), nickel-63 (Ni-63), carbon-14 (C-14), and cesium-137 (Cs-137). Further information on these and additional RCOPCs can be found in Chapter 3.0 of this RPP.

All activities will comply with conditions as set forth in the Decommissioning Work Plan (DWP) (APTIM, 2021a), U.S. Nuclear Regulatory Commission (NRC) regulations *Notices, Instructions and Reports to Workers: Inspections and Investigations* (10 Code of Federal Regulations [CFR] 19) (NRC, 2020a) and *Standards for Protection Against Radiation* (10 CFR 20) (NRC, 2020b), and this RPP. NRC inspection personnel, following proper identification and compliance with all applicable security and access control measures including radiological protection and personal safety, shall be given immediate unfettered access to the site and project personnel in accordance with 10 CFR 19.15 and 10 CFR 50.70(b)(3).

APTIM will administer a comprehensive Radiation Protection Program in support of the SSSB D&D. This RPP will be implemented utilizing Health Physics professionals, Radiological Control Technicians (RCT), and radiological controls and field implementing procedures. This RPP abides by the elements of the APTIM Radiation Safety Program (APTIM, 2019) that are applicable to this work. A list of implementing procedures is provided as Attachment 1. The

APTIM RPP and implementing procedures meet the requirements as set forth in 10 CFR 20 Subpart B.

2.0 Radiation Protection Personnel

A list of key project personnel is provided as follows:

2.1 Director, Radiation Safety

The Director, Radiation Safety (DRS) provides remote support and advice and is responsible for reviewing and approving this RPP and ensuring compliance with all applicable regulatory requirements for radiation protection of the workers, public, and environment. The DRS ensures that the radiation safety program is implemented either as written in the various licensing documents and/or is implemented by acceptable additional or alternative documents and procedures provided by partners, vendors, sub-contractors, or other sources important to the safe and successful execution of project tasks.

The DRS shall be qualified by training and experience in radiation protection including a baccalaureate degree in health physics, science, or related field and 15 years' experience in the field of health physics or radiation protection. Experience shall include 10 years of management, supervisory or team leader experience encompassing policy making or decision making on policy implementation and five years as a key regulatory interface. The DRS shall have current certification by the American Board of Health Physics.

2.2 Project Certified Health Physicist

The Project Certified Health Physicist (CHP) is responsible for overall oversight of the Radiation Protection Program. This includes conducting reviews and audits of the implementation of the RPP. The CHP is also responsible for reviewing and approving the radiation protection portions of the Accident Prevention Plan (APTIM, 2021b) and providing guidance to the Project Radiation Safety Officer (PRSO) as required. The CHP will review all Technical Work Documents and Radiation Work Permits (RWP) and work with the PRSO to oversee work plans and procedures for matters related to radiation protection. Internal intake, dose assessment, and applicable monitoring will be evaluated by the CHP.

The Project CHP shall be qualified by training and experience in radiation protection including a baccalaureate degree in health physics, science, or related field and 15 years' experience in the field of health physics or radiation protection. Experience shall include support (onsite or remote) to field project personnel as a health physicist, radiological engineer, radiation safety officer or other professional staff member with increasingly responsible technical leadership, experience as the lead or sole technical decision maker for program elements within the overall

health physics program or as the lead technical representative on the project health physics staff , and experience as lead author, reviewer, or approver of project reports and documents. The Project CHP shall have current certification by the American Board of Health Physics.

2.3 Project Radiation Safety Officer

The PRSO is the individual assigned to implement this RPP at the SSSB project site. The PRSO is responsible for oversight and review of all radiological decommissioning activities and radiological data collected for the purpose of radiation safety and control. In addition, the PRSO is responsible for the following tasks:

- Field implementation and enforcement of the DWP.
- Ensure compliance with applicable regulations concerning the handling and transportation of radioactive material.
- Provide training to on-site personnel who may be exposed to ionizing radiation.
- Review the results of surveys, sampling, and environmental monitoring to identify trends and potential for personnel exposure.
- Identify potential radiological hazards and means of protection against these hazards.
- Specify proper levels of personal protective equipment (PPE) and resources necessary to ensure health and safety of workers.
- Observe work in progress to verify adherence to day-to-day radiation safety operations and implementing procedures.
- Investigation of accidents/incidents and "radiological near misses" involving radioactive materials or radiation exposures. A radiological near miss is defined as an undesired event that, under slightly different circumstances, could result in a significant radiological exposure or contamination event above APTIM administrative or project limits.
- Conduct weekly safety audits and complete required documentation.
- Coordinate with the Project Manager (PM) regarding the control of existing and potential radiological hazards.

The PRSO shall be qualified by training and experience in radiation protection and be available for advice and assistance on radiological safety matters. The PRSO’s training and experience shall include the uses of the types and quantities of radioactive material identified on the project

so that the PRSO is able to oversee the radiation safety program during normal and emergency conditions. The PRSO must have at least five years of documented direct, hands-on radiological controls experience.

2.4 Project Manager

The PM is responsible for ensuring the work is conducted safely and in compliance with all applicable permits, client contracts, and other applicable controlling documents. The PM also ensures adequate resources and staffing are available to develop and implement this RPP in compliance with applicable regulations and requirements.

2.5 Site Manager

The Site Manager is responsible for assuring that personnel under his/her direction comply with radiological requirements, including applicable site-specific procedures, training requirements, RWPs, and verbal instructions provided by radiological control personnel.

2.6 Radiological Controls Supervisor

The Radiological Controls Supervisor (RCS) is the individual assigned to supervise the RCTs and oversee daily radiological operations. The RCS may serve as the PRSO’s designee when the PRSO is not on site. The RCS has documented training as specified in procedure APTIM-SSSB-001, *Personnel Training Requirements* (Attachment 1).

2.7 Radiological Control Technicians

RCTs may be APTIM or subcontract employees. The RCTs are responsible for performing work in compliance with this RPP and applicable radiological site-specific procedures and work instructions. RCTs will install and maintain radiation monitoring devices and air sampling equipment, perform periodic instrument checks, perform radiological surveys (e.g., surveys of areas, equipment, and materials and surveys of waste containers in support of shipping tasks), workplace monitoring, and collect and prepare samples for laboratory analysis. The RCTs will also maintain radiologically controlled areas (RCA) and perform surveys of personnel and equipment exiting RCAs. RCTs will have, as a minimum, a high school diploma and at least 12 months of applied health physics experience. Section 7.3 provides additional required RCT qualifications.

2.8 Radiation Workers

Radiation workers (radiologically trained general labor force) are responsible for performing work in RCAs per the requirements of the applicable RWP or as directed by the RCT, RCS, or

PRSO. All radiation workers must successfully complete required radiation worker training as outlined in Section 7.2.

3.0 Identification of Radiation Hazards

The RCOPCs for the SSSB D&D consist of common activation products typically associated with the operation of a reactor (Table 3-1). The RCOPCs have been determined by operating history records and will be confirmed upon receipt of the vessel and performing characterization surveys. It should be noted that the majority of activity remaining on the SSSB is associated with the Wet Pit (spent fuel pool). At this time, it has been determined that no reactor fuel constituents have been identified as RCOPCs for SSSB; however, this will be verified as part of the vessel characterization.

Table 3-1
Radiological Contaminants of Potential Concern

Radiological Contaminants of Potential Concern [a]				Estimated Activity in Wet Pit Decayed to 2021 (Curies)
Radionuclide	**Abbreviation**	**Half-Life (Years)**	**Detectable**	
Activation Products				
Cobalt-60	Co-60	5.27	Yes	6.6E-02
Iron-55	Fe-55	2.7	Hard to Detect	1.1E-02
Nickel-63	Ni-63	100.1	Hard to Detect	3.0E-02
Hydrogen-3	H-3 (tritium)	12.3	Hard to Detect	1.3E-01
Carbon-14	C-14	5730	Hard to Detect	6.3E-03
Mixed Fission Products				
Cesium-137	Cs-137	30.1	Yes	1.2E-03

[a] Department of the Navy RCOPCs shipyard low-level radioactive waste decayed to 2021 (U.S. Department of the Navy, 2006).

4.0 Identification of Controlling Agencies and Documents

All activities will comply with the requirements set forth in the DWP, NRC regulations, and this RPP.

Through an Interagency Agreement, the Navy has established a process with the NRC for technical and contractual implementation of NRC regulations governing the D&D of the SSSB. APTIM is under contract with the Naval Sea Systems Command (NAVSEA) to perform SSSB D&D in compliance with NRC decommissioning regulations. Under contract with the NAVSEA, APTIM has prepared the DWP in accordance with NRC requirements for submittal to the NRC for review.

The guidance for controlling the release of M&E associated with decommissioning the SSSB for unrestricted use is the *Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual* (MARSAME) (NRC, 2009). APTIM will prepare a survey plan for unrestricted release of M&E based on MARSAME guidance.

Prior to arrival of the SSSB in Mobile, a baseline survey will be performed of the area where the SSSB will be sited for D&D in accordance with the Baseline Survey Plan, which is included as an attachment to the DWP. This survey will encompass the areas involved in and adjacent to where radiological work will be conducted. The baseline survey will establish initial conditions, including background levels to confirm future release of the area following completion of the work and as reference for environmental monitoring conducted throughout the duration of the project in accordance with the Environmental Monitoring Plan, which is included as an attachment to the DWP.

Once all potentially impacted M&E has been removed for disposal and any remaining portions of the SSSB have been removed for unrestricted use, a final status survey will be performed of the project performance and support areas. Baseline and final status survey plans will be developed following the guidance provided in the *Multi-Agency Radiation Survey and Site Investigation Manual* (NRC, 2000). The final status survey process will demonstrate that the facility meets the unrestricted use release requirements as specified in 10 CFR 20.1402 (NRC, 2013) and that the site was not impacted by project operations.

5.0 Evaluation of Potential Exposure to Workers

Radiological hazards from the handling of spent fuel and activated materials exist in areas of the SSSB previously maintained as RCAs. Most residual radioactivity on the vessel is contained within the wet pit (spent fuel pool) and water treatment components and systems. It is assumed that the highest potential dose to workers will result from the management and handling of materials within the Clean House and Pump Room during the removal of components from the wet pit, general wet pit contamination reduction and the removal of the wet pit filtration system, chillers, heat exchangers, and demineralizers. The Clean House is a high bay enclosed area providing a controlled environment where the majority of refueling support operations were performed. The Clean House contains the dry and wet pits. Occupational dose from the balance of work is anticipated to be minimal compared to the wet pit and associated system dismantlement and disposition.

It is expected that the primary gamma-emitting radionuclide contributing to gamma exposure rates will be Co-60. Due to the lack of available radiological survey information, no project dose estimates have been performed. Occupational dose estimates will be performed as more radiological survey data are accumulated from characterization surveys on receipt of the vessel prior to performing dismantlement work (Attachment 2).

Responses to emergencies in radiologically impacted areas of the SSSB also presents a risk of potential exposures to workers and emergency responders. Emergency responders will have radiological emergency response training prior to the start of fieldwork in Mobile, and in the event of an emergency will be provided with appropriate dosimetry to monitor their exposure. Responses to these emergencies are described in APTIM-SSSB-002, *Emergency Response* (Attachment 1).

5.1 Personnel Monitoring Policy

Internal and/or external dose monitoring is required for individuals who can reasonably be expected to receive a dose greater than 10 percent of the maximum permissible dose. APTIM will require external dose monitoring for occupationally exposed individuals as deemed necessary to demonstrate compliance with APTIM administrative limits and federal regulations and ensure that doses are kept As Low as Reasonably Achievable (ALARA). Monitoring of personnel exposures will be performed in accordance with the applicable sections of APTIM-SSSB-015, *Personnel Monitoring* (Attachment 1).

5.2 Dose Limits and ALARA

To provide assurance that individuals do not exceed the federal limits specified in 10 CFR 20 (NRC, 2020b), APTIM will implement administrative dose limits established at 40 percent of the federal limits (Table 5-1). APTIM will actively monitor each personnel's cumulative dose (Total Effective Dose Equivalent) and notify project management and the PRSO once anyone reaches 50 percent and at 75 percent of the APTIM administrative limits. Unplanned exceedances of the administrative limits will be investigated by the PRSO and will be entered into the APTIM Radiological Improvement Report program for corrective action tracking.

Table 5-1
SSSB Occupational Dose Limits

Body part	Federal Annual Limit	APTIM Administrative Limit (40% Federal Annual Limit)	APTIM Notification
Whole Body	5 rem (0.05 sievert)	2 rem (0.02 sievert)	50% Administrative Limit; 75% Administrative Limit
Individual Organ	50 rem (0.5 sievert)	20 rem (0.2 sievert)	50% Administrative Limit 75% Administrative Limit
Lens of eye	15 rem (0.15 sievert)	6 rem (0.06 sievert)	50% Administrative Limit 75% Administrative Limit
Skin or Extremity	50 rem (0.5 sievert)	20 rem (0.2 sievert)	50% Administrative Limit 75% Administrative Limit
Declared Pregnant Worker	500 millirem during gestation period	Not applicable	Not applicable

Prior to performing specific work activities with increased dose potential, a review will be performed to document any dose estimates to help manage personnel dose. The number of workers, projected number of hours to be worked, and survey data will be used in order to project expected worker dose. In addition, the work will be discussed and planned prior to performance to streamline work, identify areas of dose concern, and minimize the number of personnel and the time necessary in order to minimize personnel exposure.

5.3 Radiation Exposure Restrictions

In addition to implementing ALARA principles through the RWP process, as described in APTIM-SSSB-003, *Radiation Work Permits* (Attachment 1), additional dose restrictions shall be imposed for all work activities as follows:

- Individuals under 18 years of age shall not be occupationally exposed.

- Members of the public shall not receive doses exceeding 100 millirem (mrem) per year excluding background and medical exposures, and the dose in any unrestricted area from operations associated with this project shall not exceed two mrem in any one hour. To ensure that doses to the public do not exceed two mrem in any one hour, surveys will be performed in applicable unrestricted areas, physical barriers will be established as necessary, and appropriate postings (Restricted Area) will be displayed.

- Members of the public shall not receive a total effective dose equivalent in excess of 10 mrem per year from air emissions of radioactive material to the environment, excluding Radon-222 and its daughters.

- Planned Special Exposures are not permitted.

- Individuals shall not conduct specific tasks within an RCA if their current dose accumulation has exceeded the administrative limits unless entry is approved by the PRSO.

- Visitors shall not be allowed to receive a whole-body dose greater than 10 mrem per visit.

5.4 External Monitoring

Trained radiation workers entering an SSSB RCA will wear personnel dosimetry issued by APTIM as specified on the applicable RWP. A National Voluntary Laboratory Accreditation Program accredited dosimetry service will be utilized to provide dosimetry. The primary dosimeter results will be the official dose of record for external exposures. The PRSO may exempt short-stay visitors and vendors from the requirement to wear personnel dosimetry if conditions warrant such exemption. As required by the RWP, some radiation workers may be required to wear extremity dosimeters (e.g., finger rings or wrist dosimeters). Supplemental monitoring, such as self-reading or alarming dosimeters, may also be required for a particular work task to track dose on a per-task or per-entry level during tasks where dose rates are expected to vary significantly during performance of the task. Supplemental monitoring will be specified in the applicable RWP.

5.5 Internal Monitoring

Monitoring for internal exposure as a result of a radiological intake is not anticipated during the SSSB project. Significant internal exposure risks, specifically the risk of exposure through ingestion or inhalation, are not expected to be encountered during decommissioning activities, as most of the radioactivity is part of a “wet” system. Although not anticipated, work will be

continually evaluated by health physics and internal dose monitoring will be required on an as-needed basis.

Personnel whose estimated intake may exceed 200 Derived Air Concentration (DAC)-hours over the course of a year or the project (i.e., 10% of the annual limit on intake) or up to 12 DAC-hours in a week (i.e., airborne radioactivity area), shall be monitored for intake by bioassay or DAC-hour tracking. Bioassay monitoring is the preferred technique for accuracy; however, the PRSO and CHP will determine the appropriate internal dose tracking method based on the respiratory protection (if worn) and the potential for an intake. The PRSO may also request a bioassay any time as necessary if an internal exposure is suspected for internal dose assessment. If airborne radioactive material hazards exist, the use of breathing zone (BZ) air sampling for the purpose of assigning internal exposures may be used by DAC-hour tracking rather than by bioassay. Dose will not be assigned unless BZ samples indicate the presence of airborne contamination in excess of 10 percent of the DAC (accounting for respirator protection factors if they are worn; see Chapter 11.0 and APTIM-SSSB-021, *Respiratory Protection Program* [Attachment 1]).

Since occupational exposure does not include exposure due to medical administration of radionuclides, radiation workers subject to personnel monitoring are required to inform the PRSO before receiving medical treatments involving radionuclides. After being informed of a medical intake, documentation will be obtained and signed by the individual stating the date of treatment, radionuclide used, amount of intake, and medical procedure. The PRSO will perform an assessment to determine what work restrictions may be necessary until the medical radionuclides have cleared to avoid problems with frisking/portal monitors, exposure to coworkers, or exposure to external dosimeters.

5.6 Summation of Internal and External Doses

Internal and external doses will be summed whenever positive doses are recorded to document an individual’s Total Effective Dose Equivalent. The dose to the lens of the eye, skin, and extremities are not included in the summation. Procedure APTIM-SSSB-015, *Personnel Monitoring* (Attachment 1), includes procedures for the preparation, retention, and reporting of records for occupational radiation exposures.

5.7 Termination

If personnel are required to submit a baseline or other bioassay sample, they shall be requested to submit a bioassay sample upon completion of their radiological work assignment at SSSB.

5.8 Personnel Radiation Exposure History

All monitored workers on the project are required to submit a current NRC Form 4 or equivalent documenting their current years exposure history prior to working in RCAs.

5.9 Personnel Monitoring and Dosimetry Data

All personnel monitoring data shall be considered private information and, if in paper format, will be kept in a locked, fire-resistant cabinet or safe. Personnel exposure information shall not be released except as required by regulation or license condition or at the written request of the individual. Personnel exposure records will be generated and maintained in accordance with 10 CFR 19.13, *Notices and Reports to Individuals*.

Radiation exposure records for individuals supporting SSSB will be maintained with the project exposure files as part of the APTIM project records.

5.10 Dosimetry Processing

APTIM will manage all project dosimetry and exchange personnel and environmental dosimeters on a quarterly basis unless the PRSO and project CHP determine that a more frequent exchange is necessary.

5.11 Visitors

Visitors entering a radiologically controlled and posted area shall be appropriately monitored, as required and detailed in the area RWP. External monitoring may be performed with self-reading dosimeters and may be performed individually or with a single dosimeter for a group of visitors or by escort with appropriate dosimetry. Short-stay visitors and vendors may be exempted from the need for wearing personnel dosimetry if conditions warrant such exemption. Such exemptions, which are granted by the PRSO, shall be documented.

6.0 Evaluation of Public Dose

All project operations shall be conducted to ensure exposures to individual members of the public do not exceed the limits as specified in 10 CFR 20 Subpart D, *Radiation Dose Limits for Individual Members of the Public*, and that public exposure is maintained ALARA. Public dose shall be routinely monitored through an environmental monitoring program in accordance with the Environmental Monitoring Plan specifying the types of monitoring and locations that will be performed including monitoring for direct exposure utilizing site perimeter dosimeters and surveys, and site perimeter air sampling.

A dose assessment for members of the public will be conducted and documented on an annual basis in accordance with APTIM-SSSB-025, *Public Dose Assessments* (Attachment 1), to demonstrate compliance with the regulatory limits. This assessment shall be based on results of radiological surveys, site perimeter air monitoring data, and any environmental dosimeter readings.

7.0 Radiation Safety Training Program

Radiation safety training will be provided to all individuals before being allowed unescorted access to RCAs or being occupationally exposed to ionizing radiation, whether escorted or not. In addition, a daily tailgate safety meeting will be conducted at the beginning of each shift to discuss the tasks of the day, hazards and controls related to those tasks, and applicable RWPs.

Radiation safety training shall include topics to the extent appropriate to the individual's prior training, work assignments, and degree of exposure to potential radiological hazards. Radiation safety training will meet the applicable sections of APTIM-SSSB-001, *Personnel Training Requirements* (Attachment 1).

7.1 Site Briefing

The site briefing is presented to site visitors who may access RCAs with an escort. The briefing consists of a description of site-specific hazards, locations on site that these visitors are allowed to access, emergency response and evacuation routes, potential exposure to radiation and radioactive material, and other applicable information. Visitors must also complete a visitor access control form in accordance with site-specific procedure APTIM-SSSB-015, *Personnel Monitoring* (Attachment 1). Visitors are prohibited from entering the following areas:

- Contamination Areas
- Radiation and High-Radiation Areas
- Any areas which exceed a dose rate of two mrem per hour
- Airborne Radioactivity Areas.

7.2 Radiation Worker Training

Site-specific annual radiation worker training is required for all individuals who may access RCAs without escort per APTIM-SSSB-001, *Personnel Training Requirements* (Attachment 1). Radiation worker training contains the following topics:

- Review and acknowledgment of this RPP (Attachment 3)
- Principles of ionizing radiation
- Health effects from exposure to radioactive material
- Radiation emissions and associated risks of the types of radioactive material that have been found on SSSB
- Radiation exposure limits

- ALARA goals
- ALARA work principles and techniques, such as methods used to minimize exposure, purposes, and functions of protective devices
- Purpose and proper use of dosimetry
- Storage, transfer, or use of radioactive material
- RCA restrictions and postings
- Applicable regulations for the protection of personnel from exposure to radioactive material
- Recognition of site-specific radiation hazards
- Notification procedure for radioactive material found in an area where it is not anticipated
- Notification procedure and expected actions in the event of an emergency, breakage, or spill of radioactive material
- Emergency response actions
- Contamination control
- Radiation survey instrumentation
- Responsibilities of employees and management.

A written and practical examination will be given to each radiation worker. Successful completion of radiation training requires a score of 80 percent or higher on the examination.

7.3 Radiological Control Technician Training Qualifications

RCT candidates shall be qualified if they meet the requirements of one or more of the following categories:

- Verifiable evidence of training, experience, or combination of training and experience consistent with the requirements of ANSI/American Nuclear Society, *Selection, Qualification, and Training of Personnel for Nuclear Power Plants,* ANSI/ANS-3.1-1993 (reaffirmed 1999) for radiation protection technicians
- National certification with the National Registry of Radiation Protection Technologists

- Certification as a U.S. Department of Energy RCT consistent with the requirements of 10 CFR 835, Section 835.103
- Evidence of NAVSHIPS 389-0288, *Radiological Controls for Shipyards,* or NAVSEA 389-0153, *Radiological Controls,* Article 108, qualification
- Two-year technical degree in health physics or related science field.

RCTs will have, as a minimum, a high school diploma and at least 12 months of applied health physics experience. RCTs will complete qualification cards that include formal evaluations of knowledge and skills prior to providing job coverage alone and participate in ongoing radiation safety training consistent with their duties and responsibilities.

8.0 Declared Pregnant Worker Program

Female workers may declare pregnancy in writing in accordance with APTIM-SSSB-015, *Personnel Monitoring* (Attachment 1).

Based on federal regulatory requirements, controls shall be established for the protection of the embryo/fetus during a female worker's declared pregnancy. These controls ensure compliance with regulatory requirements and protect the rights of the female worker. A declared pregnant worker will not be permitted to enter airborne radioactivity areas nor assigned to tasks that could lead to internal radionuclide intakes.

9.0 As Low as Reasonably Achievable Program

The SSSB project will work to ensure that all personnel radiation exposure is kept ALARA, taking technological, social, and economic factors into account. Radiation exposure to project personnel, visitors, and contractors, as well as the general public, will be controlled so that exposures are held below regulatory limits.

Elements of the SSSB project ALARA program include the following:

- Management commitment, engineering, and administrative control levels for control of radiation exposure to workers and members of the public
- Review of plans, procedures, and facilities to determine where controls could be used to limit doses
- Use of surveying and monitoring techniques to determine RCAs and controlling access to these areas
- Prevention of unnecessary handling of radioactive materials
- Use of personnel dosimeters to verify exposures to visitors in RCAs
- ALARA goals/radiological performance goals
- Records of ALARA program elements.

10.0 External Exposure Control

Both engineering and administrative controls will be employed, as necessary, to reduce and minimize personnel exposure to meet the requirements of 10 CFR 20. Routine surveys will be performed of all radiological work areas and perimeters to verify proper radiological postings and controls and to identify any areas of concern. Survey results will be posted and/or communicated to project personnel such that they have a full understanding of the radiological conditions within their work area so they may maintain their exposure ALARA.

Access control measures will be established for RCAs to prevent unauthorized access. In addition to normal administrative controls, alarms, barriers, and locking devices may be used. Job-specific external control measures will also be specified in the technical work document or RWP for the task.

11.0 Internal Exposure Control

Significant internal exposure risks are not expected to be encountered during decommissioning activities at the SSSB project, as most of the radioactivity is in wet systems and system components. However, administrative and engineering controls will be utilized as necessary to assure internal exposure are maintained ALARA.

Engineering controls that may be employed include, but are not limited to, confinement and containment systems, ventilation systems, and high-efficiency particulate air filtration systems. PPE such as respirators will be used when engineering controls are not sufficient to maintain potential exposures ALARA.

Methods for control of airborne radiological hazards are described in APTIM-SSSB-007, *Contamination and Airborne Radiation Control* (Attachment 1). Job-specific internal exposure control measures will be specified in the technical work document or RWP for the task.

Information on the project respiratory protection program can be found in the following procedures (Attachment 1):

- APTIM-SSSB-021, *Respiratory Protection Program*
- APTIM-SSSB-022, *Respirator Fit Testing*
- APTIM-SSSB-023, *Selection and Use of Respiratory Protection Equipment*
- APTIM-SSSB-024, *Inspection, Maintenance and Control of Respiratory Protection Equipment*.

These procedures incorporate the requirements and guidance contained in 10 CFR 20, Subpart H – Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas; *Manual of Respiratory Protection Against Airborne Radioactive Materials* (NUREG/CR-0041) (NRC, 2001); and *Regulatory Guide 8.15, Acceptable Programs for Respiratory Protection* (NRC, 1999). Topics addressed include, but are not limited to, medical evaluations, personnel training, fit testing, use of equipment, protection factors, and air monitoring approved by the National Institute for Occupational Safety and Health.

In addition, the radiological respiratory protection program falls under the umbrella of the Respiratory Protection Plan, which is included in the SSSB Accident Prevention Plan. The

Respiratory Protection Plan includes the designation of a project respirator program administrator who is assisted with respirator selection by the Project CHP and Project Certified Industrial Hygienist.

12.0 Monitoring and Measuring External Exposure

APTIM requires monitoring of an individual's external radiation dose for all workers entering an RCA. The PRSO may exempt short-stay visitors and vendors from external monitoring if conditions warrant such exemption.

External monitoring will comply with requirements and guidance limits specified in 10 CFR 20 and this RPP. See Section 5.2 for further information on exposure limits. In the event of an unplanned exposure, lost dosimeter, or an off-scale self-reading dosimeter, an external dose assessment will be conducted in accordance with APTIM-SSSB-018, *External Dose Assessments* (Attachment 1).

13.0 Monitoring and Measuring Internal Exposure

As stated in Chapter 11.0, significant internal exposure risks are not expected to be encountered during decommissioning activities at the SSSB project; however, air monitoring for airborne particulate will be performed when radiological activities with the potential to disturb contaminated material or generate dust is initiated. Requirements for air monitoring, including action levels, frequency, sample methods, and sample analysis are found in APTIM-SSSB-016, *Air Sampling and Analysis* (Attachment 1), job-specific RWPs, and site-specific work instructions.

An air sampling program will be implemented when an evaluation of potential airborne radioactive material hazards indicates the presence of airborne contamination in excess of 10 percent of the DAC. However, dose will not be assigned unless air samples indicate the presence of airborne contamination in excess of 10 percent of the DAC (accounting for respirator protection factors if they are worn).

Although not expected, internal monitoring is required for personnel expected to exceed 200 DAC-hours over the course of a year or the project or 12 DAC-hours in a week. Internal monitoring will be performed by DAC-hour tracking or bioassay at the discretion of the PRSO as described in APTIM-SSSB-017, *Bio-Assay Sampling* (Attachment 1).

All air samples will be evaluated and any elevated airborne activity investigated. This includes any air sample exceeding 10% of the DAC in an uncontrolled area, 30% of the DAC (i.e., ~12 DAC-hours/week) in a controlled area not posted as an airborne radioactivity area and any samples exceeding 10 DAC in an airborne radioactivity area where respiratory protection is worn. Any unplanned airborne activity event will be investigated by the PRSO and will be entered into the APTIM Radiological Improvement Report program for corrective action tracking.

Internal dose assessments will be conducted in accordance with APTIM-SSSB-019, *Internal Dose Assessments* (Attachment 1).

14.0 Surveys and Monitoring

Surveys and monitoring will be performed throughout the life cycle of the SSSB project to evaluate and document radiological hazards which may be present and the effectiveness of radiological controls. These will include preliminary surveys to document baseline conditions prior to siting the SSSB, characterization surveys to ensure the proper radiological postings and controls, surveys for unrestricted release of materials and equipment, routine workplace surveys to monitor working conditions and identify any changing radiological conditions, buffer zone surveys to assess any spread of contamination, and environmental monitoring of the general area around the project site. Methods used to perform these surveys include air sampling, removable contamination surveys (smears), beta surface scanning, general area dose rates, collection and analysis of samples, source dose modeling, and general observations.

Routine surveys will be conducted at frequencies and locations dependent on the work activities performed. Contamination surveys will be performed of all control points at a frequency (daily or weekly) dependent on the contamination potential in the work area as determined by the PRSO. The purpose of the surveys is to ensure contamination is not tracked out of controlled areas. Weekly surveys will be performed of general radiological work areas as well as contamination surveys and egress routes, personnel break areas, and the count room. Monthly and/or quarterly surveys of general office spaces and support areas and site perimeters will be performed as verification of project controls.

Non-routine contamination surveys will be conducted as deemed necessary by the PRSO. The purpose of these types of surveys is primarily to detect and/or prevent the spread of contamination and, as necessary, to prepare RWPs and monitor associated work. These surveys will also be used to ensure proper contamination control and respiratory protective measures are being applied and to support action specific dose estimates. Enhanced personnel contamination surveys will be required (e.g., nasal and face smears and sampling of hair) when the work performed results in unexpectedly high levels of loose or airborne contamination.

Although hot particles are not anticipated on the SSSB, they will be evaluated, particularly during work in and around the wet pit, wet pit tools, and containments. If hot particles are determined to be of concern, additional surveys will be performed such as increased frequency, use of sticky rollers, additional personnel frisking requirements, etc.

Performance and documentation of all radiological surveys is per APTIM-SSSB-009, *Performance of Radiological Surveys* (Attachment 1). Review and approval of radiological surveys will be performed by the PRSO or RCS. Copies of radiological surveys will be made available to the PRSO and Project CHP for review.

The survey of M&E and the release criteria, including the survey methodologies and evaluation and determination of instrument sensitivities, are discussed in the DWP and described in detail in the SSSB project Materials Categorization, Survey, and Release Plan, which is included as an attachment to the DWP.

Surveys and release of tools and equipment will be in accordance with APTIM-SSSB-010, *Unrestricted Release of Tools, Equipment and Materials* (Attachment 1).

15.0 Contamination Control

Radioactive material and contamination control measures will be established to prevent the spread of contamination to clean areas, minimize the need for respiratory protection devices, and maintain personnel exposures (internal and external) ALARA. The primary means of preventing the spread of contamination will be to contain it at its source and to minimize the number of contaminated areas and the amount of loose surface contamination. Minimizing the potential for the spread of contamination will be accomplished by instituting good work controls (engineering and administrative controls) and housekeeping practices.

A key component of contamination control is the identification and establishment of posted work areas to properly communicate the radiological hazards present in accordance with Chapter 18.0 of this RPP and APTIM-SSSB-004, *Radiological Postings* (Attachment 1). Work area setup controlling the flow of personnel, equipment, and supplies into and out of these areas will be integral in preventing the spread of contamination. Control points and/or contamination reduction zones (CRZ) and support zones will be established to maintain control and limit access to and from posted RCAs. All personnel and equipment and materials will pass through the control point or CRZ. The support zone will include controlled access points/radiological control points into and from the CRZ.

Control points will be of adequate size and have support facilities as necessary for the proper flow of personnel, equipment, and materials. This includes areas for the selection, inspection, and donning of PPE, staging of equipment and materials as wells as adequate space for the safe doffing of PPE when exiting. Frisking stations will also be set up at the control point for monitoring personnel, equipment and materials when exiting a controlled area.

If hot particles are determined to be of concern, additional contamination controls will be assessed and implemented as necessary. This include increased high-efficiency particulate air (HEPA) vacuum use, additional PPE and respiratory protection, use of sticky mats, multiple layers of control, and increased survey frequencies.

Both engineering controls (such as containment devices, fixatives, and local air filtering ventilation), and administrative controls (such as access control and PPE use) will be implemented, as necessary, to control contamination. Selection and use of PPE will be in accordance with APTIM-SSSB-005, *Selection and Use of Personnel Protective Equipment* (Attachment 1).

The removal of any temporary engineering control such as local HEPA ventilation or isolation sheeting and tents will be performed once the activities requiring such controls are complete and surveys support the removal where they are consistent with the current postings of the surrounding areas. The specific work-controlling documents (e.g., task specific RWPs, procedures, and work instructions) will specify the criterion to all down-posting and removal of controls as applicable.

Equipment, materials, and tools shall not be removed from a posted RCA without being surveyed for release. In general, tools, equipment and materials will be released provided there is no detectable activity. No detectable activity means that the measured radioactivity is not statistically different than background variations when determined using instrumentation that have the sensitivities listed in Table 15-1. Tool, equipment, and materials with inaccessible surfaces will not be released without an engineering evaluation or assessment of the inaccessible surfaces.

An area shall be identified and controlled as a Contamination Area when removable contamination levels exceed 1,000 disintegrations per minute (dpm)/100 square centimeters (cm^2) of beta/gamma-emitting radionuclides or 20 dpm/100 cm^2 of transuranic alpha-emitting radionuclides.

Table 15-1
SSSB Acceptable Instrument Sensitivity for Monitoring Surface Contamination

NUCLIDE	TOTAL [a]	REMOVABLE [b]
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission)	5,000 dpm/100 cm^2	1,000 dpm/100 cm^2
Transuranics and other alpha emitters	100 dpm/100 cm^2	20 dpm/100 cm^2

[a] As used in this table, dpm means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector by background, efficiency, and geometric factors associated with the instrumentation.

[b] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of know efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

cm^2 – Square centimeter.
dpm – Disintegrations per minute.
N/A – Not applicable.

An action level of 500 dpm/100 cm^2 has been established for removable activity in non-radiological controlled areas and 50 times the removable contamination limit in a controlled area in which the PRSO will initiate an investigation as to the source of contamination in the applicable area. Any unplanned contamination event above the action levels will be investigated by the PRSO and will be entered into the APTIM Radiological Improvement Report program for corrective action tracking. The review will include an evaluation of the potential source of contamination, housekeeping practices, increased survey frequencies and an evaluation of the current radiological postings, personnel monitoring and PPE requirements. Any personnel contamination event will be evaluated and entered in the APTIM Radiological Improvement Report program for corrective action tracking.

16.0 Instrumentation

Various types of radiological instrumentation will be used for radiation protection and survey and monitoring purposes in accordance with 10 CFR 20.1501 for the SSSB project.

Procedures APTIM-SSSB-012, *Instrument Calibration and Maintenance*; APTIM-SSSB-013, *General Operations of Portable Radiation Survey Instruments,* and APTIM-SSSB-014, *QA/QC of Radiation Survey Instruments*; and (Attachment 1), include procedures for inventory, issuance and control, calibration, operation, response testing, maintenance, repair, and quality control of radiation protection instrumentation and equipment. All instruments will be capable of performing the intended tasks with adequate sensitivity.

Instrument minimum detectable activity (MDA) is dependent upon the counting time, geometry, sample size, detector efficiency and background count rate. As a data quality objective, the MDAs will be set to the extent practical to be equal to or less than 50 percent of the applicable guideline value. For portable instrument beta surveys, Co-60 is the beta-emitting radionuclide of interest. The following equation is used for calculating the MDA (fixed point measurement) for field instrumentation:

$$MDA = \frac{3 + 3.29 * \sqrt{R_b t_s \left(1 + \frac{t_s}{t_b}\right)}}{\varepsilon_i * \varepsilon_s * \frac{Area}{100} * t_s}$$

Where:	R_b	=	Background count rate (counts per minute)
	t_s	=	Sample counting time (minutes)
	t_b	=	Background counting time (minutes)
	ε_i	=	Intrinsic (2π) instrument counting efficiency
	ε_s	=	Surface efficiency (0.25 for beta emitters with maximum beta energy $\leq$0.400 MeV)
	Area	=	Area of measurement (cm^2).

Scan minimum detectable concentrations (MDC) are addressed in the DWP.

Some of the RCOPCs are beta-emitting radionuclides that cannot be reliably detected using surface survey techniques. These radionuclides are generally referred to as “hard to detect” (HTD) because they either emit beta particles with low emission energies and/or emit no associated gamma radiation (Chapter 3.0). HTD nuclides associated with the SSSB project

include H-3, C-14, Fe-55, and Ni-63. Total surface radioactivity of HTD radionuclides will be evaluated using the results of removable contamination smears analyzed in a liquid scintillation counter by an off-site laboratory.

Table 16-1 illustrates radiological instrumentation that may be used at the SSSB project. Equivalent or similar instruments may be used in place of listed instruments.

Table 16-1
Survey Instrumentation

Detector	Type of Radiation	Calibration Source	Estimated Efficiency	Estimated MDC [a]	Use
Ludlum Model 44-9	Beta (GM)	Tc-99	19 %	3,400 dpm/100 cm^2	Frisking
Ludlum Model 44-40	Beta (GM)	Tc-99	19 %	2,300 dpm/100 cm^2	Frisking
Ludlum Model 44-116	Beta (Plastic)	Tc-99	15 %	1,200 dpm/100 cm^2 (fixed) 3,600 dpm/100 cm^2 (scan)	Direct Measurement and Scans
Ludlum Model 43-90	Alpha (ZnS)	Pu-239	20%	75 dpm/100 cm^2	Direct Measurement
Ludlum Model 43-37	Alpha/Beta (GFP)	Tc-99	20 %	340 dpm/100 cm^2 (fixed) 1,100 dpm/100 cm^2 (scan)	Direct Measurement and Scans
Ludlum Model 43-37-1	Alpha/Beta (GFP)	Tc-99	20 %	280 dpm/100 cm^2 (fixed) 900 dpm/100 cm^2 (scan)	Direct Measurement and Scans
Ludlum Model 3002 (43-147 x 2)	Alpha/Beta (ZnS / Plastic)	Tc-99	15 %	580 dpm/100 cm^2 (fixed) 1,900 dpm/100 cm^2 (scan)	Direct Measurement and Scans
Ludlum Model 2929 / 3030	Beta (Dual Phosphor)	Tc-99	25 %	15 dpm/100 cm^2 (smear) 1E-12 μCi/ml (Air Sample)	Smear and air sample counting
Ludlum Model 2929 / 3030	Alpha (Dual Phosphor)	Th-230	30 %	30 dpm/100 cm^2 (smear)	Smear
Ludlum Model 44-10	Gamma (NaI[Tl])	Cs-137	NA	NA	Surface Scans
Eberline HP-270	Gamma (GM)	Cs-137	NA	0.1 mR/hr	Dose Rate/ Shipping
Eberline RO-20	Gamma (Ion Chamber)	Cs-137	NA	0.05 mR/hr	Dose Rates/ Surveys
Ludlum Model 78	Gamma (GM)	Cs-137	NA	0.1 mR/hr	Dose Rates/ Shipping
Ludlum Model 19	Gamma (NaI[Tl])	Cs-137	NA	0.1 μR/hr	Dose Rates/ Surveys

[a] The estimated instrument efficiencies as listed for field instruments used for direct measurement and surface scans are the 2 pi surface efficiencies calculated from the manufacturers reported 4 pi efficiency assuming a 30% backscatter.
[b] Detector sensitivities for beta are based on 1-minute background and sample counts and a 1-detector-width scan speed using a surface efficiency of 25% with the exception of the air sample MDCs and smears. Smear MDCs are based on a 20-minute background and 1-minute sample count and air samples are based on a 20-minute background and a 10-minute sample count with a 4-hour sample collection volume using the manufactures reported 4 pi efficiency with no surface efficiency correction. Alpha counting assumed 3-minute sample counts for smears and a 2-minute count for direct alpha

cm^2 – Square centimeter.

dpm – Disintegrations per minute.

MDC– Minimum detectable concentration.

mR/hr – milliroentgens per hour.

μR/hr – microroentgens per hour.

The detectors as listed, or equivalents, may be paired with a variety of analog or digital counters. Examples include the Ludlum Models 3, 12, 2221, 2350-1, and 2360 depending on use and availability. The estimated detector sensitivities provided are based on the footnote provided to the table. Detection sensitivities may vary based on actual background, background and sample count times, and scan speeds. It is anticipated that the actual background as measured on the vessel and the project site will be less than the background used in the MDC calculation, which assumed a background of 10 microroentgens/hour.

17.0 Facilities and Equipment

Prior to arrival of the SSSB, a work site will be established as a controlled area with site security and staging areas for the planned work, including vessel access, materials storage areas, project offices, and crew facilities. The site will be controlled to limit public access and to provide the necessary work areas to support the D&D of the SSSB.

Prior to siting the SSSB, the work site will receive a baseline survey to document the radiological conditions of the site prior to SSSB placement. On project completion, a final survey will be performed to release the area and to demonstrate that the site was not impacted by project operations.

18.0 Radiological Areas, Posting, and Labeling

Radiological areas will be posted as required by 10 CFR 20.1902 and implemented per APTIM-SSSB-004, *Radiological Postings* (Attachment 1).

Unless specifically exempted by 10 CFR 20.1905, each container of radioactive material will be labeled with a "Caution, Radioactive Material" label as described in 10 CFR 20.1904. This labeling requirement is separate from the labeling requirements of the U.S. Department of Transportation (DOT). A package or radioactive material prepared for transportation may also need to be labeled as described in 49 CFR 172.403. The radioactive material labels from empty uncontaminated containers will be removed or defaced prior to removal or disposal of the container to unrestricted areas.

Specific information on radiological areas, postings, and labeling can be found in Table 18-1 and APTIM-SSSB-004, *Radiological Postings* (Attachment 1).

Table 18-1
Radiological Area Postings

Sign	Radiation Level
CAUTION, RADIATION AREA	≥ 5 mrem in 1 hour at 30 cm from source
CAUTION, HIGH RADIATION AREA	≥ 100 mrem in 1 hour at 30 cm from source
GRAVE DANGER, VERY HIGH RADIATION AREA	≥ 500 rads in 1 hour at 1 meter from source
CAUTION, AIRBORNE RADIOACTIVITY AREA	> 1 DAC for radionuclides of concern
CAUTION, RADIOACTIVE MATERIALS	Any area where radioactive materials (including waste) are stored or otherwise accessible to site personnel
CONTAMINATION AREA	Any area where removable contamination levels exceed 1,000 disintegrations per minute /100 square centimeters of beta/gamma-emitting radionuclides or 20 dpm/ 100 square centimeters of transuranic alpha-emitting radionuclides

cm – Centimeter.
DAC – Derived air concentration.
mrem – Millirem.

19.0 Control of Radiological Work

Work involving radioactive materials at the SSSB project will be controlled by establishing radiological standards and responsibilities as found in 10 CFR 20.1101, developing work plans, using first-line supervisors and radiological protection personnel to monitor performance of radiological work, training workers in radiation hazards, and providing personnel with work instructions and/or RWPs that include the radiological protection measures and controls necessary for safe and compliant completion of the job.

Radiation Work Permits. The performance of radiological work will be governed by an RWP or an equivalent document (such as a Hazardous Work Permit, which includes controls on the non-radiological hazards of the task), developed from the information obtained during the work planning phase. RWPs provide administrative control of all activity within RCAs and are a useful tool in maintaining exposures ALARA. The RWP will be generated by the RCS or PRSO and approved by the RCS, PRSO or CHP and by operations supervision (and safety and health supervision for Hazardous Work Permits). The RWP will specify all the relevant information concerning the task to be performed.

The information contained in the RWP will include such information as the effective date and termination date; the tasks to be performed; an entry/exit log; the expected radiological conditions; radiological survey and monitoring requirements; protective clothing requirements (including respiratory protection as needed); routine and special dosimetry requirements; ALARA requirements; and radiological conditions which, if exceeded, would require the task to be terminated. RWPs will also specify any special instructions or precautions pertinent to radiation hazards in the area, including listing the radiological hazards present; the area dose rates; and the presence and intensity of hot spots, removable surface radioactivity, and other hazards as appropriate. Personnel performing the work will acknowledge they are aware that they will be working in an RCA by signing the RWP Access Control Log.

Additional information on RWPs is presented in APTIM-SSSB-003, *Radiation Work Permits* (Attachment 1). An example RWP is included as Figure 19-1.

Figure 19-1
Radiation Work Permit Example

RWP	YYYY	AREA	Type	#	Rev
Effective Date					
Expiration Date					
Term Initial/Date					

Location:

Work Description:

Work Plan/Other: ______________________________

Principal Radionuclides (list):

Workplace Radiological Conditions: Summarized from radiological survey(s)/other. Reference: ______________________

Exposure Rate (μR/h)			Contamination (dpm/100 cm²)		
	Contact	30cm		Removable	Total
γ			α		
β			β		
Airborne Levels			**ALARA Review**		
Max (DAC)			☐Project ______________(Date)		
Location			☐ALARA Committee _____(Date) (Attach Report)		

RWP HAZARD CLASS ☐I ☐II ☐III

Control Levels

PPE

☐Coveralls 1☐ 2☐
☐Shoe covers ☐Over-boots
Type: ____________________
☐Hood
☐Safety Glasses
☐Face Shield
☐Gloves 1☐ 2☐
Type: ____________________
☐Respiratory Protection
Type: ____________________
☐Other: ____________________

DOSIMETRY

EXTERNAL
☐β/γ TLD - ***Required***
☐Extremity
☐Alarming/Self-reading
Rate ____________mrem/h
Total ____________mrem

INTERNAL
☐Bioassay – baseline
☐Bioassay – special
____

TRAINING

Immediately **STOP WORK in a safe manner if any limit is exceeded**

Exposure Rate			**Contamination (dpm/100 cm²)**		
	Contact	**30 cm**		**Removable**	**Total**
γ	mR/h	mR/h	**α**		
β	mrad/h	mrad/h	**β**		
DOSE			**Dose**		
Individual ________mrem			**Collective** ______person-rem		

☐**Radiation Worker *Required***

☐**Pre-job Brief**

☐**PPE Practical**

☐**Respirator Use/Handling**

AIR MONITORING

☐**High/Low Vol Air Monitor**

Location(s):___________ ________________________ ____________

☐**Lapel (BZA) Monitor**

Special Instructions/Hold Points

(Specify unique radiological survey requirements, engineering controls and/or any additional instructions*)*

RAD SURVEYS

☐**Pre-work**

Location: _________________

☐**Post-work**

Location:_____________ _____

RCT Coverage:

☐**Continuous**

☐**Intermittent**

Approvals to Perform Work

Rad Safety Supervisor			**Project Manager/Designee**		
Print Name	Signature	Date	Print Name	Signature	Date
PRSO			**DRS/ License RSO** (Required - Class III)		
Print Name	Signature	Date	Print Name	Signature	Date

20.0 Credentialing of Staff

All SSSB project radiological protection staff possess a combination of training and experience which allows them to ensure worker and public safety when dealing with radioactive materials and site activities. As a minimum, project staff will meet the requirements as specified in APTIM-SSSB-001, *Personnel Training Requirements*.

21.0 Procurement, Receipt, and Inventory

Instrument calibration and check sources will be used during the course of the project. These sources will be managed in accordance with APTIM-SSSB-008, *Source Inventory and Control* (Attachment 1).

All counting samples will be logged into the on-site laboratory and treated as radioactive material until otherwise shown not to be. The samples will be marked with the sample identification and stored within the laboratory or in a separate storage location. The laboratory and any other radioactive material storage location will be locked during off-hours.

21.1 Leak Testing

Periodic leak tests (upon receipt and every 3 months for alpha-emitting sources and every six months for beta-gamma emitting sources) will be performed on non-exempt sealed sources used at the SSSB project in accordance with APTIM-SSSB-008, *Source Inventory and Control*. Leak testing consists of collecting a smear sample collected on the source (encapsulated sources only) or the source storage container of electroplated sources and counting the smear. The smear counting instrument will be able to detect less than 0.005 microcuries of activity. Results of the leak test will be documented on a leak test or survey record.

If a source is found to be leaking, the source will be isolated, contained (e.g., bagged), and the immediate area surveyed in accordance with APTIM-SSSB-008 for damaged sources. Proper notification will be made as applicable and recovery actions performed to ensure no spread of contamination. The source will be removed from service and properly dispositioned.

Inventory assessments of radioactive sources will also be performed (depending on the type and quantity) every six months.

21.2 Transport of Sources

The transportation of any radioactive source will comply with requirements established DOT regulations in 49 CFR 170-189.

21.3 Reporting Lost, Damaged, or Stolen Sources

If a source is lost, damaged, or stolen, the event shall be reported immediately to the PRSO by the discovering individual. The PRSO shall immediately notify the Director, Radiation Safety and project management. He or she shall then initiate appropriate actions to control site access and recover a missing or damaged source. If a source is missing, a search by radiological control

personnel shall be initiated. In consultation with the NRC, a report shall be filed with the appropriate law enforcement agency if it is determined that radioactive material was stolen. The PRSO shall make any necessary notifications to regulatory agencies as applicable.

22.0 Shipping and Transportation of Radioactive Material

Additional information on shipping and transportation of radioactive material will be documented in the Waste Management Plan and other applicable project plans.

23.0 Control of Radioactive Waste

Additional information on management of radioactive waste will be contained in the Waste Management Plan.

24.0 Radiation Protection Records

The PRSO is responsible for ensuring that airborne monitoring, contamination surveys, and exposure/dose rate surveys are reviewed for accuracy and completeness as an on-going process. Individual dosimetry records for personnel are reviewed for positive results. Personnel exposure records will be generated and maintained in accordance APTIM-SSSB-015, *Personnel Monitoring*.

Workers to be monitored will submit current NRC Form 4 or equivalent to PRSO. The PRSO will then post these forms to the SSSB project SharePoint site.

Records relating to radiological characterization, radiation and contamination control (e.g., instrumentation, surveys, logs, air sample results, environmental sample results, and RWPs), training, personnel dose, waste characterization, unconditional release of material and equipment, self-assessments, management reviews, audits, radiological occurrences, corrective actions, and other responses to such findings or incidents are retained by APTIM as part of the official project record. All records are maintained for durations specified by contractual, APTIM, permit, and regulatory requirements.

25.0 Licenses and Permits

The SSSB is not an NRC licensed radiological vessel. However, through an Interagency Agreement between the Navy and the NRC, the NRC is assisting the Navy with the oversight of the SSSB decommissioning. APTIM, by contract with NAVSEA, will perform the SSSB D&D in compliance with NRC decommissioning regulations.

26.0 Review and Approval of Radiation Protection Plans

This RPP has been reviewed and approved in writing by the PM, PRSO, Project CHP, Site Manager, and DRS. This RPP will be reviewed when work conditions change and also shall be reviewed annually during the project. When the RPP must be modified to fit changing site conditions, the changes shall be made as an amendment to the RPP. The original text of the RPP shall not be deleted but shall be lined through to indicate that it is no longer applicable.

Field implementing procedures (Attachment 1) are reviewed/approved by the RCS/PRSO, Project CHP, and PM. Should changes be required to the procedures, the changes will be controlled and subject to the same level of technical and management reviews as the original document.

27.0 Planned Special Exposures

Planned Special Exposures, as defined in 10 CFR 20.1206, are not permitted on this project.

28.0 Self-Assessment, Reviews, and Corrective Action

Periodic self-assessments will be conducted to assist in meeting ALARA goals. These self-assessments shall evaluate the radiological safety of operations, the effectiveness of the RPP, and the status of compliance with radiological safety regulations.

29.0 References

Aptim Federal Services, LLC (APTIM), 2019, ***Radiation Safety Program***, AMS-710-07-PR-0400, Final, Revision 0, October.

Aptim Federal Services LLC (APTIM), 2021a, ***Decommissioning Work Plan, Surface Ship Support Barge Dismantlement and Disposal***, Rev. 1, April (or most recent revision).

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U.S. Nuclear Regulatory Commission (NRC), 2020a, ***Notices, Instructions and Reports to Workers: Inspections and Investigations*** (10 CFR 19), https://ecfr.io/Title-10/Part-19.

U.S. Nuclear Regulatory Commission (NRC), 2020b, ***Standards for Protection Against Radiation*** (10 CFR 20), https://ecfr.io/Title-10/Part-20.

U.S. Nuclear Regulatory Commission (NRC), 2009, ***Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME)***, NUREG-1575, Supp. 1, January.

U.S. Nuclear Regulatory Commission (NRC), 2001, ***Manual of Respiratory Protection against Airborne Radioactive Materials***, NUREG/CR-0041, Revision 1, January.

U.S. Nuclear Regulatory Commission (NRC), 2000, ***Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)***, NUREG-1575, August.

U.S. Nuclear Regulatory Commission (NRC), 1999, ***Regulatory Guide 8.15, Acceptable Programs for Respiratory Protection***, Revision 1, October.

ATTACHMENT 1

FIELD IMPLEMENTATION PROCEDURES

Applicable Field Implementation Procedures

APTIM Procedure Number	Title
APTIM-SSSB-001, Rev. 0	*Personnel Training Requirements*
APTIM-SSSB-002, Rev. 0	*Emergency Response*
APTIM-SSSB-003, Rev.0	*Radiation Work Permits*
APTIM-SSSB-004, Rev. 0	*Radiological Postings*
APTIM-SSSB-005, Rev. 0	*Selection and Use of Personnel Protective Equipment (PPE)*
APTIM-SSSB-006, Rev. 0	*Personnel Frisking and Decontamination*
APTIM-SSSB-007, Rev. 0	*Contamination & Airborne Radiation Control*
APTIM-SSSB-008, Rev. 0	*Source Inventory and Control*
APTIM-SSSB-009, Rev. 0	*Performance of Radiological Surveys*
APTIM-SSSB-010, Rev. 0	*Unrestricted Release of Tools, Equipment and Materials*
APTIM-SSSB-011, Rev. 0	*Sample Collection*
APTIM-SSSB-012, Rev. 0	*Instrument Calibration and Maintenance*
APTIM-SSSB-013, Rev. 0	*General Operations of Portable Radiation Survey Instruments*
APTIM-SSSB-014, Rev. 0	*QA/QC of Radiation Survey Instruments*
APTIM-SSSB-015, Rev. 0	*Personnel Monitoring*
APTIM-SSSB-016, Rev. 0	*Air Sampling and Analysis*
APTIM-SSSB-017, Rev. 0	*Bioassay Sampling*
APTIM-SSSB-018, Rev. 0	*External Dose Assessments*
APTIM-SSSB-019, Rev. 0	*Internal Dose Assessments*
APTIM-SSSB-020, Rev. 0	*ALARA Plans and Dose Modeling*
APTIM-SSSB-021, Rev. 0	*Respiratory Protection Program*
APTIM-SSSB-022, Rev. 0	*Respirator Fit Testing*
APTIM-SSSB-023, Rev.0	*Selection and Use of Respiratory Protection Equipment*
APTIM-SSSB-024, Rev. 0	*Inspection, Maintenance and Control of Respiratory Protection Equipment*
APTIM-SSSB-025. Rev. 0	*Public Dose Assessments*

ATTACHMENT 2

LIKELY ANNUAL RADIATION DOSE EVALUATION FORM

Likely Annual Radiation Dose Evaluation Form

	Page _1_ of _1_
1. Project/Facility:	
2. Address:	
3. Date of Evaluation:	
4. Individual/Group:	
5. Describe Method Used to Evaluate Likely External Dose:	
6. Describe Method Used to Evaluate Likely Internal Dose:	
7. Based upon the methods described above the annual external radiation dose to this individual/group is unlikely to exceed:	
8. Based upon the methods described above the annual internal radiation dose to this individual/group is unlikely to exceed:	
Evaluation performed by:	____________________ (Print Name)
Signature:	____________________

Form Number:		**Issued for Use:**		**Page 1 of 1**

ATTACHMENT 3

RADIATION PROTECTION PLAN ACKNOWLEDGEMENT FORM

Radiation Protection Plan Acknowledgement Form

I have reviewed, understand, and agree to follow the Radiation Protection Plan for the SSSB project. Additionally, I understand that there are additional non-radiological health and safety requirements, which are presented in the Site Health and Safety Plan. I agree to abide by the requirements of the Radiation Protection Plan for the work that I will perform.

Printed Name	Signature	Representing	Date

ATTACHMENT 2

APTIM RADIATION SAFETY PROGRAM PROCEDURE

PROCEDURE

Procedure Number:

AMS-710-07-PR-04000

Revision:

0

Procedure Owner:

Radiation Safety

Issuing Authority:

Director Radiation Safety

Approval Date:

10/24/2019

APTIM

RADIATION SAFETY PROGRAM

0	Initial Issue	M. Somerville	10/24/2019
Rev	**Changes**	**Approved**	**Date**

Parent Document: N/A

RADIATION SAFETY PROGRAM

1.0 PURPOSE

This purpose of this procedure is to define and establish the APTIM Radiation Safety Program (RSP) and to provide the required components, responsibilities and oversight of each site-specific radiation protection plan (RPP) developed to ensure safe, efficient, and compliant work with radioactive material and sources of ionizing radiation.

2.0 SCOPE

This document prescribes the specific requirements for RPPs that are developed and implemented for all APTIM sites and licensed activities that involve the possession, use or work with radioactive materials and the potential for exposure to sources of ionizing radiation.

All APTIM sites where work-related activities may result in workers and/or the public being exposed to ionizing radiation above background levels are required to implement the requirements in the approved site-specific RPP. When contractors are performing radiation work for APTIM, verification that the contractor's radiation safety program meets applicable regulatory standards and APTIM ALARA policy must be completed and documented in the site-specific RPP by a qualified individual and approved by the Director, Radiation Safety (DRS), prior to beginning radiation work.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- Director-Radiation Safety (DRS)
- Radiation Safety Officer (RSO)
- Manager-Radiological Operations (MRO)
- Manager-Health Physics Technical Support (MTS)
- HSE Director or VP
- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors

4.0 PROCEDURE

4.1 General

4.1.1 Radiation Safety Committee (RSC)

The Radiation Safety Committee is comprised of the Director-Radiation Safety (DRS) who also serves as the corporate Radiation Safety Officer (RSO), the Manager-Radiological Operations

(MRO), and the Manager-Health Physics Technical Support (MTS). The RSC meets informally at least once per month and can convene formally to review high risk work, planned special exposures (PSE), review radiological incidents, review support requests, or otherwise as needed to ensure program implementation.

4.1.2 Health, Safety and Environment (HSE) Director or VP

The Health, Safety and Environment (HSE Director or VP) is responsible for:

- Providing necessary resources and support that originate in the industrial safety program as necessary.
- Ensuring alignment between industrial safety and radiological safety at the program level and at each specific job site that performs radiological work.
- Assisting, where necessary, with reporting requirements and response to incidents at all project sites and work locations that have a radiological component.

4.1.3 Director, Radiation Safety (DRS)

The Director, Radiation Safety (DRS) is responsible for:

- Directing the Radiation Safety Group, which includes guiding the development, management, and implementation of the APTIM RSP, management of radiation resources (equipment and personnel), on-going improvement of the program, management of the Project Health Physicists and Project Radiation Safety Officers (PRSO) to provide technically sound support to field activities to ensure compliance with applicable regulatory, license and contract technical requirements.
- Directing independent radiation safety audits of sites and licenses for which an RPP is required. This includes pre-operation, periodic, and episodic reviews. Long duration projects will be reviewed annually. An independent audit of short duration (less than one year) projects will be performed at the discretion of the DRS.
- Reviewing and approving requisitions for services and materials involving potential exposure to ionizing radiation or radioactive materials.
- Reviewing and approving RPPs developed for projects, licenses, sites, task orders, etc.
- Providing oversight of radioactive materials and device license requirements during the performance of radiation investigations, remedial actions, laboratory processes and handling/storage of radioactive material or devices. Designate Authorized Users in accordance with applicable license requirements.
- Serving as the contact person for regulator’s site inspections of operations and lead technical authority in programmatic regulatory matters. Maintain records of regulatory interfaces. The DRS may designate the assigned PRSO to serve as the point of contact for site inspections, as documented in the site-specific RPP.
- Leading radiation emergency response efforts (AMS-710-07-WI-04023, *Radiological Emergency Response*).

- Verifying adequacy of contractor Radiation Safety Program through approval of project-specific RPP.
- Serving as corporate RSO.

4.1.4 Project Manager (PM)/Responsible Manager (RM)

- Conducting work safely and in compliance with all applicable permits, licenses, client contracts and other applicable radiation safety controlling documents.
- Manage work to ensure radiation exposure is kept ALARA.
- Make resources and staffing available to develop and implement the RPP in compliance with applicable regulations, requirements and commitments and see that it is approved in a timely manner.
- In collaboration with PRSO or assigned Health Physicist, address all radiation issues during proposal/plan development.

4.2 Procedure

It is APTIM's policy that all work with radioactive materials and ionizing radiation devices be purposeful and performed in a manner that protects workers, members of the general public and the environment. Work involving radiation hazards may not begin unless an approved RPP is in place ensuring that work can be performed in a safe and compliant manner. APTIM endorses and applies ALARA principles to radiological work so that personnel exposures to radiation are maintained as low as reasonably achievable (ALARA).

4.2.1 Development of Radiation Protection Plans (RPP)

RPPs will be developed to support consistent application of program requirements (reference the checklist in AMS-710-01-CK-04013). This section describes key elements required for an RPP that will be considered and included directly in the RPP or by reference to a specific procedure. Individual items may be tailored for applicability based on project hazard assessment. A client format may be used if specified by contract or when working to client procedures.

The RPP and associated procedures provide information to meet project or license specific requirements, regulations, and commitments. At a minimum, the RPP will define and quantify sources of radiation and identify risks to occupational workers and members of the public managed under the RPP. Controlling documents will be identified and/or incorporated into the RPP, as appropriate. Project specific work instructions will be developed and applied as necessary to ensure safe handling of radioactive material and control personnel exposure to ionizing radiation. APTIM procedures and/or project-specific work instructions will be utilized to support RPP requirements and as a means of employing the best practices and consistent methods. Refer to the reference section of this procedure for applicable work instructions and forms.

4.2.2 Identification of Radiation Hazards

Each RPP will include requirements to provide on-going evaluation and documentation of radiation hazards that may be present. The RPP will be developed from the best available

information about the radiation sources involved. This will include information about quantities and concentrations of the specific radionuclides to be handled and the characteristics of any devices that may produce ionizing radiation when energized. If the available information is not conclusive, conservative assumptions will be made. The RPP must be periodically reviewed and maintained to reflect current radiation conditions.

4.2.2.1 Evaluation of Potential Exposure to Workers

All RPPs will include an evaluation of external and internal exposures that are likely to occur during routine operations. This is a key step in development of site-specific radiation protection procedures. A graded approach will be implemented; the higher the potential exposures the more detail must be included in the RPP. RPPs for activities that involve the use of radioactive material other than sealed sources must include an evaluation of intakes that are likely to occur during normal operations. These projections drive the development of the bioassay and air sampling technical basis documents and programs, engineering controls, personal protective equipment (PPE), etc. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04003, *Evaluation of Potential Occupational Exposures*.

4.2.3 Controlling Agencies and Licenses

Controlling documents will be identified and may include contracts, licenses, regulations, client RPPs, regulatory guides and other documents. These documents are to be examined, understood and align with corporate requirements assessed prior to the start of the project.

All aspects of licenses, including the RPP are considered contractual agreements between the company and the licensing agency. All licensing actions will be subject to review by the DRS prior to submission to the regulator.

Controlling documents will be maintained as part of the RPP documentation package until conclusion of the program or project or termination of the applicable license.

Copies of radioactive material and radiography licenses for APTIM projects will be maintained by the Radiation Safety Group Licensing Manager and made available on the Radiation Safety website. Additional requirements for industrial radiography programs are provided in AMS-710-01-PR-02400, *Industrial Radiography.*

Record management and retention must meet requirements of Section 4.2.19 below. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04004, *Radiation Safety Controlling Agencies and Licenses*.

4.2.4 Radiation Safety Training Program

All RPPs will include requirements for the radiation safety training of personnel. The level of training for personnel will be commensurate with the level of exposure anticipated and will be compliant with applicable regulations, requirements, and commitments. Radiation safety training must be established for general employees, radiation workers, and visitors and meet applicable regulatory requirements and requirements of AMS-710-05-PR-01900, *HSE Education and Training*.

Records of radiation worker training and general employee radiation safety training will be maintained with project records and entered into the APTIM Electronic Data Management System (EDMS). Periodic retraining will be established with a frequency of no less than every two years. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04005, *Radiation Safety Training*.

4.2.4.1 Declared Pregnant Woman Program

RPPs will include provisions allowing radiation workers to declare pregnancy in writing. These programs will be developed to comply with applicable license, regulations, requirements, and commitments. AMS-710-01-PR-00200, *Embryo-Fetus Protection Program*.

4.2.5 Evaluation of Public Dose

Each RPP will include a project-specific procedure for demonstrating compliance with internal and external public dose limits and commitments. A review of public dose will be evaluated and reported to the DRS annually for those projects lasting greater than 12 months. The annual public dose report will include a description of the type of monitoring used and public dose calculation assumptions. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04006, *Evaluation of Pubic Dose*.

4.2.6 ALARA Program

ALARA principles will be addressed in all RPPs. All RPPs will include a written plan for review of ALARA efforts. The resources directed towards dose reduction should be proportional to the magnitude of the potential reduction and will be focused on those areas in which the greatest potential dose reduction exists. An on-going ALARA review program is required; the frequency of ALARA reviews will be, at a minimum, annual. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04007, *ALARA Program*.

4.2.7 Control of Radiation Work – Radiological Work Permits

Control of work involving radioactive materials, sources and radiation-producing machines will be accomplished by establishing radiation standards and responsibilities, using first-line supervisors and radiation protection personnel to monitor performance of radiation work, training workers in radiation hazards, and providing personnel with operating procedures and/or Radiological Work Permits (RWPs) that establish job-specific radiation protection measures and controls necessary for safe and compliant completion of the job. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04008, *Control of Radiological Work*.

4.2.8 External Exposure Control and Monitoring

All RPPs authorizing the use of radionuclides that present external hazard will include procedures for controlling and minimizing external exposure. In addition to time, distance and shielding, provisions should include practice, in the form of mock-ups and dry runs, before high activity sources are manipulated. Special consideration will be given to storage areas. Provisions for documented periodic and episodic measurements of radiation fields are essential.

Each RPP will include the process for assigning external dosimetry to individuals based upon evaluations of the likely external exposures. As appropriate, external dosimetry obtained from,

and processed by, a National Voluntary Laboratory Accreditation Program (NVLAP) or Department of Energy Laboratory Accreditation Program (DOELAP) certified dosimeter processor will be furnished. Dosimetry reports will be promptly reviewed by the PRSO on receipt and actions are to be taken as required to maintain exposures ALARA. All administrative and engineering external exposure controls and external dosimetry will be included in the project or task-specific operating procedure or RWP. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04010, *External Exposure Control and Monitoring*.

4.2.9 Internal Exposure Control and Monitoring

All RPPs for activities in which unsealed radioactive material is handled will include procedures for minimizing intakes of radioactive material. Engineering controls such as dust suppression and air handling are the preferred means of reducing risks of intakes and will be evaluated. In addition, personal protective equipment (PPE) may be used. When engineering controls cannot meet exposure reduction goals for airborne material, respiratory protective equipment may be used in conjunction with an approved, documented respiratory protection plan, AMS-710-02-PR-03500, *Respiratory Protection.*

Each RPP developed for work involving the use unsealed radioactive material will include a process for assessing internal exposure. A technical basis for the Internal Exposure program will be established. Determination of intakes may be made by bioassay (direct or indirect measurement) or determining airborne levels of radioactive material in an individual breathing zone or by a combination of the above. Refer to regulations, requirements and commitments for preferred methods. A technical basis for the Internal Exposure program will be established. All administrative and engineering internal exposure controls and bioassay requirements will be included in the project or task-specific operating procedure or RWP. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04011, *Internal Exposure Control and Monitoring*.

4.2.10 Surveys and Monitoring

Each RPP will include procedures that provide guidance for developing the survey and monitoring plans necessary to evaluate exposure to personnel and concentrations of radioactive material. Methods used to perform these surveys include air sampling, smear testing, collection and analysis of samples, measurement of the intensity of radiation fields, calculations and observations. Surveys as used in this context may be routine periodic occurrences, or may be prompted by an event such as movement of a source, shielding redesign, or request to move equipment from a contamination zone. A schedule for performing routine surveys of various types will be established. A technical basis document showing that instruments have the required sensitivity and range will be used for selecting instruments used for measurement and monitoring. Minimum requirements of this RPP element can be found in AMS-710-07-PR-04012, *Radiological Surveys and Monitoring*.

4.2.11 Contamination Control

Each RPP will include provisions for limiting the spread of radioactive contamination. The key component of contamination control is the identification and demarcation of zones where contamination is likely. Contamination control will emphasize controlling the flow of personnel,

equipment, and supplies into and out of these areas. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04013, *Contamination Control*.

4.2.12 Instrumentation

The RPP will include a section in which radiation detection instruments suitable for the required measurements are listed and the guidelines for developing operational procedures are presented. Operating instructions, calibration and quality assurance procedures will be maintained for each instrument. This requirement applies to portable and fixed instruments. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04014, *Radiation Detection Instrumentation*.

4.2.13 Radiological Labelling, Posting and Access Control

Each RPP will include provisions to identify, label, post and provide access control of radiologically-controlled (and/or restricted) material and areas. The results of surveys will be used to establish boundaries and controls for radioactive material areas, radiation and high radiation areas, contamination and high contamination areas, and airborne radioactivity areas. All radiological areas will be posted as required by the controlling documents. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04015, *Radiological Labelling, Postings and Access Control*.

4.2.14 Radiation Safety Staff Credentials

Each RPP will include a procedure for a documented review and acceptance of the credentials of health physics staff. Minimal qualification requirements will be established or approved by the Director, Radiation Safety. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04016, *Qualification of Radiation Safety Workers and Staff*.

4.2.15 Procurement, Receipt, Transfer and Inventory of Radioactive Material

Each RPP will include a procedure for maintaining an inventory of radioactive material under its control. As appropriate, the procedure will include provisions for procuring, receiving, and checking-in shipments of radioactive material in accordance with the requirements of the controlling documents. Transfers of radiation sources to other licensed entities must be documented in accordance with the requirements of the controlling documents. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04017, *Procurement, Receipt, Transfer, Inventory of Radioactive Sources*.

4.2.16 Shipping and Transportation of Radioactive Materials

Each RPP will contain procedures for shipping and transportation of radioactive material. Radioactive material that is shipped by the company will be packaged, surveyed, and labelled by a qualified shipper in accordance with USDOT regulations, found in Title 49 CFR and in accordance with any other applicable regulations such as Part 71 of Title 10 CFR. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04018, *Shipping and Transportation of Radioactive Material*.

4.2.17 Control of Radioactive Waste

Each RPP will include procedures for minimizing the amount of waste generated. The amount of waste that must be disposed of on site or that must be sent off site to licensed disposal facilities will be minimized. Disposal of radioactive waste may be done only as allowed by the controlling documents. Minimum requirements of this RPP element can be found in AMS-710-07-WI-04019, *Control of Radioactive Waste*.

4.2.18 Radiation Protection Records

Records will be maintained in order to document implementation of each RPP and to demonstrate compliance with regulations, requirements, and commitments. Records relating to a license program will be maintained for the duration of the license, or disposed of as authorized by applicable agency. Record retention requirements should be determined by examination of controlling documents. Each RPP will include specific record maintenance and retention requirements unique to the project/program, regulatory requirement and applicable requirements of AMS-905-00-PR-10000, *Document Management Setup, Execution and Closeout.*

4.2.19 Reports and Notifications

Each RPP will include procedures for developing, communicating, and delivering required reports and notification. These procedures will include provisions to notify the DRS of all incidents and notifications and reports to regulators. Each RPP will include provisions for dealing with radiation occurrences including the issuance and distribution of Radiation Improvement Reports (RIRs). In addition, the DRS and PM/RM will be informed of all regulatory inspections, proposed regulatory Notices of Violation (NOV), fines, or escalated enforcement actions. As appropriate these procedures should include provisions for required reports to workers. The DRS will review and approve responses to proposed enforcement actions.

4.2.20 Planned Special Exposures (PSE)

RPPs that include provisions for allowing planned special exposures will require the written approval of the PRSO, PM/RM and the DRS. The RSC will review and approve PSEs.

4.2.21 Review and Approval of RPPs

The RPP is not issued or in effect until it has been reviewed and approved by a designated radiation safety technical reviewer and approved by the DRS or designee. The RPP will state any specific conditions of approval and will specify the limit of the duration of approval, if any. Time for development of the RPP must include sufficient time for the required reviews.

RPPs will be reviewed when work conditions change and reviewed periodically (minimum annually) during the project. When the RPP must be modified to fit changing site conditions the changes will be made as an amendment to the RPP. The original text of the RPP will not be deleted but will be lined through to indicate that it is no longer applicable.

The RPP will be reviewed with all project personnel before work begins. All project personnel governed by the program will sign acknowledging their understanding of site rules and site hazards prior to beginning work. This may be coordinated with acknowledgement of the site Health and Safety Plan.

4.2.22 Self-Assessment, Reviews, and Corrective Actions

4.2.22.1 Self-Assessment

Periodic self-assessments will be conducted in accordance with ALARA goals. Self-assessments will evaluate radiation safety, RPP implementation (see AMS-710-07-WI-04000), and compliance with regulations. The APTIM I-CARE radiation safety cards can be used to supplement periodic self-assessments. The frequency of the self-assessments will be no less than once per quarter. For projects with durations less than a quarter, at least one self-assessment must be performed and documented.

4.2.22.2 Radiation Protection Plan Audits

Audit Plans will be developed for each site and documented in the Radiation Audit Plan. All documents related to radiation safety will be reviewed and recorded per requirements of AMS-710-07-WI-04002, *Radiation Safety Audit Program*. An RPP audit must be completed annually. Short-term duration projects of less than one year must have at a minimum of one RPP audit.

4.2.22.3 Incident Notification and Corrective Actions

Deficiencies will be documented using the RIR and incident notification process, per requirements of AMS-710-07-WI-04020, *Incident Notification and Reporting*. If serious deficiencies are noted, immediate action will be required. The PRSO and PM/RM will develop and implement a corrective action plan with specifically assigned tasks and a schedule for completion. The corrective action plan requires review by the DRS and RSC, Chair. Corrective actions must be completed in a timely manner. Less serious deficiencies may be resolved immediately without a corrective action plan. Radiation Corrective Action plans will be developed for all deficiencies and corrective actions managed in the APTIM EDMS.

5.0 TERMINOLOGY

Term	Definition
ALARA	As Low As Reasonably Achievable
DOELAP	Department of Energy Laboratory Accreditation Program
DRS	Director of Radiation Safety
EDMS	APTIM Electronic Data Management System
HSE	Health, Safety and Environment
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
PM	Project Manager
PPE	Personal Protective Equipment
PRSO	Project Radiation Safety Officer

PSE	Planned Special Exposures
Radiation Protection Plan (RPP)	Provides license reference and procedures used by a specific site or project to detail methods involved with safe handling of radioactive materials, radiation sources and/or devices.
RIR	Radiation Improvement Report
RM	Responsible Manager
RSC	Radiation Safety Committee
Radiation Safety Group	Group of professional responsible for design and implementation of APTIM Radiation Safety Program. The Radiation Safety Group is managed by the Director, Radiation Safety.
Radiation Safety Program (RSP)	Comprehensive set of policies and plans developed and implemented to achieve and ensure compliance to regulatory requirements involving the use of radioactive materials and/or radiation sources.
RWP	Radiological Work Permit

6.0 REFERENCES

6.1 Required Forms/Checklists

AMS-710-01-CK-04013	Checklist for Site Specific Radiation Protection Plans

6.2 Other Internal References

AMS-710-01-PR-00200	Embryo-Fetus Protection Program
AMS-710-02-PR-03500	Respiratory Plan
AMS-710-05-PR-01900	HSE Education and Training
AMS-710-07-PR-02400	Industrial Radiography
AMS-710-07-GL-04030	As Low As Reasonably Achievable (ALARA) Plan Development and Approval
AMS-710-07-GL-04128	As Low As Reasonably Achievable (ALARA) Program for Design and Design Modifications
AMS-710-07-GL-40031	Radiation Safety Planned Special Exposures
AMS-710-07-WI-04000	Self Assessments of the Radiation Protection Plan
AMS-710-07-WI-04002	Radiation Safety Audit Program
AMS-710-07-WI-04003	Evaluation of Potential Occupational Exposures
AMS-710-07-WI-04004	Radiation Safety Controlling Agencies and Licenses
AMS-710-07-WI-04005	Radiation Safety Training
AMS-710-07-WI-04006	Evaluation of Public Dose

AMS-710-07-WI-04007	ALARA Program
AMS-710-07-WI-04008	Control of Radiological Work
AMS-710-07-WI-04009	Radiological Work Permits
AMS-710-07-WI-04010	External Exposure Control and Monitoring
AMS-710-07-WI-04011	Internal Exposure Control and Monitoring
AMS-710-07-WI-04012	Radiological Surveys and Monitoring
AMS-710-07-WI-04013	Contamination Control
AMS-710-07-WI-04014	Radiation Detection Instrumentation
AMS-710-07-WI-04015	Radiological Labelling, Postings and Access Control
AMS-710-07-WI-04016	Qualification of Radiation Safety Workers and Staff
AMS-710-07-WI-04017	Procurement, Receipt, Transfer, Inventory of Radioactive Material
AMS-710-07-WI-04018	Shipping and Transportation of Radioactive Material
AMS-710-07-WI-04019	Control of Radioactive Waste
AMS-710-07-WI-04020	Radiation Safety Incident Notification and Improvement Reporting
AMS-710-07-WI-04023	Radiological Emergency Response
AMS-710-07-WI-04501	Radiation Safety Proper Handling of Dosimetry Data
AMS-710-07-WI-40121	Performing and Documenting Radiation and Contamination Surveys
AMS-710-07-WI-40122	Gamma Walkover Survey Using Global Positioning System
AMS-710-07-WI-40123	Sample Collection for Radiological Analysis
AMS-905-00-PR-10000	Document Management Setup, Execution and Closeout

6.3 Other External References

Title 49 CFR, Code of Federal Regulations
Title 10 CFR, Part 71, Code of Federal Regulations
USNRC 10 CFR 20, Regulatory Guides 8.13 and 8.29

7.0 ATTACHMENTS

Attachment	Attachment Title
None	

ATTACHMENT 3

SSSB PROJECT ENVIRONMENTAL MONITORING PLAN

ENVIRONMENTAL MONITORING PLAN

SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL

Project Number: 501513
Contract Number: N00024-20-C-4139

Prepared for

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614 Sicard Street SE
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Prepared by

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March 2021

Revision 0

ENVIRONMENTAL MONITORING PLAN

SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL

Project Number: 501513
Contract Number: N00024-20-C-4139

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March 2021

Revision 0

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Record of Revisions

Revision No.	Description of Revision	Date
0	Environmental Monitoring Plan	March 2021

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Acronyms and Abbreviations

ALARA	as low as reasonably achievable
APTIM	Aptim Federal Services, LLC
ASY	Alabama Shipyard
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
Co-60	cobalt-60
CS	Containment Structure
D&D	dismantlement and disposal
DWP	Decommissioning Work Plan
EMP	Environmental Monitoring Plan
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air
μCi/mL	microcuries per milliliter
mrem	millirem
NRC	U.S. Nuclear Regulatory Commission
OSL	optically stimulated luminescence
pCi/g	picocuries per gram
PCB	polychlorinated biphenyl
PQP	Project Quality Plan
PRSO	Project Radiation Safety Officer
PWEFC	Prototype Waterborne Expended Fuel Container
QC	quality control
RCOPC	radionuclide contaminant of potential concern
RPP	Radiation Protection Plan
SSSB	Surface Ship Support Barge
SOP	standard operating procedure
TLD	thermoluminescent dosimeter

1.0 Introduction

The Surface Ship Support Barge (SSSB) is a barge (i.e., non-powered vessel) that was used to support refueling of U.S. Navy nuclear-powered ships. The function of the SSSB was to receive, hold, and prepare previously used reactor components designated for ship-out or reuse. The SSSB provided the ability to perform maintenance functions like those performed in a typical pressurized water reactor spent fuel pool except for long-term spent fuel storage.

The SSSB was originally a portion of the World-War-II-era T-2 tanker (SS CANTIGNY). CANTIGNY was constructed in 1945 by Sun Shipbuilding Company in Chester, Pennsylvania. Some of the remainder of CANTIGNY was reused with a new and larger midsection and bow constructed by Burmeister and Wain of Copenhagen, Denmark. The rebuilt CANTIGNY was operated until it was scrapped in Spain in 1984.

The CANTIGNY mid-body section was converted to a nuclear support facility in 1964 by Newport News Shipbuilding and was originally referred to as the Prototype Waterborne Expended Fuel Container (PWEFC). The PWEFC was constructed by Newport News Shipbuilding and Drydock Co. and used for support of the first and second CVN-65 (USS ENTERPRISE) refuelings. The vessel was extensively refurbished by Newport News Shipbuilding in the late 1980s with much of the original hull and tank structure replaced and new longitudinal bulkheads installed. In 1990, the PWEFC was upgraded to provide an additional 50 years of service by completing repairs and alterations. During the repairs, the PWEFC was renamed the SSSB. Thus, the SSSB bears little resemblance to the original CANTIGNY. No new concepts in nuclear support facilities were used in the SSSB.

There is no U.S. Nuclear Regulatory Commission (NRC) license number associated with the SSSB. Radioactive material is possessed under contractual authorization with the U.S. Navy Nuclear Power Program. The SSSB was last used to support the final defueling of the Ex-Enterprise (CVN-65) in approximately 2016 and the vessel is currently in inactive layup status.

In 2021, the SSSB will be moved via heavy lift deck barge from Colonna's Shipyard in Norfolk, Virginia to the Alabama Shipyard (ASY) facility in Mobile, Alabama where APTIM Federal Services, LLC (APTIM) will perform dismantlement of the vessel.

1.1 Purpose

The purpose of this Environmental Monitoring Plan (EMP) is to establish the environmental monitoring program that will be implemented during the dismantlement of the SSSB to ensure

the effectiveness of engineering and administrative controls designed to minimize or eliminate the potential for releases to the environment. Survey and sample data acquired during the environmental monitoring program will be compared to baseline survey and sample data, as described in the Baseline Survey Plan (APTIM, 2021a) or to off-site data used to establish background levels as applicable.

The dismantlement and disposal (D&D) of the SSSB will involve the removal of the primary radioactive source (i.e., wet pit and associated components) from the vessel followed by systematic vessel dismantlement. The majority of the vessel is designated for size reduction, packaging, and shipment as low-level radioactive waste. As a result, there will be the potential for exposure to hazards, particularly radioactive materials, during dismantlement that will require monitoring.

During dismantlement, environmental monitoring for radiological and nonradiological hazards (as applicable) will be performed in order to evaluate any potential exposure to the public. Monitoring will be performed to ensure the dismantlement work is performed safely and in compliance with all Federal, State, and local regulations and requirements to ensure the safety of the general public and the environment. To facilitate in the effort, a local or on-site weather station will be utilized as well to monitor wind directions, wind speed, and precipitation.

1.2 Scope

The SSSB dismantlement will be performed in a controlled manner to minimize any public exposure to radiation and other hazards. This will require the assessment of background levels of contaminants as well as the analysis of routine samples from areas that can be accessed by facility personnel and the public in order to monitor and evaluate any potential exposures as a direct result of D&D operations. The environmental monitoring program will include air sampling, direct radiation exposure monitoring, and storm water and sediment sampling. As noted in the Decommissioning Work Plan (DWP) (APTIM, 2021b), the scope of this EMP is limited to the environmental monitoring conducted during the D&D efforts conducted on the ASY dock between Piers K and L. An overview of the D&D site location at ASY is provided on Figure 1-1 and the project site layout is shown on Figure 1-2.

The environmental monitoring program will start prior to the arrival of the SSSB (approximately 1 month) in Mobile and will continue through the conclusion of D&D activities.

Figure 1-1
SSSB Project Site Location at Alabama Shipyard

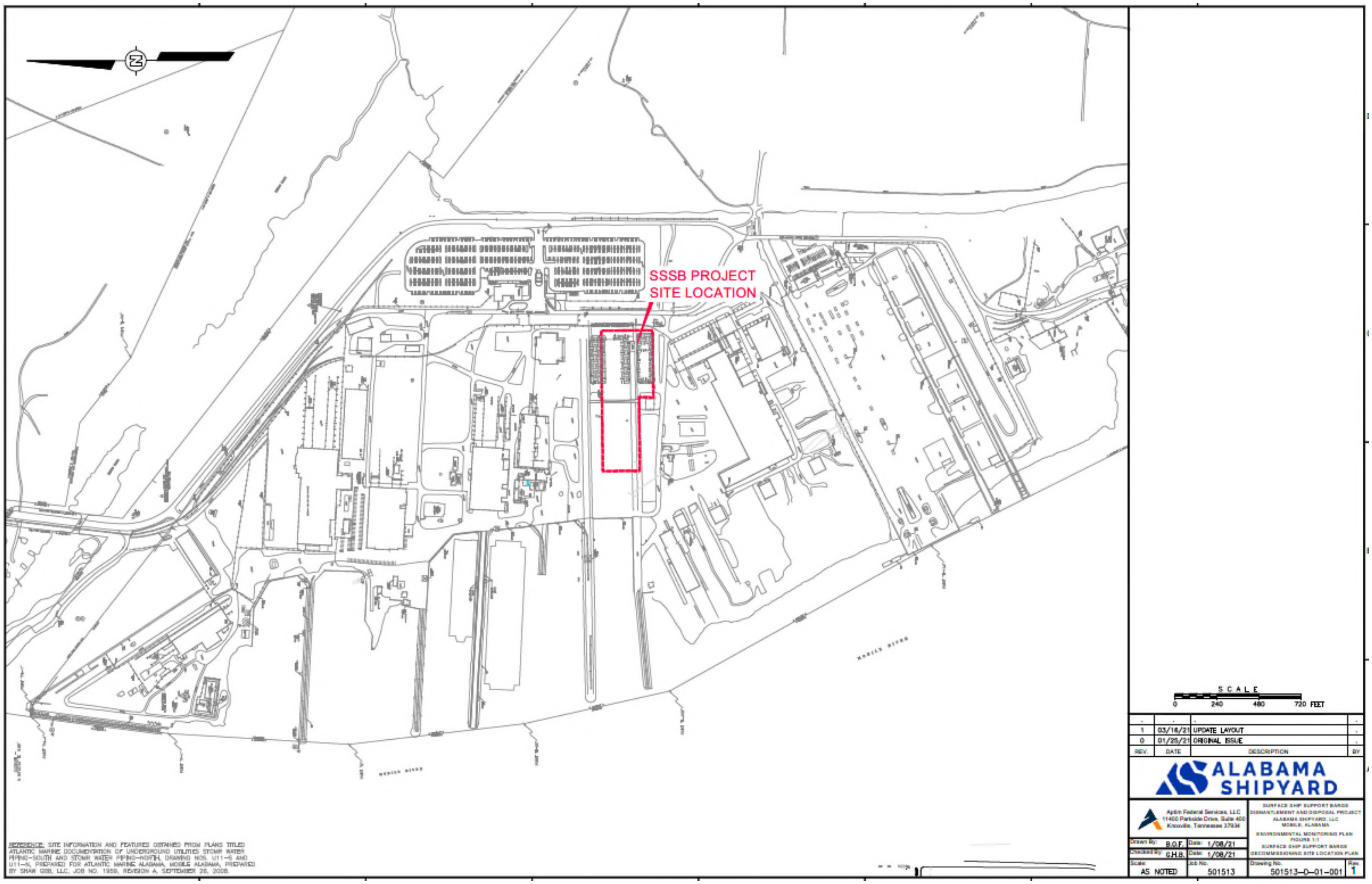
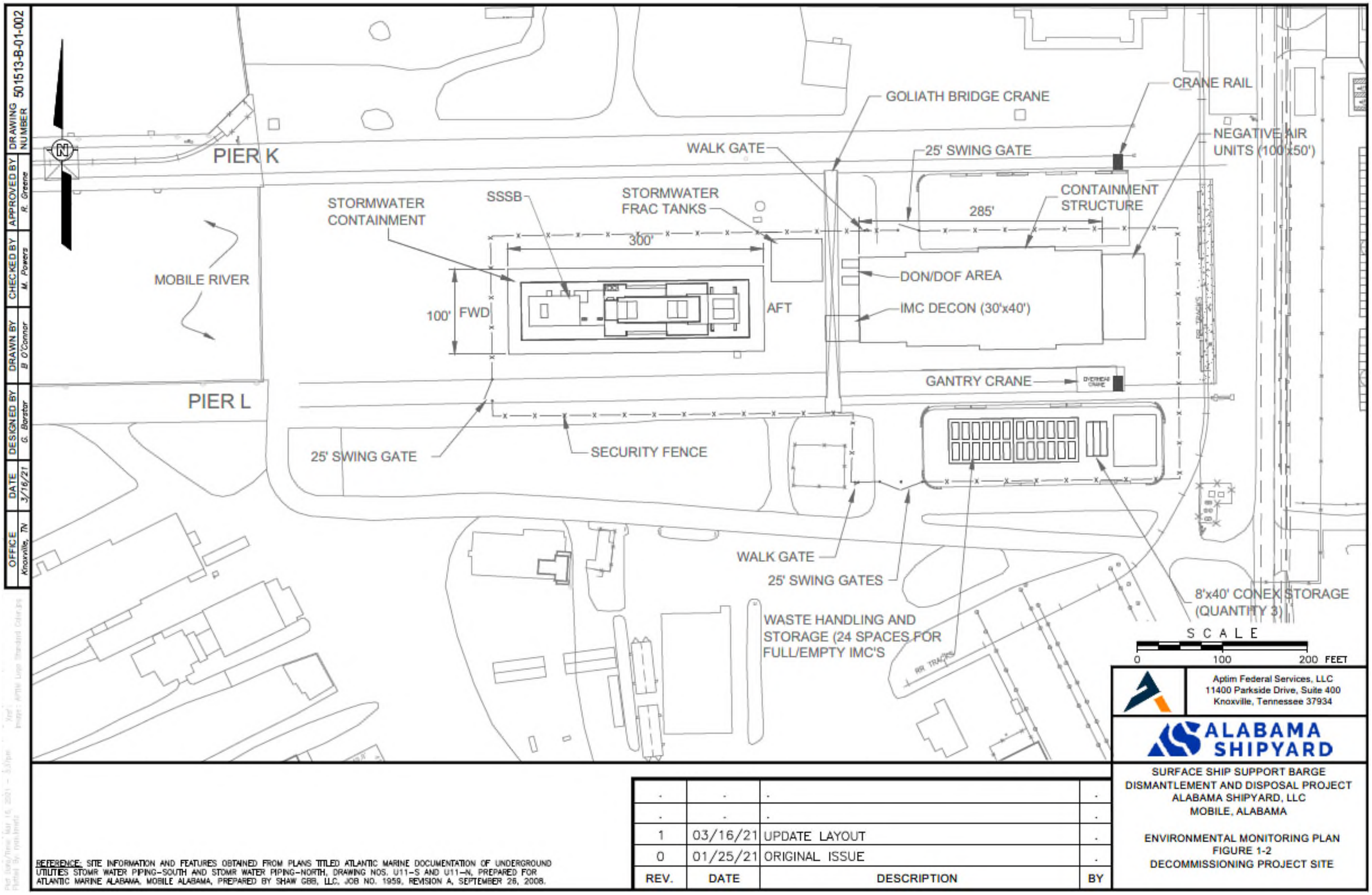


Figure 1-2
SSSB Project Site Layout



1.3 Radionuclide Contaminants of Potential Concern

The radionuclide contaminants of potential concern (RCOPC) are specified in Table 4-1 of the DWP and are summarized in Table 1-1 along with their modes of decay. These RCOPCs are the result of handling activated equipment, materials, and spent fuel while servicing and refueling U.S. Navy nuclear-powered vessels.

Table 1-1
Radionuclide Contaminants of Potential Concern

Radionuclide	Radiation Emitted
Carbon-14	Low-energy beta
Cobalt-60	Beta/gamma
Iron-55	Electron Capture; x-ray
Nickel-63	Low-energy beta
Cesium-137	Beta/gamma

As noted in the DWP, no alpha contamination is anticipated on the SSSB; however, surveys will be performed to assess whether additional RCOPCs are present that will require monitoring.

1.4 Nonradiological Hazards

In addition to the RCOPCs, nonradiological hazards are also present on the SSSB. These include asbestos-containing material, lead, and polychlorinated biphenyls (PCB)-containing materials, which will be appropriately handled and disposed as necessary during D&D activities. Other nonradiological hazards will be assessed as necessary to identify any other hazards prior to dismantlement.

1.5 Exposure Limits

Exposure limits have been established for the general public based on federal agency regulations. This includes limits for public exposure to radioactive materials and other hazards as applicable.

1.5.1 Radiological Hazards

The public exposure limits for radioactive materials are specified in Title 10 of the Code of Federal Regulations (CFR) Part 20, *Standards for Protection Against Radiation*. The exposure limits for members of the general public to radioactive materials as provided in 10 CFR 20.1101, *Radiation Protection Programs,* and 10 CFR 20.1301, *Dose Limits for Individual Members of the Public*. 10 CFR 20.1301(a)(1) specifically states that operations shall be conducted such that:

> *"The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year, exclusive of the*

> *dose contributions from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released under § 35.75, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive materials into sanitary sewerage in accordance with § 20.2003."*

Additionally, 10 CFR 20.1101(d) states that the Radiation Protection Program shall:

> *"implement the ALARA (as low as reasonably achievable) requirements of § 20.1101(b), and notwithstanding the requirements in § 20.1301 of this part, a constraint on air emissions of radioactive material to the environment, excluding Radon-222 and its daughters, shall be established by the licensees other than those subject to § 50.34a, such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent (TEDE) in excess of 10 mrem (0.1 mSv) per year from these emissions."*

10 CFR 20.1301 and 10 CFR 20.1302 further state that the effective dose equivalent in any unrestricted area may not exceed 2 millirem (mrem) per hour and that the maximum allowable dose to the public from effluents is 50 mrem per year as listed in Appendix B of 10 CFR 20. It also states that the 100 mrem per year dose limit includes doses from all pathways, including direct radiation, liquid effluents (other than permitted sanitary sewer disposal), and air emissions.

1.5.2 Nonradiological Hazards

Monitoring limits for non-radiological hazards will be established as part of the occupational work controls.

1.6 As Low as Reasonably Achievable

As low as reasonably achievable (ALARA) is a core principle of the SSSB project Radiation Protection Plan (RPP) (APTIM, 2021c). Exposures will be kept ALARA through proper project planning and the implementation of engineering and administrative controls. Measures to control releases to the environment to levels that are ALARA are summarized in Chapter 2.0 of this EMP.

2.0 Environmental Release Controls

The release of potential contaminants to the environment and any potential exposure to the public will be controlled and minimized through the use of engineering controls and the implementation of the project RPP and Accident Prevention Plan (APTIM, 2021d).

Upon arrival at ASY, the SSSB will be placed on blocks atop an impermeable liner and a berm will be placed around the perimeter of the SSSB work area to control run-off. During the initial stages of the project, the most contaminated structures, systems, equipment, and remaining wet pit water will be packaged and removed using the SSSB itself as a containment device which will be equipped with high-efficiency particulate air (HEPA)-filtered ventilation. Since contaminated surfaces on the interior of the vessel will not be exposed to the weather, storm water will not be sampled during this time.

Once removal of SSSB structural surfaces commences and potentially contaminated surfaces are exposed, the berm surrounding the perimeter of the SSSB work area liner will be closed and storm water coming in contact with the vessel will be collected, sampled, and properly disposed. These engineering controls are intended to control potential releases to the environment via surface water runoff.

A Containment Structure (CS) will be erected to the east of the SSSB footprint and will be used to contain work while sizing sections of the SSSB for disposal following the primary source removal. The CS will be lined and include road plates for heavy equipment traffic and staging of materials. The CS will be closed and HEPA-filtered ventilation will be connected to the CS to provide a negative-air enclosure.

These engineering controls are intended to control potential releases to the environment via air emissions and surface water runoff.

3.0 Direct Exposure Monitoring

Direct exposure monitoring will be performed using thermoluminescent dosimeters (TLD) or optically stimulated luminescence (OSL) dosimeters. Environmental dosimetry will be established at specific locations to monitor direct radiation exposure of facility personnel and the general public during D&D operations.

3.1 Monitoring Locations

The initially proposed locations for direct exposure monitoring are provided in Appendix A. These locations include a minimum of six environmental TLDs/OSLs around the project security fence and one within the project administrative offices or break area. Additional locations may be selected by the Project Radiation Safety Officer (PRSO) as necessary.

In order to determine the potential direct exposure to a member of the general public as a result of D&D operations, the levels of background exposure due to terrestrial and cosmic sources will be determined by establishing background monitoring locations away from the SSSB project site. These will include a TLD/OSL at or near the entrance to the ASY site or other off-site locations to be determined.

3.2 Monitoring Frequency

Environmental dosimetry will be exchanged and processed on a quarterly basis unless it is determined that more frequent (e.g., monthly) monitoring is necessary. The PRSO, with the approval of the project Certified Health Physicist (CHP), will determine if any modifications to the monitoring frequency or locations for direct exposure monitoring are required.

4.0 Air Monitoring

Air monitoring will consist of air particulate sampling and sample analysis for gross alpha/beta activity in accordance with Chapters 7.0 and 8.8 of the DWP. Gross alpha results will be used for informational purposes and not be used to determine compliance or evaluate the effectiveness of environmental release controls. As stated in the DWP, no alpha emitters are anticipated; however, this will be continually evaluated as surveys are performed during D&D activities.

4.1 Airborne Emission Limits

The airborne environmental release limit of 5.0E-11 microcuries per milliliter (μCi/mL) from 10 CFR 20 Appendix B, Table 2 (Column 1) will be used for air emissions based on cobalt-60 (Co-60), the most limiting RCOPC. The primary high-energy beta-emitting radionuclide as listed in Table 1-1 is Co-60. The low-energy beta emitters and hard-to-detect RCOPCs all have higher airborne emission limits (2 to 4 orders of magnitude higher) than Co-60 and are not expected to be present without Co-60. As a result, gross beta analysis of particulate air samples is an acceptable method for monitoring airborne emissions to the environment as specified in the DWP.

The limit established from 10 CFR 20 Appendix B, Table 2 represents the concentration which, if inhaled continuously over the course of the year, would produce a total effective dose equivalent of 50 mrem/year (0.5 millisieverts per year) to a member of the public. Considering the public dose constraint to airborne emissions is 10 mrem/year as specified in 10 CFR 20.1101 (d), the limit of 5.0E-11 μCi/mL for Co-60 will be reduced by a factor of 5 to 1.0E-11 μCi/mL for gross beta activity screening.

All environmental air samples (radiological) will be analyzed at an off-site laboratory for gross alpha/beta activity. As previously stated, gross alpha results are for information purposes only. If the gross beta results are elevated, additional analyses such as gamma spectroscopy or liquid scintillation analysis for isotopic identification may be requested.

4.2 Air Sampling Locations

Air sampling stations for radiological emissions from the project site will be set up to monitor areas that are generally accessible to facility personnel and at locations along the site perimeter. These stations will monitor for potential airborne releases to the public and to provide data to document potential exposures from air emissions.

The locations for air monitoring will be determined by the PRSO in conjunction with the project CHP based on wind rose data and predominant wind directions. Preliminary air monitoring locations are provided in Appendix A. Based on wind rose data (Appendix B), the predominant wind directions at the project site are out of the north and southeast from November through May; however, the wind directions vary from June through October during the hurricane season. Four air sampling stations will be established along the security fence perimeter: one each in the four cardinal directions. A fifth air sampling location will also be established at the project administrative trailers as applicable. An additional monitoring station will be established at a suitable background location at ASY or an off-site location to be determined by the PRSO in conjunction with the project CHP. The final locations of all air sampling stations will be documented on a map of the facility.

4.3 HEPA Filter Exhaust

The general area of any HEPA-filtered exhaust discharged directly to the environment outside of controlled areas will be sampled.

4.4 Sampling Frequency

Radiological air samplers used to monitor facility personnel and the general public will be operated 24 hours per day 7 days a week and be changed once per week unless more frequent monitoring is necessary (e.g., spill/release occurs) as determined by the PRSO in conjunction with the project CHP.

5.0 Storm Water Sampling

Storm water within the planned work area is controlled by a series of storm drains constituting two drainfields. One drainfield discharges to a grate-covered concrete collection basin or channel which discharges to the drainage ditch to the southeast of the site. The second storm drain system discharges directly to an outfall located further down the drainage ditch to the south of the project site as shown in Appendix A. No liquid effluent discharges are anticipated during the dismantlement of the SSSB; however, periodic monitoring will be performed as discussed in this chapter.

The majority of the radiological source term will be removed within the confines of the vessel prior to dismantlement. Once the majority of the radiological source term is removed, the SSSB will be sectioned (i.e., cut into pieces), with removed sections relocated to the CS for dismantlement and sizing within the CS enclosure.

During the initial stage of the project, potentially contaminated surfaces will not be exposed to the environment. Any run-off will be from the weathered exterior of the SSSB. As a result, storm water will not be collected from the bermed area until the SSSB sectioning begins.

Once the SSSB sectioning begins and potentially contaminated surfaces are exposed to the environment, the berm surrounding the perimeter of the SSSB work area liner will be closed and storm water will be collected, sampled, and properly disposed. These engineering controls are intended to control potential releases to the environment via surface water runoff.

5.1 Storm Water Effluent Limits

The storm water effluent limits are specified in 10 CFR 20 Appendix B, Table 2 for radiological effluent monitoring and are summarized in Table 5-1 for the RCOPCs.

Storm water samples collected will be analyzed by the offsite laboratory for gross alpha/beta and by gamma spectroscopy. The gross beta results will be compared to a limit of 3.0 E-06 µCi/mL (the most restrictive higher energy beta emitter, Co-60). The gross alpha results will be used for information purposes only. If the gross beta results are elevated, additional analyses such as gamma spectroscopy or liquid scintillation analysis for isotopic identification may be requested and compared to the limits provided in Table 5-1.

Table 5-1
Surface Water Effluent Limits (Radiological)

RCOPC	Effluent Limit (μCi/mL)
Carbon-14	3.0E-05
Cobalt-60	3.0E-06
Iron-55	1.0E-04
Nickel-63	1.0E-04
Cesium-137	1.0E-06

RCOPC – radionuclide contaminant of potential concern.
μCi/mL – microcuries per milliliter.

In addition to the radionuclides listed above, each sample will be analyzed for total lead (via U.S. Environmental Protection Agency [EPA] Method 6010C) and total PCBs (via EPA Method 8082A). These data will be compared to the data for the samples collected prior to the start of D&D activities. In support of that comparison, the storm water samples will also be analyzed for the reference elements aluminum, iron, and manganese; total suspended solids; and pH. With these additional analyses, geochemical evaluation of lead can be performed. Geochemical evaluation permits the identification of samples that may have been impacted and distinguishes them from samples that contain only background concentrations of lead.

Geochemical evaluation is a type of forensic analysis that is based on the well-known behavior of elements in solid and aqueous media, including adsorption/desorption reactions on the surfaces of suspended clay and iron oxide minerals, pH effects, and reduction/oxidation effects (Myers and Thorbjornsen, 2004; Thorbjornsen and Myers, 2007a, 2007b, 2008). Concentration ratios of specific element pairs are examined to determine the source(s) of the elevated concentrations and pinpoint exactly which, if any, samples are impacted by potential contamination.

For each storm water sample, a filtered sample (0.45-micron pore size) will be obtained for each unfiltered sample, and both samples will be analyzed for metals. Comparisons of filtered vs. unfiltered element concentrations provide another line of evidence to support the conclusions based on trace vs. major element ratios (Thorbjornsen and Myers, 2007b, 2008). Filtered/unfiltered ratios of approximately 1.0 indicate that a given element is present in solution or associated with very fine particulates that can pass through the filter, whereas filtered/unfiltered ratios below 1.0 indicate that some portion of the element is associated with suspended particulates, such as clay minerals. Very low filtered/unfiltered ratios confirm that the

trace element is primarily associated with mineral surfaces, and such an observation would corroborate the conclusion, based on an observed correlation of the trace element's unfiltered concentrations vs. the corresponding unfiltered aluminum concentrations, that the element is adsorbed on suspended clay minerals and has a natural source.

Because of asbestos's characteristics and its improbability of being an aqueous contaminant, the storm water samples will not be analyzed for asbestos.

5.2 Storm Water Sampling Locations

Storm water will be sampled by collecting a grab sample at each of the locations shown in Appendix A. These include a sample location east of the project footprint, either at the storm water collection basin/channel or, alternatively, where it discharges at the head of the drainage ditch, and another location at the stormwater outfall further down the ditch to the south of the project site. A third sampling location will be established closer to the project site from the section of the stormwater drains which discharges to the south outfall.

5.3 Storm Water Sampling Frequency

Samples will be collected once per quarter following a measurable discharge event (e.g., rain events greater than 0.1 inch in 24 hours) provided that water is present. At least one sampling round will occur prior to SSSB arrival and placement at ASY. Additional sampling will be performed following any rain event that exceeds the collection and storage capacity of the run-off collection system if the collection berms are overrun. Sampling will continue through the conclusion of D&D activities.

6.0 Soil/Sediment Sampling

No soil or sediment contamination is anticipated as a result of SSSB D&D project operations. Any potential residual contamination will be assessed as part of the Final Status Survey following site operations. However, as a result of stormwater discharge, soil and sediments within the stormwater collection system and drainage ditch may potentially be impacted. As a result, soil/sediment accumulated at the storm water collection points will be sampled.

Samples will be analyzed by the off-site laboratory for Co-60 via gamma spectroscopy; total lead, aluminum, calcium, iron, magnesium, manganese, and potassium (via EPA Method 6010C); and total PCBs (via EPA Method 8082A). Aluminum, calcium, iron, magnesium, manganese, and potassium are not elements of concern but they are important reference elements used to evaluate lead concentrations during geochemical evaluation (Myers and Thorbjornsen, 2004; Thorbjornsen and Myers, 2007a; ASTM International, 2020). Geochemical evaluation permits the identification of soil/sediment samples that may have been impacted and distinguishes them from samples that contain only background concentrations of lead. Similarly, environmental forensic analyses can be performed on the PCB concentration data to identify the likely source(s) of those compounds (ASTM International, 2020; Interstate Technology & Regulatory Council, in progress). Geochemical evaluations are described further in the Baseline Survey Plan.

6.1 Soil/Sediment Sampling Limits

Considering no RCOPCs would be present without Co-60 and because Co-60 is the most limiting radionuclide, any radiological soil/sediment sample results will be reviewed for any positive Co-60 results. Any samples with detectable Co-60 levels will have additional sample analyses performed as directed by the PRSO in conjunction with the project CHP. All soil/sediment sample results will be compared to the baseline survey data.

Nonradiological data will be compared to the baseline data, including geochemical evaluation, as described above and in the Baseline Survey Plan (APTIM, 2021a).

Because of asbestos's characteristics (not soluble and low density) and its improbability of being a contaminant, the soil/sediment samples will not be analyzed for asbestos.

6.2 Soil/Sediment Sampling Locations

Soil/sediment samples will be collected at the same locations where the storm water samples are collected (see Appendix A).

6.3 Soil/Sediment Sampling Frequency

Soil/sediment samples will be collected on a quarterly basis, beginning prior to the arrival of the SSSB in Mobile and continuing through the conclusion of D&D activities.

7.0 Reporting

7.1 Quarterly Trend Analysis and Summary

In order to ensure regulatory compliance and to confirm that the engineering and administrative controls that have been implemented are adequate to maintain dose to members of the public ALARA, the various exposure pathways will be monitored as discussed in the prior sections. The monitoring data will be reviewed routinely and tracked to identify any trends that may indicate potential concerns that need to be addressed which could lead to unnecessary personnel exposure and/or releases to the environment. A quarterly trend analysis of the radiological data will be generated by the PRSO (or designee) and submitted to the project CHP for review.

7.1.1 Direct Exposure

Upon receipt of each environmental dose report, the dose at each monitoring station will be reviewed and the data compared to background and prior monitoring reports and the cumulative dose at each location determined. The data will be reviewed to determine any data trends and assess any concerns that may impact compliance with the public dose limits as discussed in Section 1.5.1.

7.1.2 Air Monitoring

All air sampling data will be reviewed directly against the gross beta air emission limit of 1.0E-11 μCi/mL as specified in Section 4.1. The radiological data will also be evaluated against prior monitoring results. The data will be plotted graphically and reviewed to determine any data trends and assess any concerns that may impact compliance with the public dose limits as discussed in Section 1.5.1 for air emissions.

7.1.3 Storm Water

Storm water sampling results will be compared to the limits specified in Section 5.1. The radiological data will be plotted graphically as applicable and reviewed to determine any data trends and assess any concerns that may impact compliance with the public dose limits, as discussed in Section 1.5.1.

7.1.4 Soil/Sediment

Soil/sediment samples will be analyzed for any detectable Co-60 activity to determine if further investigation is necessary. The radiological data will be plotted graphically as applicable and reviewed to determine any data trends and assess any concerns that may impact compliance with the public dose limits, as discussed in Section 1.5.1.

7.2 Annual Public Dose Assessment

An annual public dose assessment (January to December of each year) will be performed and documented to demonstrate compliance with the regulatory public dose limits. This assessment will be based on a combination of results, including direct exposure monitoring, radiation surveys and dose contributions based upon air emissions, and liquid effluent monitoring data. All sample analyses supporting the public dose assessment will be analyzed by the approved off-site laboratory. This assessment will be reviewed by a CHP and documented in an annual report.

8.0 Quality Assurance and Quality Control

Environmental monitoring data will be generated during implementation of this EMP. This will include direct monitoring results and sample results for soil/sediment, air, and water collected during D&D operations. As a result, data quality will be of vital importance to ensure representative data, detection sensitivities, and data accuracy and reproducibility. This will be controlled through implementation of the SSSB Project Quality Plan (PQP) (APTIM, 2021e), Sampling and Analysis Plan (SAP) (APTIM, 2021f), and the project standard operating procedures (SOP).

8.1 Sampling Design and Rationale

As specified in Chapter 1.0 of this EMP, the dismantlement of the SSSB will involve the removal and packaging of nonradioactive and radioactively contaminated materials from the vessel for disposal. As a result, there will be the potential for exposure to hazards which will require monitoring to evaluate any potential exposures to facility personnel and the public to ensure the D&D work is performed safely and in compliance with all Federal, State, and local regulations and requirements.

8.2 Sampling Locations

Sampling locations will be selected and finalized as outlined in this EMP in order to measure the effectiveness of administrative and engineering controls implemented to minimize or eliminate the potential spread of contaminants into the environment, and to assess any public exposure. Samples will be collected in a biased manner depending upon the operations at locations which will be most representative of the measurement of any exposure to the public. Preliminary sampling locations are provided in Appendix A of this EMP.

8.3 Sampling Methods

All surveys and samples will be performed and collected in accordance with project field SOPs. These include the methods for collection of samples and the performance of surveys, including the quality control (QC) of field instruments.

8.4 Instrument Selection, Calibration, and Operation

Instruments and equipment will be selected that will measure the contaminants of concern at adequate detection sensitivities to ensure no public exposure above the applicable exposure limits. All environmental monitoring samples, including air, water, and soil/sediment samples, will be analyzed by the approved off-site laboratory. Air samples may also be analyzed on-site

for more rapid results prior to shipment to the off-site laboratory for further analysis. Instrument calibration, maintenance, testing, and inspection will be performed in accordance with SOPs as part of the SSSB project RPP and SAP.

8.5 Field Quality Control Requirements

QC samples will be collected at the frequency of 1 sample for every 20 samples analyzed or 1 per sampling event (whichever is greater) with the exception of air samples and direct exposure monitoring. Similarly, for metals and PCB analyses, equipment blank and matrix spike/matrix spike duplicate samples will be analyzed at a frequency of 1 sample for every 20 samples or per batch.

Daily background and source checks will be conducted on all radiological monitoring equipment.

8.6 Analytical Methods Minimum Detectable Activity and Limit of Detection/Limit of Quantitation Requirements

The analytical methods, minimum detectable activity, and limits of detection/limits of quantitation requirements for all samples collected during this project are provided in the PQP, SAP, RPP, and SOPs.

8.7 Analytical SOPs, Calibration, and Maintenance Requirements

Analytical SOPs, instrument calibration, and maintenance, testing, and inspections for the SSSB project are provided in the PQP, SAP, RPP, and SOPs.

9.0 References

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Aptim Federal Services, LLC (APTIM), 2021b, ***Decommissioning Work Plan, Surface Ship Support Barge Dismantlement and Disposal***, Rev. 1, April (or most recent revision).

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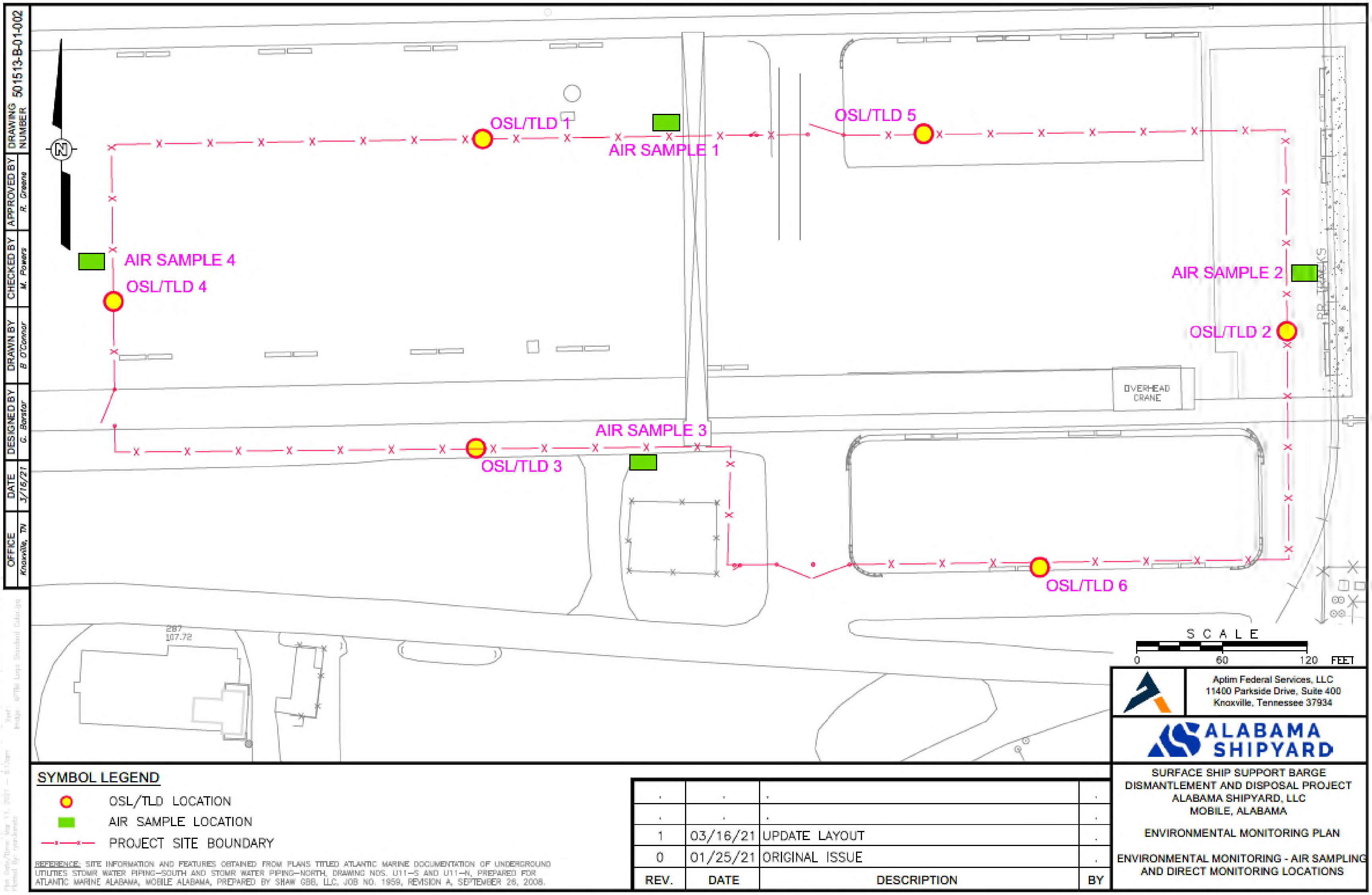
U.S. Nuclear Regulatory Commission (NRC), Title 10 Code of Federal Regulations Part 20 (10 CFR 20), ***Standards for Protection Against Radiation***.

APPENDIX A

ENVIRONMENTAL MONITORING LOCATIONS (PRELIMINARY)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APPROVED BY R. Greene
CHECKED BY M. Powers
DRAWN BY B O'Connor
DESIGNED BY G. Barstar
DATE 3/16/21
OFFICE Knoxville, TN
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OSL/TLD 1
AIR SAMPLE 1
OSL/TLD 5
AIR SAMPLE 4
OSL/TLD 4
AIR SAMPLE 2
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RR TRACKS
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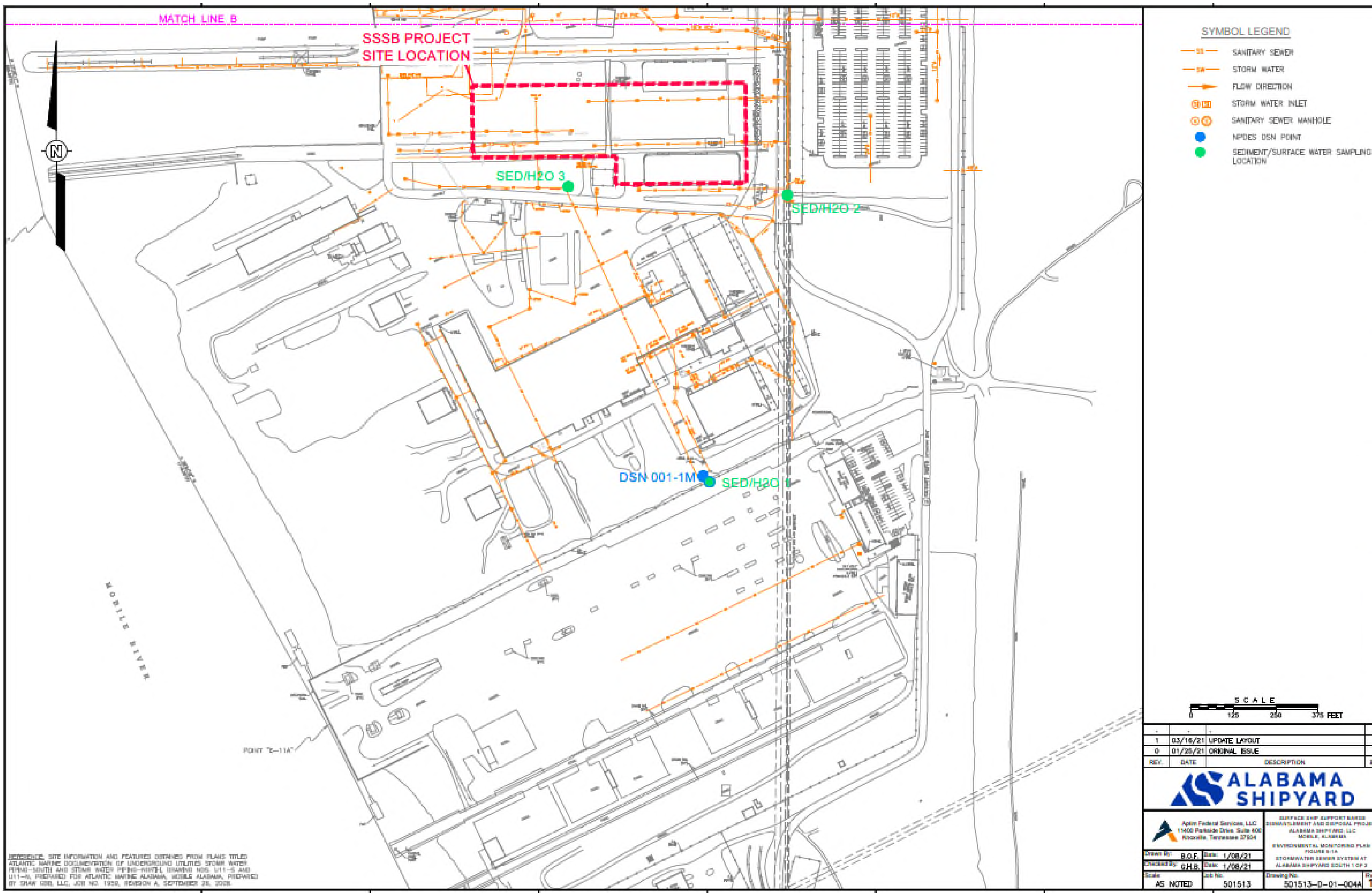
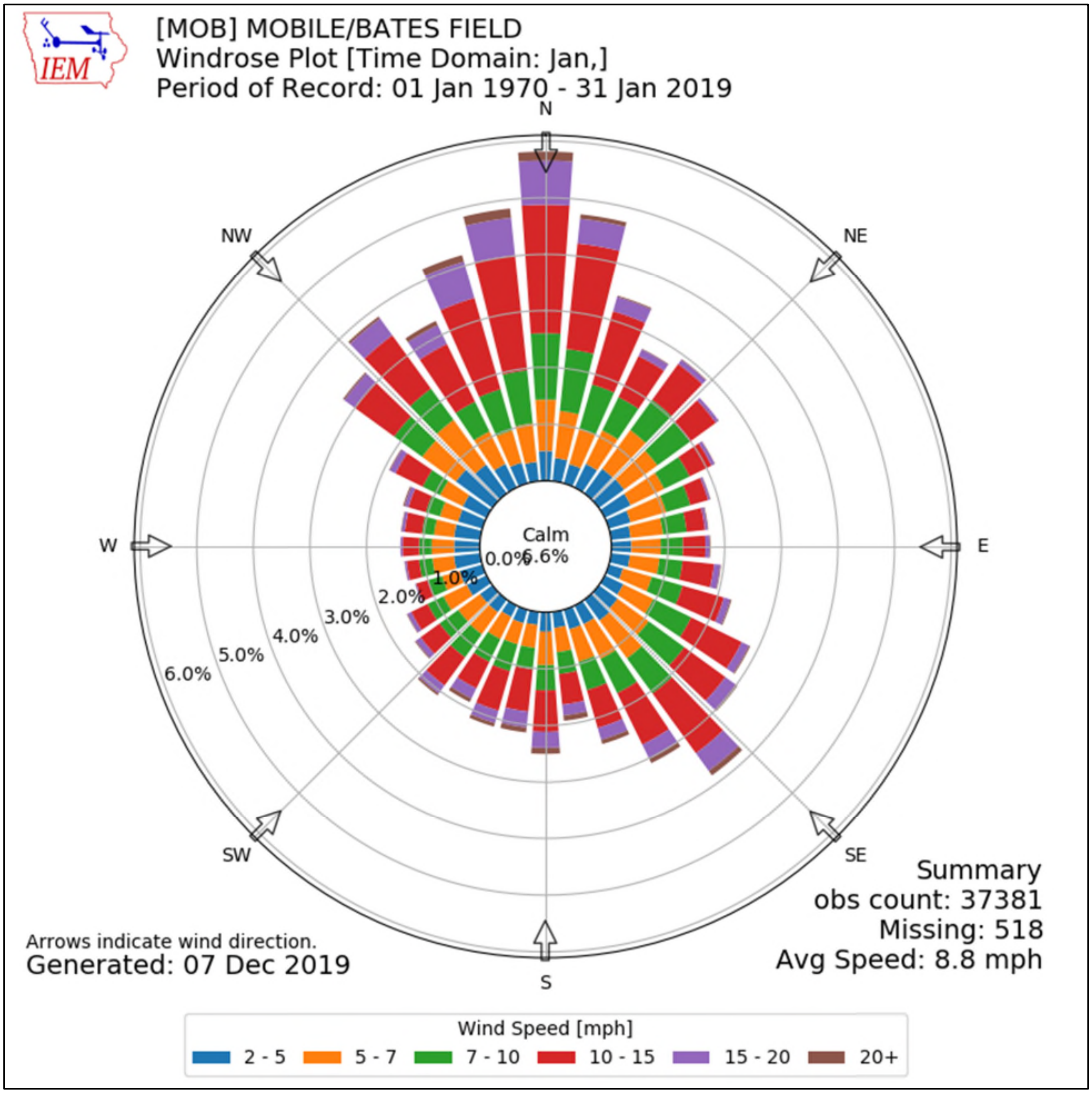
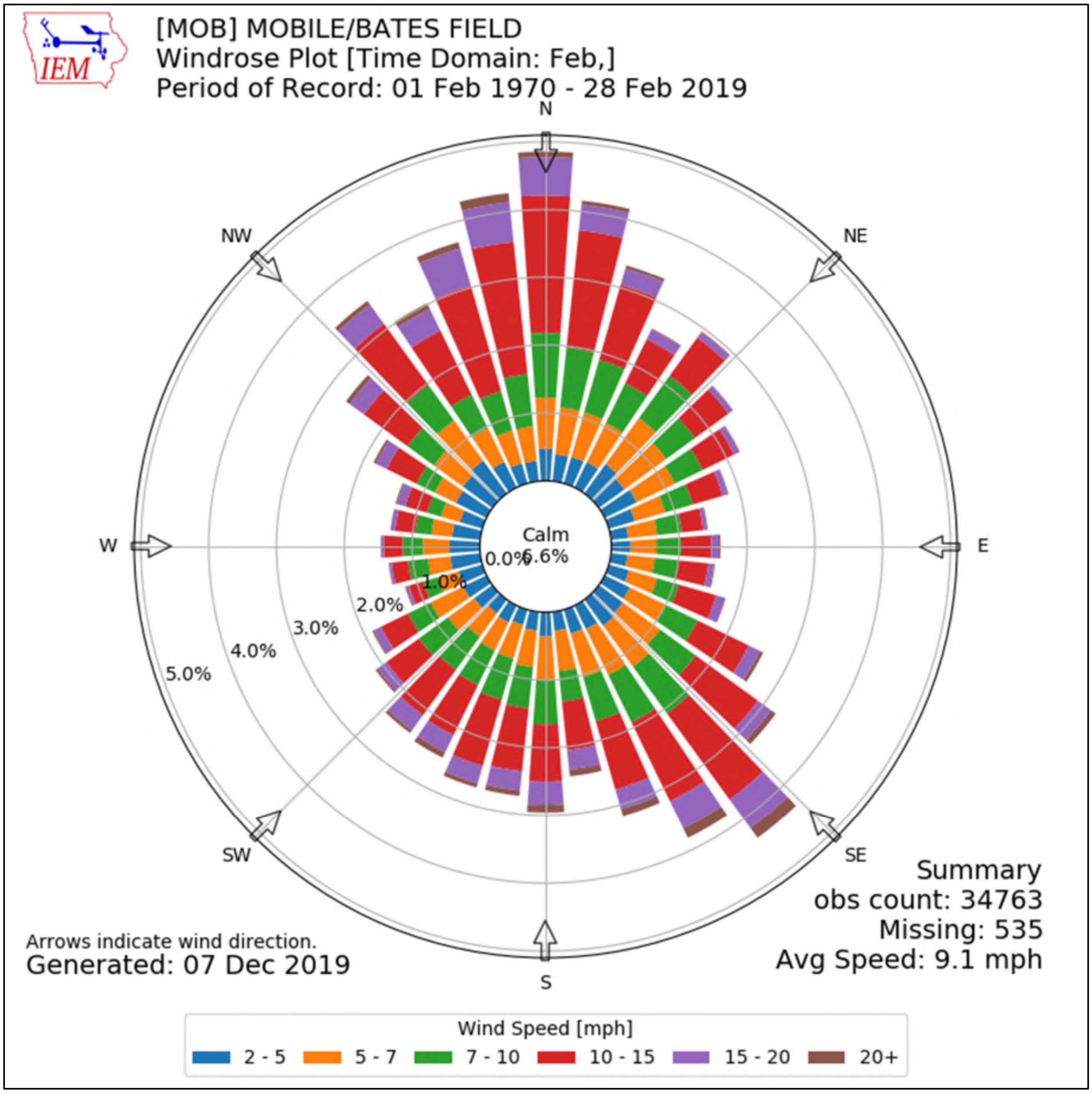
120
FEET
Aptim Federal Services, LLC
11400 Parkside Drive, Suite 400
Knoxville, Tennessee 37934
ALABAMA SHIPYARD
SYMBOL LEGEND
OSL/TLD LOCATION
AIR SAMPLE LOCATION
PROJECT SITE BOUNDARY
REFERENCE: SITE INFORMATION AND FEATURES OBTAINED FROM PLANS TITLED ATLANTIC MARINE DOCUMENTATION OF UNDERGROUND UTILITIES STOMR WATER PIPING—SOUTH AND STOMR WATER PIPING—NORTH, DRAWING NOS. U11—S AND U11—N, PREPARED FOR ATLANTIC MARINE ALABAMA, MOBILE ALABAMA, PREPARED BY SHAW GBB, LLC, JOB NO. 1959, REVISION A, SEPTEMBER 26, 2008.
1 03/16/21 UPDATE LAYOUT
0 01/25/21 ORIGINAL ISSUE
REV. DATE DESCRIPTION BY
SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL PROJECT
ALABAMA SHIPYARD, LLC
MOBILE, ALABAMA
ENVIRONMENTAL MONITORING PLAN
ENVIRONMENTAL MONITORING - AIR SAMPLING AND DIRECT MONITORING LOCATIONS


MATCH LINE B
SSSB PROJECT
SITE LOCATION
SED/H2O 3
SED/H2O 2
DSN 001-1M
SED/H2O 1
MOBILE RIVER
SYMBOL LEGEND
SANITARY SEWER
STORM WATER
FLOW DIRECTION
STORM WATER INLET
SANITARY SEWER MANHOLE
NPDES DSN POINT
SEDIMENT/SURFACE WATER SAMPLING LOCATION
SCALE
0
125
250
375 FEET
1 03/16/21 UPDATE LAYOUT
0 01/25/21 ORIGINAL ISSUE
REV. DATE DESCRIPTION BY
ALABAMA SHIPYARD
Drawn By: B.O.F. Date: 1/08/21
Checked By: G.H.B. Date: 1/08/21
Scale AS NOTED
Job No. 501513
Drawing No. 501513-0-01-004A
Rev. 1

APPENDIX B

WIND ROSE DATA (MOBILE, AL)


[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Jan,]
Period of Record: 01 Jan 1970 - 31 Jan 2019
N
NE
E
SE
S
SW
W
NW
Calm
0.0%
6.6%
1.0%
2.0%
3.0%
4.0%
5.0%
6.0%
Summary
obs count: 37381
Missing: 518
Avg Speed: 8.8 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+


[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Feb,]
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N
NE
E
SE
S
SW
W
NW
Calm
6.6%
0.0%
1.0%
2.0%
3.0%
4.0%
5.0%
Summary
obs count: 34763
Missing: 535
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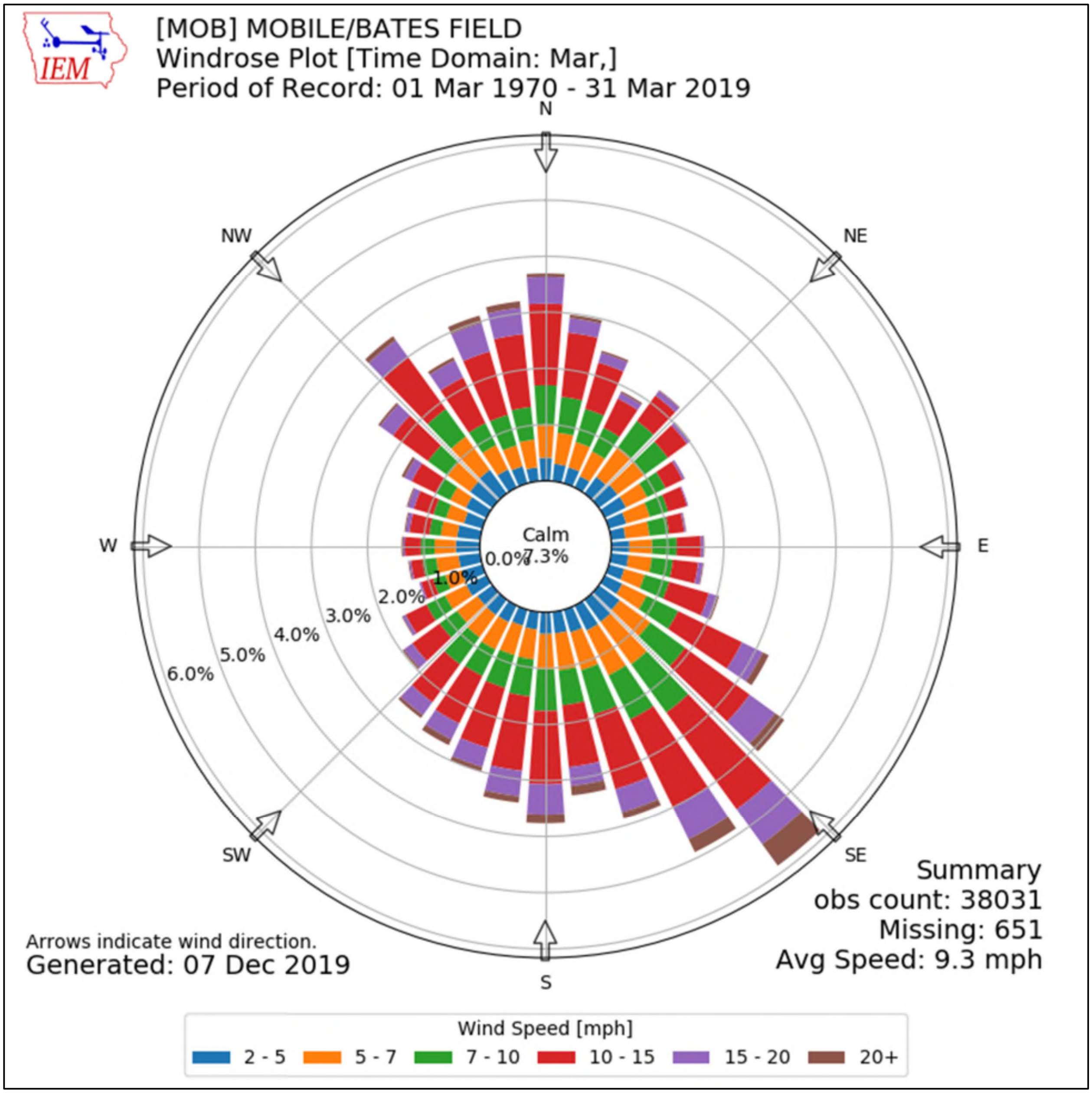
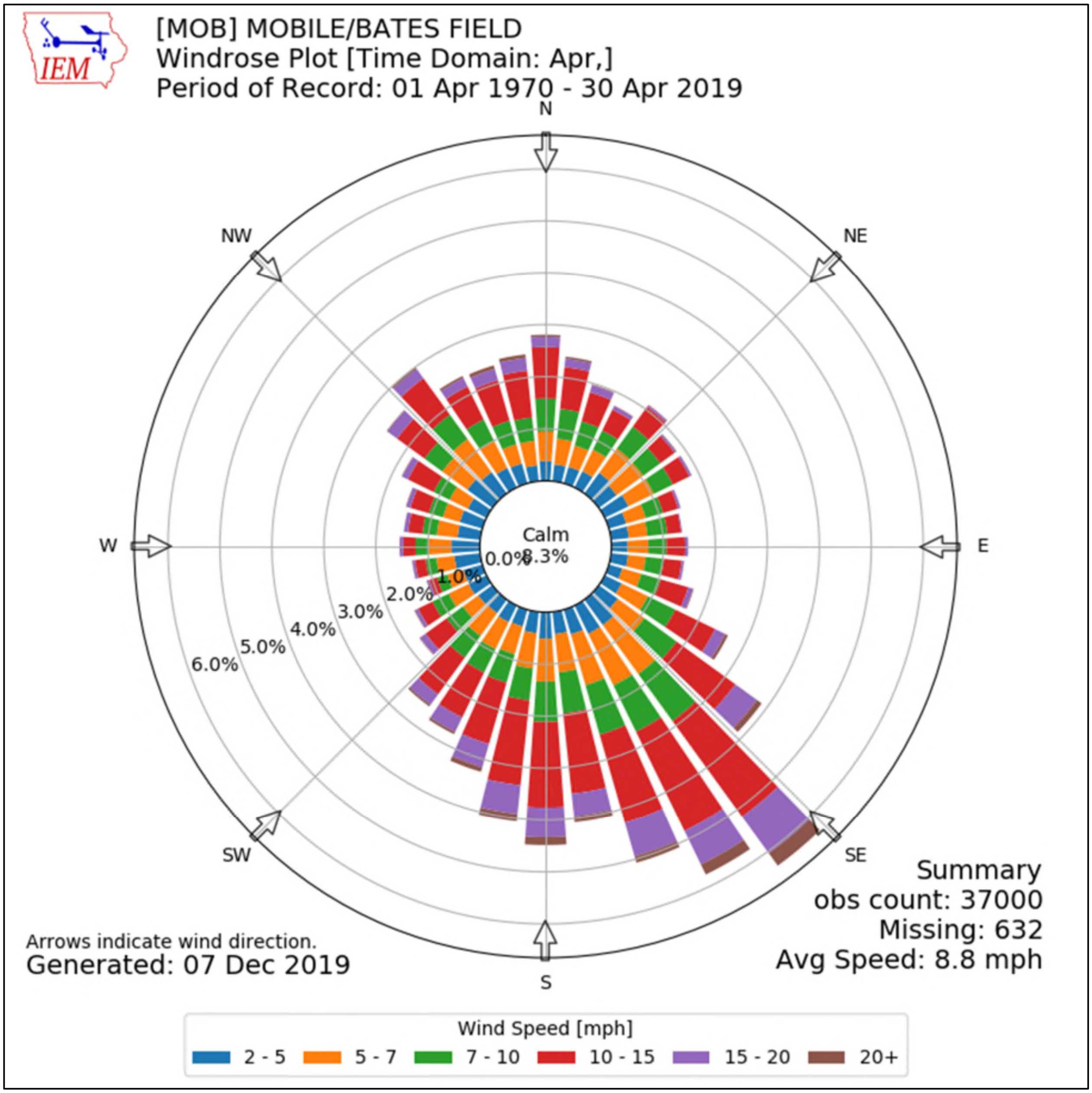
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+


[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Mar,]
Period of Record: 01 Mar 1970 - 31 Mar 2019
N
NE
E
SE
S
SW
W
NW
Calm
7.3%
0.0%
1.0%
2.0%
3.0%
4.0%
5.0%
6.0%
Summary
obs count: 38031
Missing: 651
Avg Speed: 9.3 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+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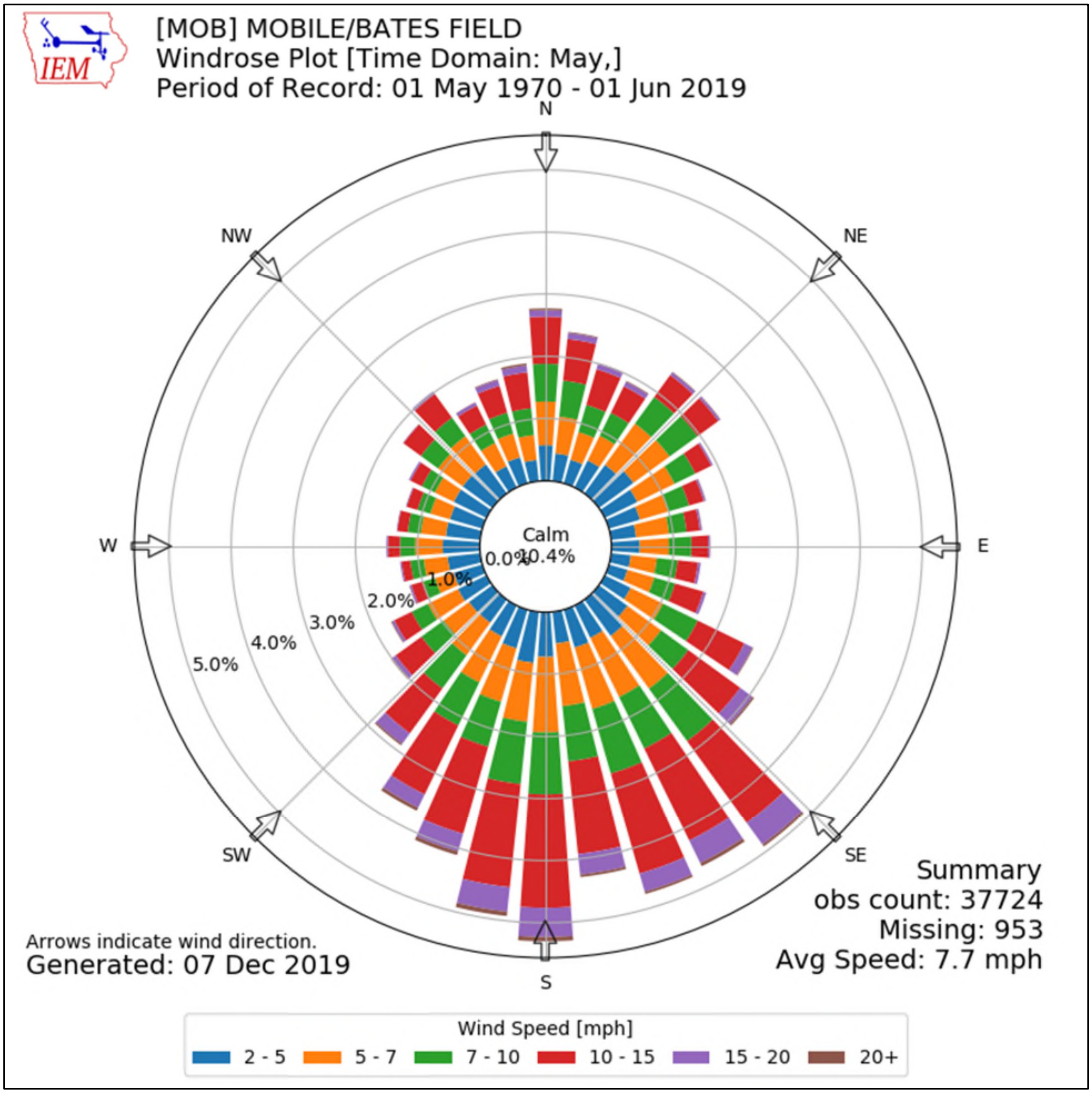
Windrose Plot [Time Domain: Apr,]
Period of Record: 01 Apr 1970 - 30 Apr 2019
N
NE
E
SE
S
SW
W
NW
Calm
0.0%
8.3%
1.0%
2.0%
3.0%
4.0%
5.0%
6.0%
Summary
obs count: 37000
Missing: 632
Avg Speed: 8.8 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+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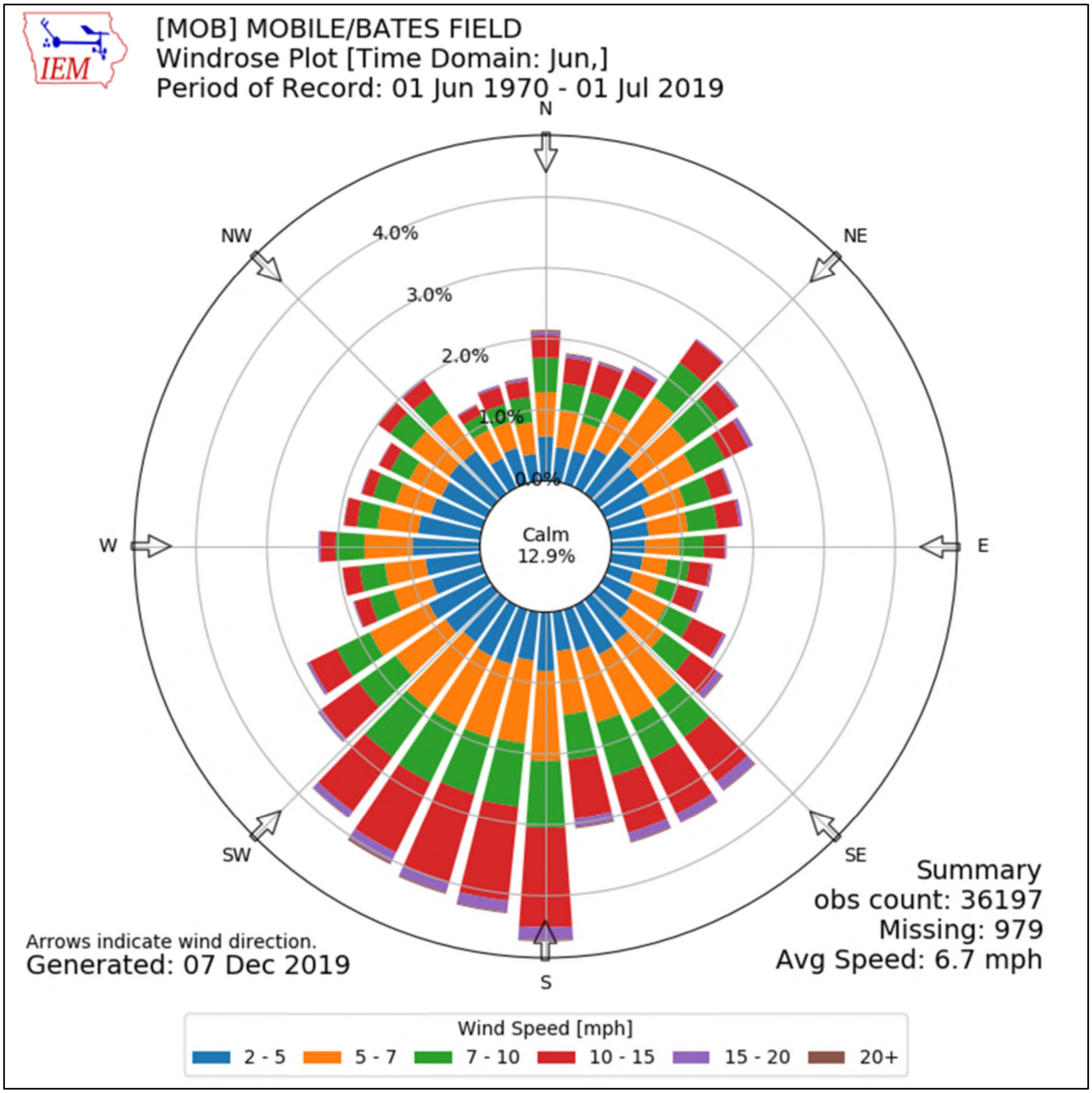
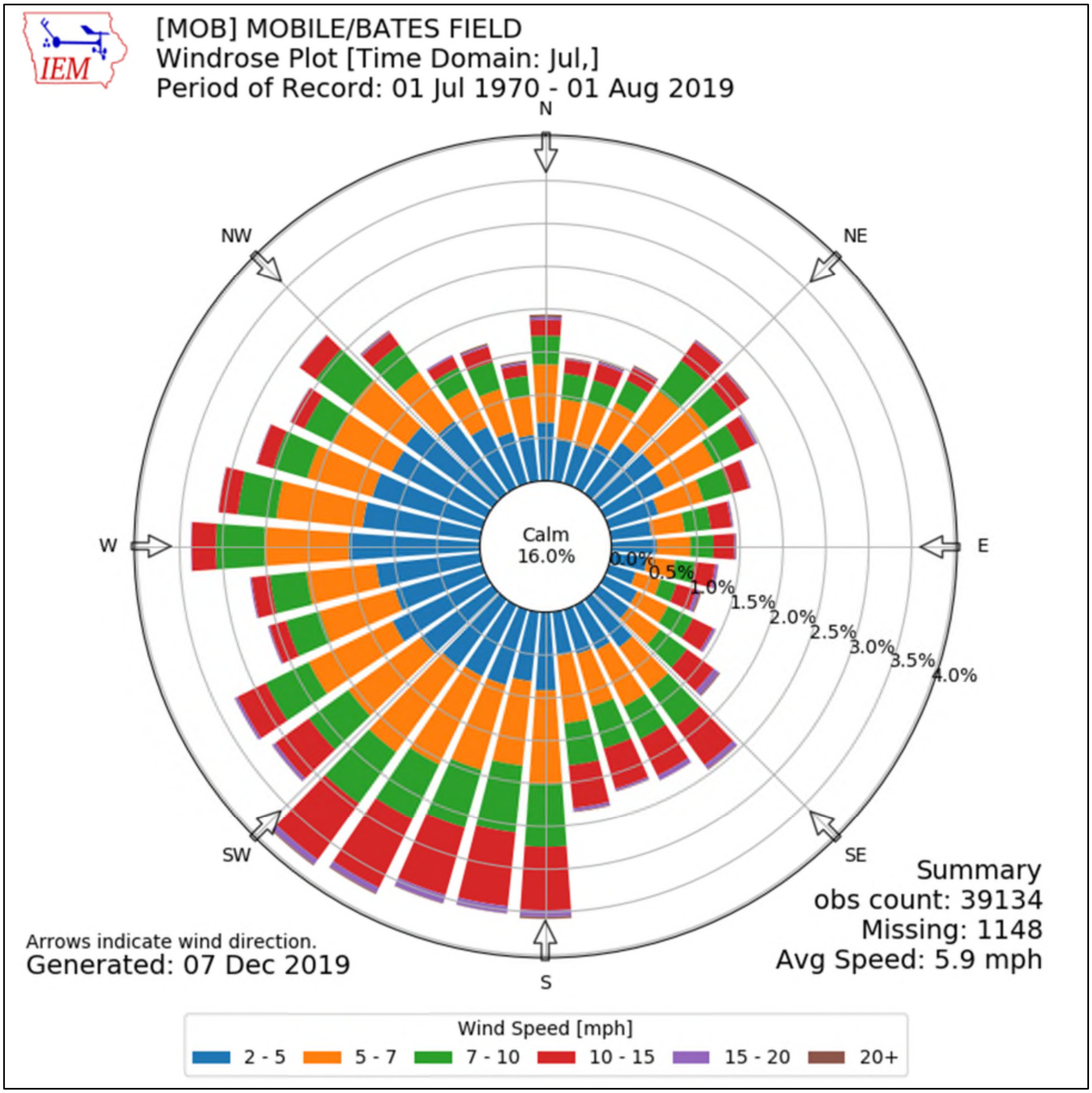
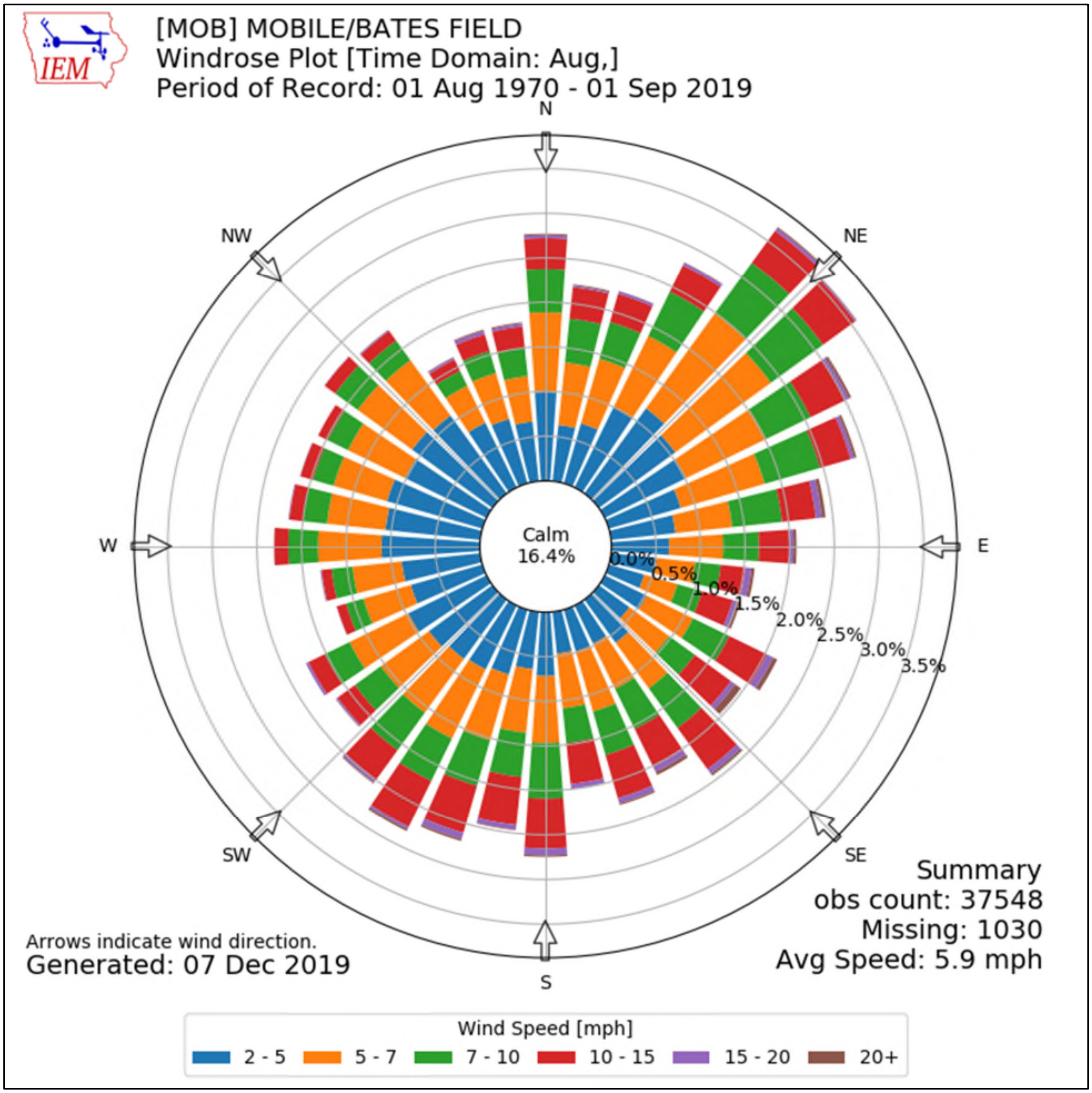
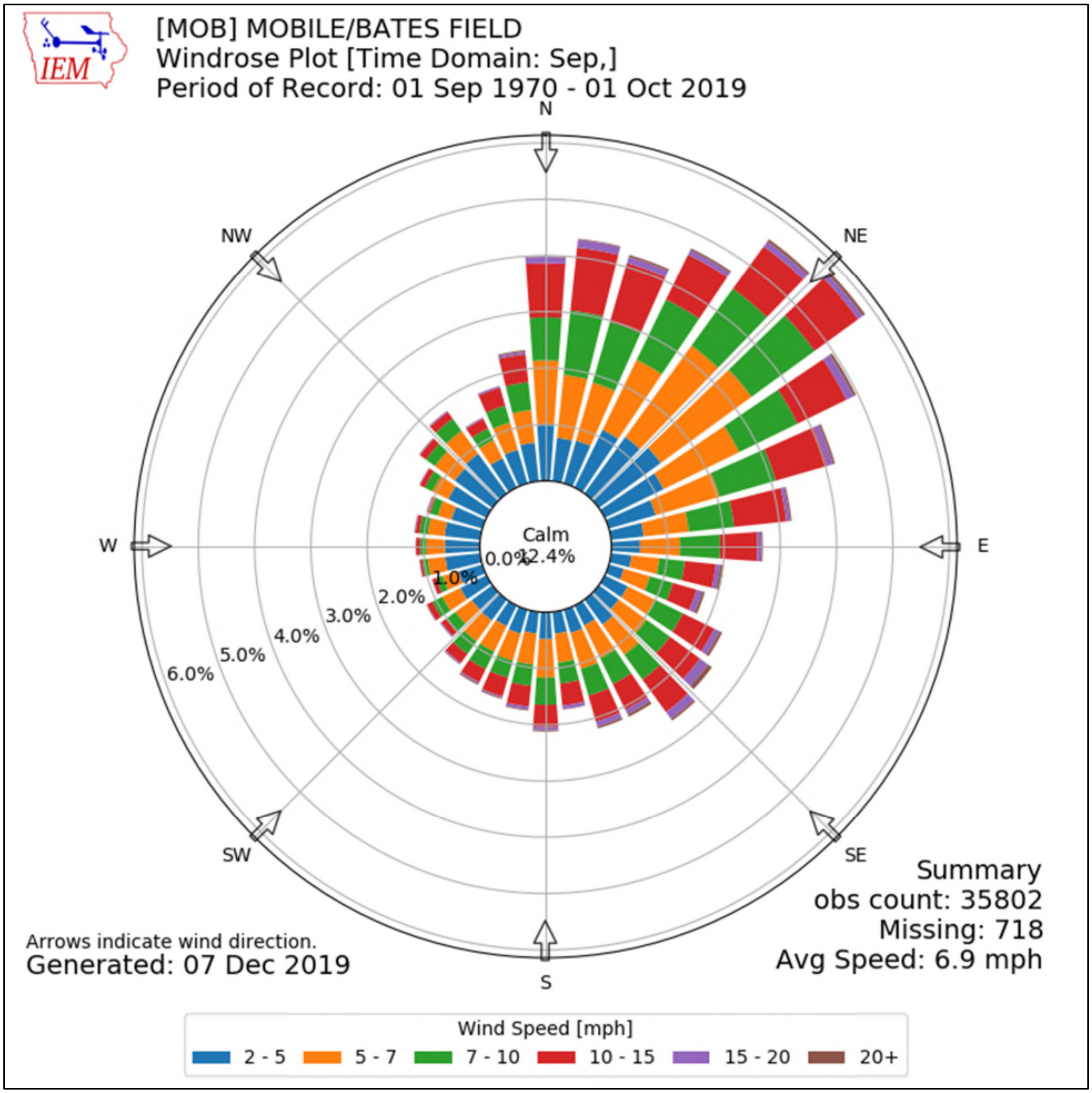
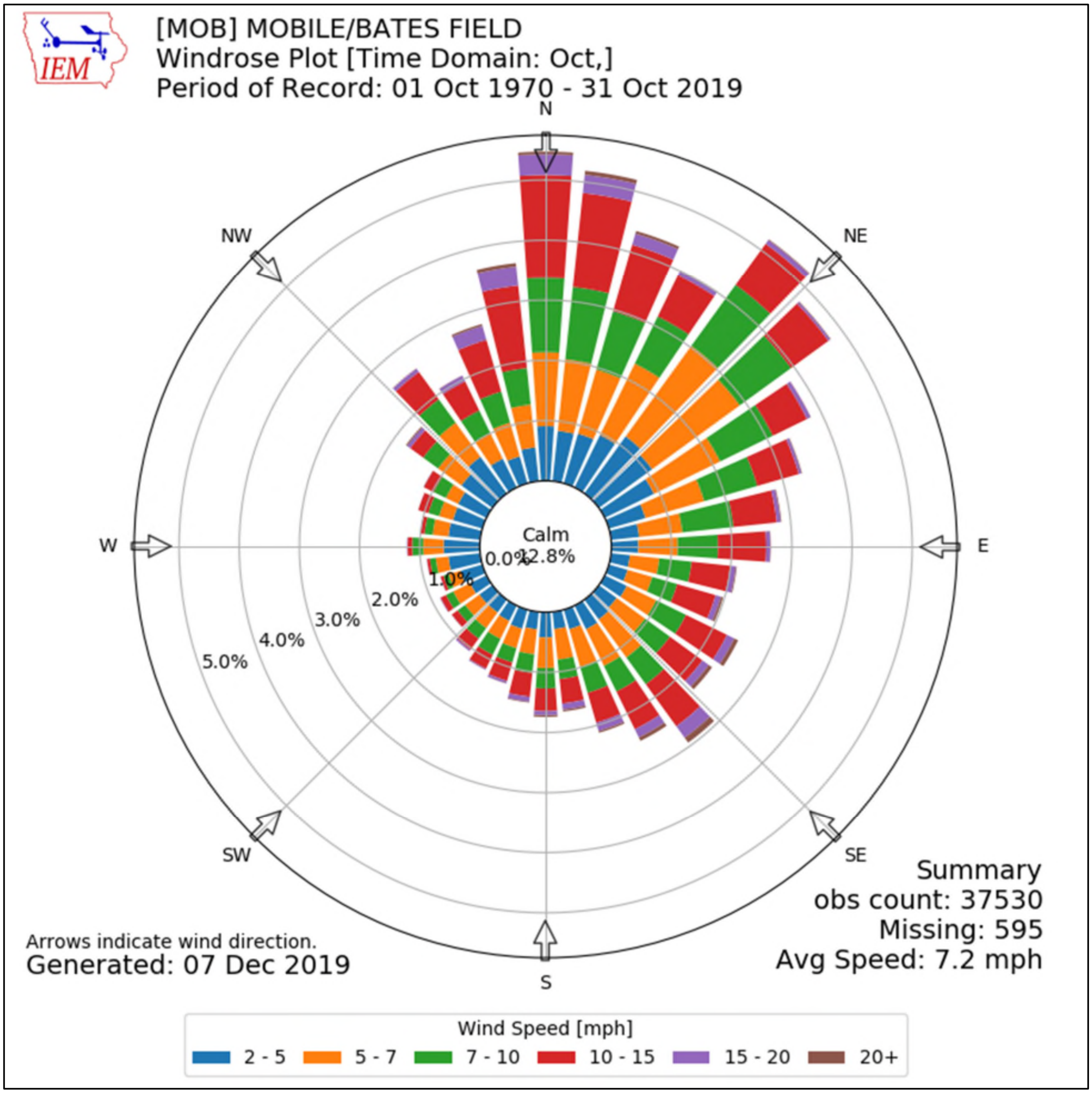
N
NE
E
SE
S
SW
W
NW
Calm
0.0%
10.4%
1.0%
2.0%
3.0%
4.0%
5.0%
Summary
obs count: 37724
Missing: 953
Avg Speed: 7.7 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+

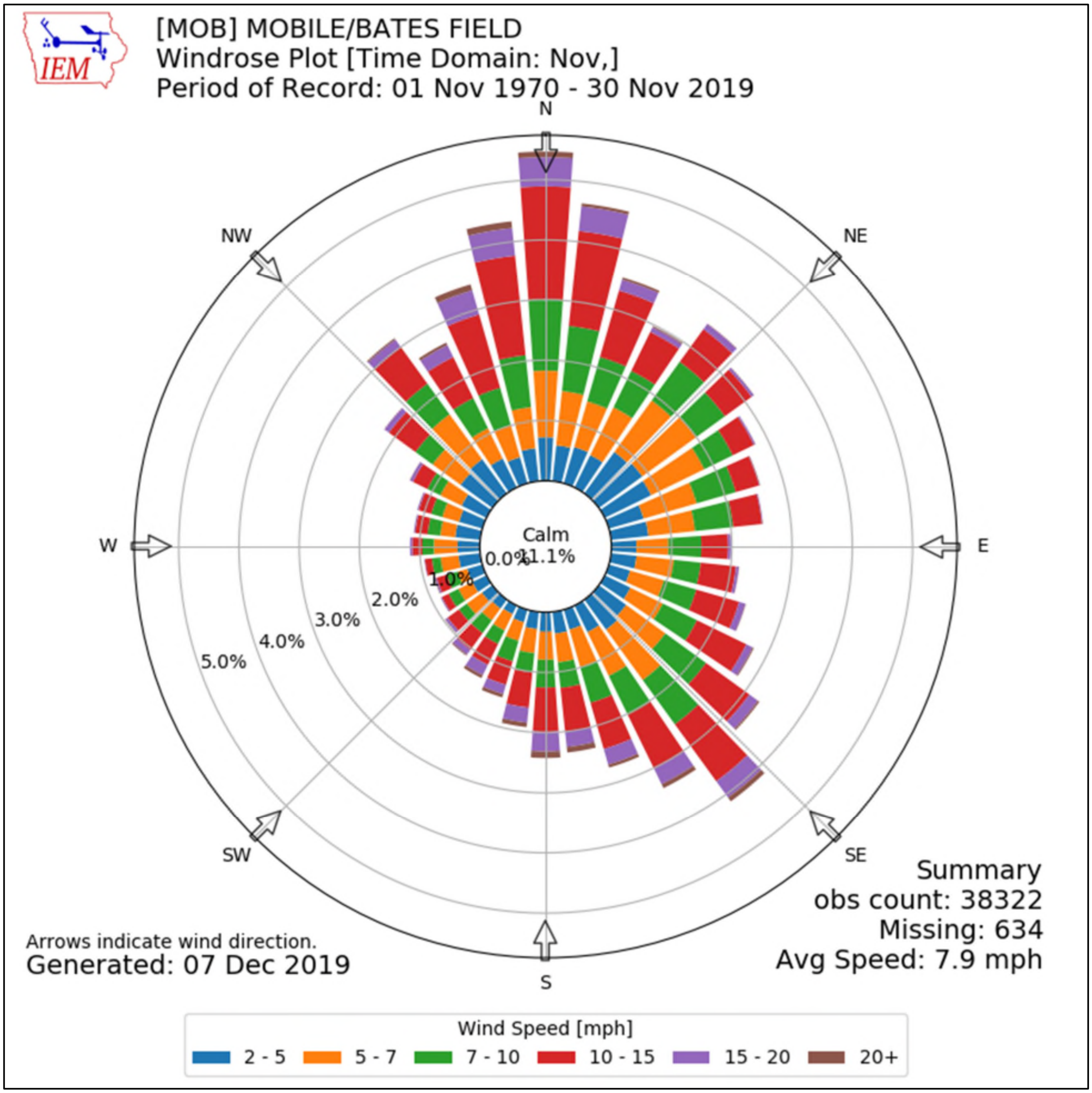

[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Jun,]
Period of Record: 01 Jun 1970 - 01 Jul 2019
N
NE
E
SE
S
SW
W
NW
4.0%
3.0%
2.0%
1.0%
0.0%
Calm
12.9%
Summary
obs count: 36197
Missing: 979
Avg Speed: 6.7 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+

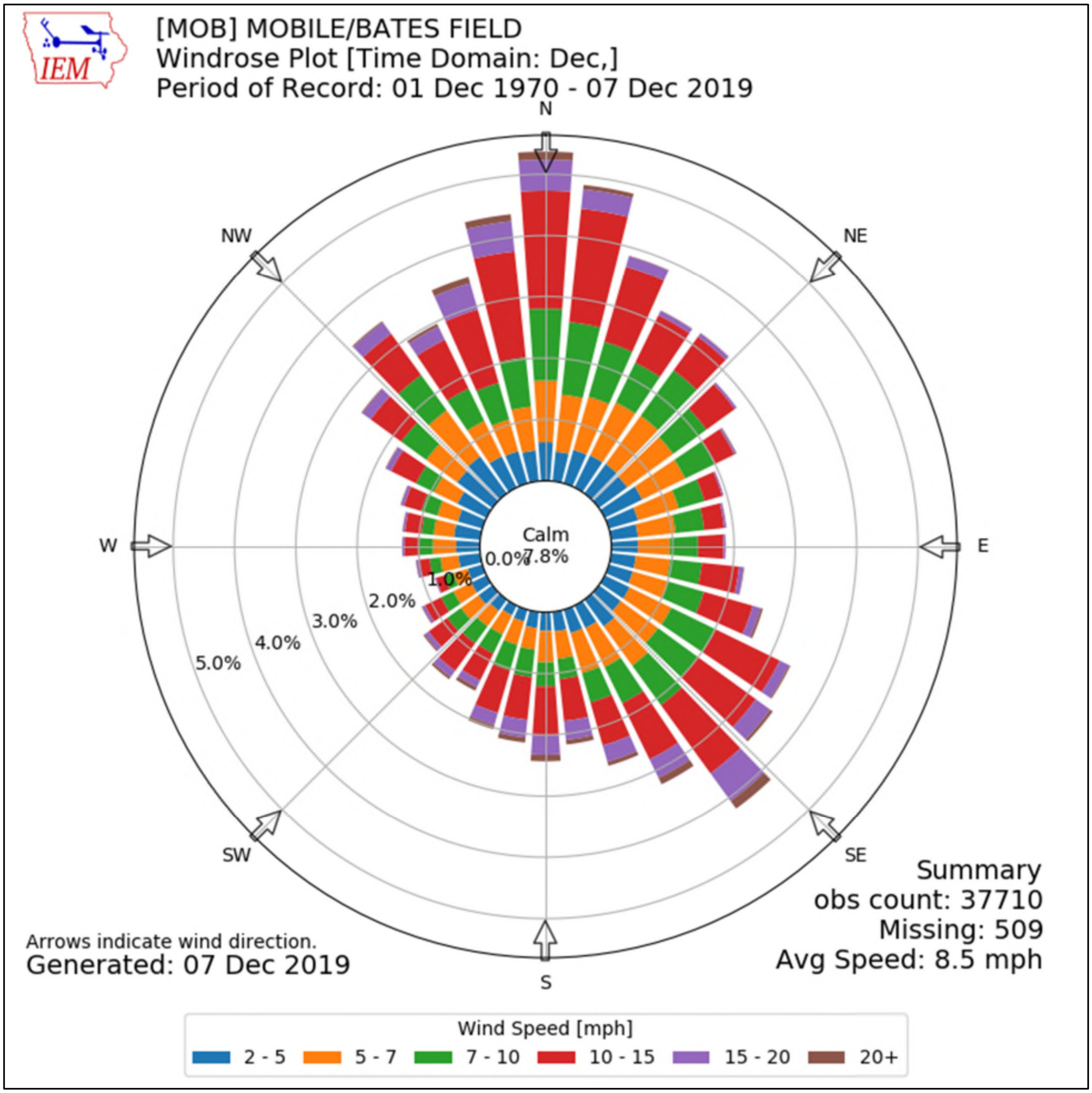

[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Jul,]
Period of Record: 01 Jul 1970 - 01 Aug 2019
N
NE
E
SE
S
SW
W
NW
Calm
16.0%
0.0%
0.5%
1.0%
1.5%
2.0%
2.5%
3.0%
3.5%
4.0%
Summary
obs count: 39134
Missing: 1148
Avg Speed: 5.9 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+

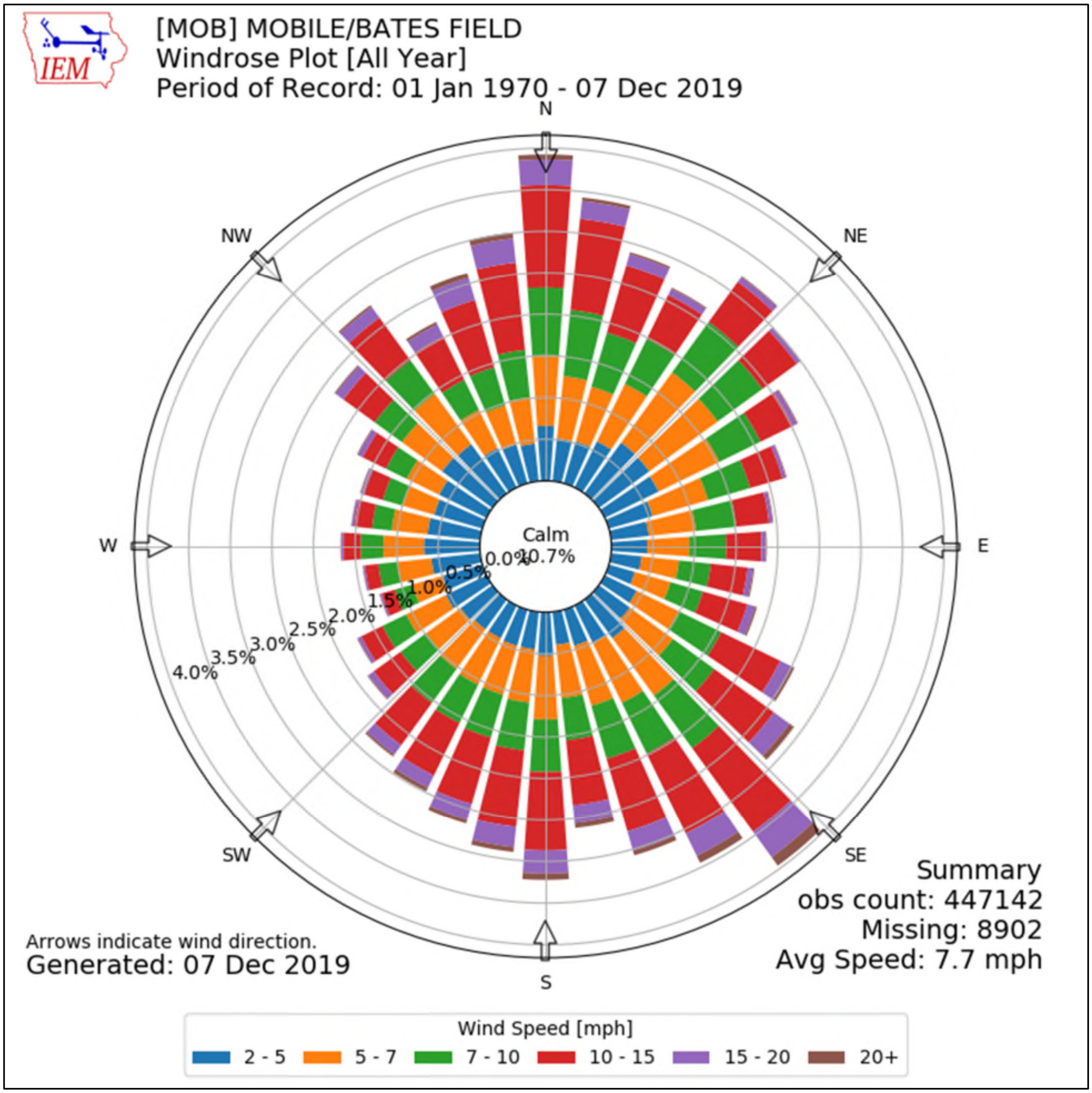

[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Aug,]
Period of Record: 01 Aug 1970 - 01 Sep 2019
N
NE
E
SE
S
SW
W
NW
Calm
16.4%
0.0%
0.5%
1.0%
1.5%
2.0%
2.5%
3.0%
3.5%
Summary
obs count: 37548
Missing: 1030
Avg Speed: 5.9 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+


IEM
[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Sep,]
Period of Record: 01 Sep 1970 - 01 Oct 2019
N
NE
E
SE
S
SW
W
NW
Calm
0.0%
12.4%
1.0%
2.0%
3.0%
4.0%
5.0%
6.0%
Summary
obs count: 35802
Missing: 718
Avg Speed: 6.9 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+


[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Oct,]
Period of Record: 01 Oct 1970 - 31 Oct 2019
N
NW
NE
W
E
SW
SE
S
Calm
0.0%
12.8%
1.0%
2.0%
3.0%
4.0%
5.0%
Summary
obs count: 37530
Missing: 595
Avg Speed: 7.2 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+


[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Nov,]
Period of Record: 01 Nov 1970 - 30 Nov 2019
N
NE
E
SE
S
SW
W
NW
Calm
0.0%
1.1%
1.0%
2.0%
3.0%
4.0%
5.0%
Summary
obs count: 38322
Missing: 634
Avg Speed: 7.9 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+


[MOB] MOBILE/BATES FIELD
Windrose Plot [Time Domain: Dec,]
Period of Record: 01 Dec 1970 - 07 Dec 2019
N
NE
E
SE
S
SW
W
NW
Calm
0.0%
7.8%
1.0%
2.0%
3.0%
4.0%
5.0%
Summary
obs count: 37710
Missing: 509
Avg Speed: 8.5 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+


[MOB] MOBILE/BATES FIELD
Windrose Plot [All Year]
Period of Record: 01 Jan 1970 - 07 Dec 2019
N
NE
E
SE
S
SW
W
NW
Calm
0.0%
10.7%
0.5%
1.0%
1.5%
2.0%
2.5%
3.0%
3.5%
4.0%
Summary
obs count: 447142
Missing: 8902
Avg Speed: 7.7 mph
Arrows indicate wind direction.
Generated: 07 Dec 2019
Wind Speed [mph]
2 - 5
5 - 7
7 - 10
10 - 15
15 - 20
20+

ATTACHMENT 4

SSSB PROJECT BASELINE SURVEY PLAN

BASELINE SURVEY PLAN

SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL

Project Number: 501513
Contract Number: N00024-20-C-4139

Prepared for

Naval Sea Systems Command
614 Sicard Street SE
Washington Navy Yard, DC 20376-7007

Prepared by

Aptim Federal Services, LLC
11400 Parkside Drive, Suite 400
Knoxville, Tennessee 37934

March 2021

Revision 0

BASELINE SURVEY PLAN

SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL

Prepared by

APTIM Federal Services, LLC
2410 Cherahala Blvd.
Knoxville, TN 37932

March 2021

Revision 0

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Reviewed/Approved by: [signature] Date: March 18, 2021
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Art Palmer, CHP
APTIM Technical Manager
865-765-7898

Reviewed/Approved by: [signature] Date: March 18, 2021
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APTIM Project Manager
208-901-2142

Reviewed/Approved by: [signature] Date: March 18, 2021
Robert Biolchini, PE
APTIM Site Manager
419-306-8994

Record of Revisions

Revision No.	Description of Revision	Date
0	Baseline Survey Plan	March 2021

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Acronyms and Abbreviations

2x2 NaI(Tl)	2-inch by 2-inch thallium-activated sodium iodide
ACM	asbestos-containing material
ANSI	American National Standards Institute
APP	Accident Prevention Plan
APTIM	Aptim Federal Services, LLC
ASY	Alabama Shipyard
CHP	Certified Health Physicist
cm^2	square centimeter
Co-60	cobalt-60
D&D	dismantlement and disposal
DCGL	Derived Concentration Guideline Level
dpm	disintegrations per minute
DWP	Decommissioning Work Plan
FSS	Final Status Survey
GPS	Global Positioning System
GWS	gamma walkover scan
LBGR	Lower Bound of the Grey Region
m	meter
m^2	square meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
µCi/mL	microcuries per milliliter
MDA	minimum detectable activity
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
PRSO	Project Radiation Safety Officer
PWEFC	Prototype Waterborne Expended Fuel Container
QC	quality control
RCOPC	radionuclide contaminant of potential concern
SAP	Sampling and Analysis Plan

SOP	standard operating procedure
SSSB	Surface Ship Support Barge
SU	survey unit
TOC	total organic carbon
WRS	Wilcoxon Rank Sum

1.0 Introduction

The SSSB is a barge (i.e., non-powered vessel) that was used to support refueling of Navy nuclear-powered ships. The function of the SSSB was to receive, hold, and prepare previously used reactor components designated for ship-out or reuse. The SSSB provided the ability to perform maintenance functions like those performed in a typical pressurized water reactor spent fuel pool except for long-term spent fuel storage.

The SSSB was originally a portion of the World-War-II-era T-2 tanker (SS CANTIGNY). CANTIGNY was constructed in 1945 by Sun Shipbuilding Company in Chester, Pennsylvania. Some of the remainder of CANTIGNY was reused with a new and larger midsection and bow constructed by Burmeister and Wain of Copenhagen, Denmark. The rebuilt CANTIGNY was operated until it was scrapped in Spain in 1984.

The CANTIGNY mid-body section was converted to a nuclear support facility in 1964 by Newport News Shipbuilding and was originally referred to as the Prototype Waterborne Expended Fuel Container (PWEFC). The PWEFC was constructed by Newport News Shipbuilding and Drydock Co. and used for support of the first and second CVN-65 (USS ENTERPRISE) refuelings. The vessel was extensively refurbished by Newport News Shipbuilding in the late 1980s with much of the original hull and tank structure replaced and new longitudinal bulkheads installed. In 1990, the PWEFC was upgraded to provide an additional 50 years of service by completing repairs and alterations. During the repairs, the PWEFC was renamed the SSSB. Thus, the SSSB bears little resemblance to the original CANTIGNY. No new concepts in nuclear support facilities were used in the SSSB.

There is no U.S. Nuclear Regulatory Commission (NRC) license number associated with the SSSB. Radioactive material is possessed under contractual authorization with the U.S. Navy Nuclear Power Program. The SSSB was last used to support the final defueling of the Ex-Enterprise (CVN-65) in approximately 2016 and the vessel is currently in inactive layup status.

As part of the SSSB dismantlement and disposal (D&D) project, the SSSB will be moved via heavy lift deck barge from Colonna's Shipyard in Norfolk, Virginia to the Alabama Shipyard (ASY) facility in Mobile, Alabama. Upon arrival at ASY, the SSSB will be moved from the deck barge onto blocks, using self-propelled modular transporters, at a location on ASY's dock between Piers K and L. The SSSB will be positioned under ASY's 'Goliath' bridge crane and within reach of two gantry cranes that will be used in the dismantlement process. After the SSSB

is in place, a containment structure will be erected to the east of the vessel for use during sizing of sections of the vessel for disposal.

1.1 Purpose

The purpose of this Baseline Survey Plan is to provide the basis for determining the baseline conditions of the planned dismantlement footprint, support areas, and immediate surroundings (i.e., potential runoff areas) at ASY prior to commencing dismantlement of the SSSB. The baseline survey will serve two primary purposes:

- Establish baseline survey and sample data for comparison with the final survey data on completion of project activities to ensure the site was not impacted by project operations
- Establish baseline survey and sample data for soil/sediment (i.e., run-off areas) against which environmental monitoring data will be compared to verify any potential public exposure is maintained within all regulatory limits and as low as reasonably achievable during execution of the project.

The baseline survey will also ensure that the project site is properly characterized prior to the arrival of the SSSB.

1.2 Scope

This Baseline Survey Plan specifies the methodologies and protocols for performing the baseline surveys for radiological and hazardous contaminants in support of the SSSB D&D project, which will be performed between Piers K and L at ASY. The SSSB D&D project site location at ASY is shown on Figure 1-1 and the project site layout is shown on Figure 1-2.

The scope of the baseline survey includes all areas directly controlled by Aptim Federal Services, LLC (APTIM) during dismantlement, including any support areas within the established SSSB project security fence and the immediately surrounding areas of potential runoff. No other areas will be included as part of the baseline survey scope.

1.3 Applicability

This plan applies to all APTIM personnel and their subcontractors who perform surveys and collect samples as part of the baseline survey in support of the SSSB D&D project. This plan also applies to all project personnel documenting, evaluating, and reviewing survey data and sample analysis results.

Figure 1-1
SSSB Project Site Location at Alabama Shipyard

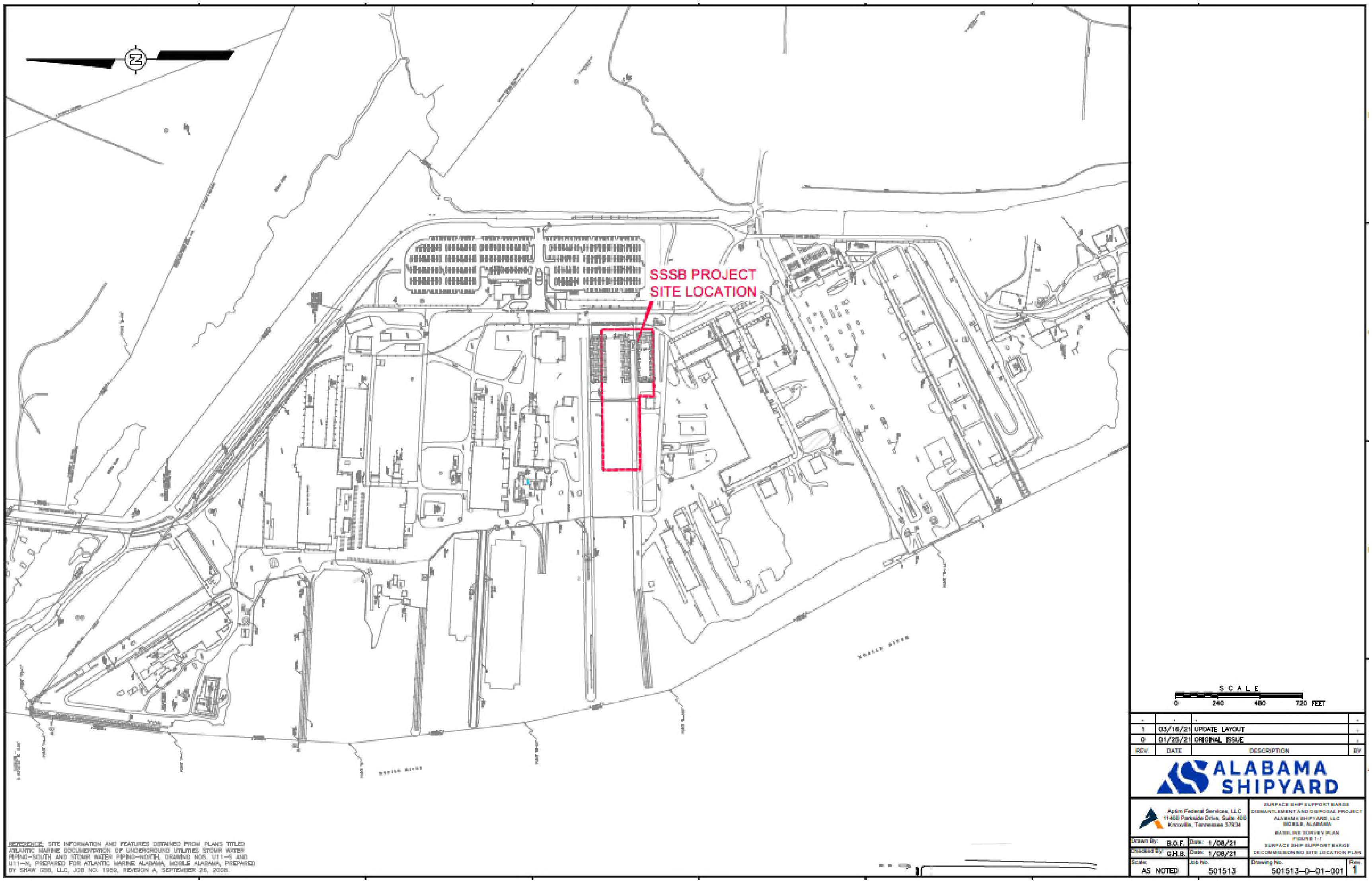
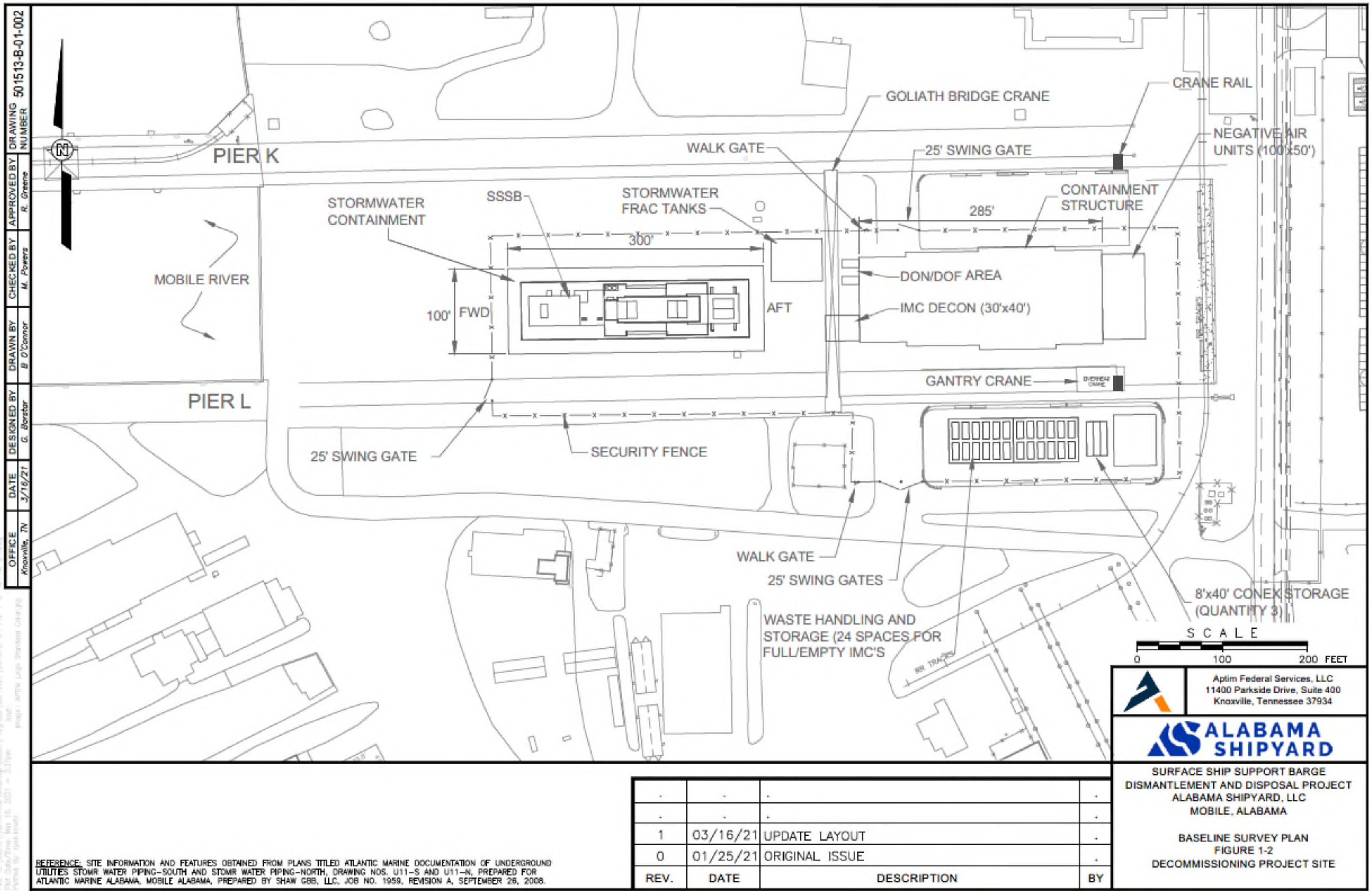


Figure 1-2
SSSB Project Site Layout



2.0 Baseline Survey Overview

The baseline survey will be based in part on the guidance provided in NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (NRC, 2000). Although the survey is not intended for the release of the project area at the ASY facility, MARSSIM will be used as the basis for designing the baseline survey to ensure adequate and representative data are collected so that the end goals for the survey are achieved.

2.1 Survey Objectives

This Baseline Survey Plan has the following objectives:

- Document the site baseline conditions to be used for comparison with the FSS through statistical analysis and for reference during routine environmental monitoring as specified in the SSSB project Environmental Monitoring Plan (APTIM, 2021a).
- Collect sufficient baseline data for statistical analysis to support the FSS after completion of the SSSB D&D to release the project site on completion of work.

This data will be used to develop the average concentration, distribution, and concentration range of each analyte from the samples collected and measurement data sets. These data sets will then be compared to the sample results collected as part of the SSSB D&D project environmental monitoring program (as applicable) and FSS to determine if further investigation is necessary.

2.2 Data Quality Objectives

The primary data quality objective (DQO) is to ensure that a sufficient quantity of quality data are collected to support the future survey and release of the ASY facility on completion of radiological operations. To ensure this, the MARSSIM survey guidance will be implemented. Specific DQOs are summarized in the following chapters for the survey design, survey instrumentation, and quality control (QC) and as detailed in the Final Status Survey Plan.

2.3 Contaminants of Concern

The radionuclide contaminants of potential concern (RCOPC) for the SSSB project are specified in Table 4-1 of the Decommissioning Work Plan (DWP) (APTIM, 2021b), and are summarized below in Table 2-1 along with their modes of decay. These RCOPCs are the result of handling activated equipment, materials, and spent fuel while servicing and refueling naval vessels.

Additional non-radiological hazards may include asbestos-containing material (ACM) and lead; however, because of asbestos’s characteristics, ACM analysis will not be required as part of the

baseline survey. Polychlorinated biphenyls (PCB) may also be present as part of the SSSB dismantlement.

Table 2-1
SSSB Radionuclides of Potential Concern

Radionuclide	Decay Mode
Carbon-14	Beta (low energy)
Cobalt-60	Beta/Gamma
Iron-55	x-ray
Nickel-63	Beta (low energy)
Cesium-137	Beta/Gamma

Note: includes only radionuclides present at greater than 1% of the total nuclide activity after decay.

2.4 Radiological Screening Criteria

For the SSSB project, there are no established guideline criteria for the baseline survey since the intent of the survey is to establish baseline contaminant concentrations. However, the screening values for surface and soil contamination provided in *Consolidated Decommissioning Guidance: Decommissioning Process for Materials Licensees*, NUREG-1757, Volume 1, Revision 2, Appendix B (NRC, 2006), will be used to establish minimum survey detection limits. As a DQO, the instrument minimum detectable activities (MDA) will be set to 50 percent or less for the most limiting guideline values as attainable. For beta surveys using portable field instruments, cobalt-60 (Co-60) is the most limiting beta-emitting radionuclide of interest. Alpha surveys will not be performed as part of the baseline survey because alpha-emitting radionuclides are not anticipated to be present on the SSSB as per the DWP.

2.4.1 Paved/Concrete Surfaces

Surveys of paved/concrete surfaces will consist of gamma walkover scans (GWS), beta surface scans, direct static readings, and smear samples.

Table B.1 of NUREG-1757 provides acceptable screening values for surface contamination of common radionuclides. These surface screening limits for the RCOPCs are summarized in Table 2-2 and will be used to establish detection sensitivities for the baseline survey.

Table 2-2
Screening Limits - Surface Contamination

Radionuclide	Screening Limit (dpm/100 cm^2)
Carbon-14	3,700,000
Cobalt-60	7,100
Iron-55	4,500,000
Nickel-63	1,800,000
Cesium-137	28,000

cm^2 – square centimeters
dpm – disintegrations per minute.

2.4.2 Soil and Sediment

Not all areas of the planned project footprint are paved. Surveys of unpaved surfaces, including areas of runoff, will consist of GWS and soil/sediment samples. No beta scans or smear samples will be performed on unpaved areas.

Table B.2 of NUREG-1757 provides acceptable screening values for soil contamination of common radionuclides (NRC, 2006). The screening limits for the RCOPCs are provided in Table 2-3 and will be used to establish detection sensitivities for soil/sediment samples.

Table 2-3
Screening Limits - Soil

Radionuclide	Screening Limit (pCi/g)
Carbon-14	12
Cobalt-60	3.8
Iron-55	10,000
Nickel-63	2,100
Cesium-137	11

pCi/g – picocuries per gram.

2.5 Hazardous Material Evaluations

In addition to the RCOPCs, each soil and sediment sample will be analyzed for lead and PCBs. The baseline data will be characterized in terms of range, distribution, and central tendency, and

will be compared to the data acquired during the FSS to confirm or rule out the need for further investigation.

To support the evaluation of lead concentrations, the soil and sediment samples will also be analyzed for aluminum, calcium, iron, magnesium, manganese, and potassium. These major elements are not analytes of concern (and thus their concentrations will not be compared to screening values) but they are important reference elements used to evaluate lead concentrations during geochemical evaluation (Myers and Thorbjornsen, 2004; Thorbjornsen and Myers, 2007a; ASTM International, 2020). Geochemical evaluation permits the identification of soil and/or sediment samples that may have been impacted and distinguishes them from samples that contain only background concentrations of lead (see Section 2.6). Similarly, environmental forensic analyses can be performed on the PCB data to identify the likely source(s) of those compounds (ASTM International, 2020; Interstate Technology & Regulatory Council, in progress).

Because of asbestos's characteristics (not soluble and low density) and its improbability of being a contaminant, the soil and sediment samples will not be analyzed for asbestos.

2.6 Geochemical Evaluation

The statistical procedures described above can erroneously declare contamination to be present. For example, metals concentrations can be elevated in soil or sediment samples as a result of naturally occurring geochemical processes (e.g., associated with fine-grained minerals). Statistical tests are blind to the geochemical mechanisms controlling element concentrations and can falsely indicate a contaminant source or increasing trend where none is present. Each statistical test that is performed has a certain probability of falsely identifying contamination. Performing such tests for multiple analytes increases the chances of such erroneous results. Accordingly, a geochemical evaluation will be performed for any element that fails the statistical comparison of baseline vs. FSS data. Geochemical evaluation is a type of forensic analysis that is based on the well-known behavior of elements in soil and sediment, including adsorption/desorption reactions on the surfaces of clay and iron oxide minerals (Myers and Thorbjornsen, 2004; Thorbjornsen and Myers, 2007a, 2007b, 2008; ASTM International, 2020). Concentration ratios are examined to determine the source(s) of the elevated concentrations and pinpoint exactly which, if any, samples are impacted by potential contamination. These ratios include selected trace elements vs. major elements and PCBs vs. total organic carbon (TOC).

In support of the geochemical evaluation, and in addition to PCBs and lead, all baseline and FSS soil/sediment samples will be analyzed for TOC and the reference elements aluminum, calcium, iron, magnesium, manganese, and potassium.

3.0 Survey Design

The baseline survey will be performed over the project footprint, support areas, and areas of runoff at the ASY facility prior to the arrival and siting of the SSSB. This will consist of GWS, beta surface scans, direct beta measurements, smears for removable beta radioactivity, and samples for volumetric analysis as applicable.

In order to ensure sufficient quality data to meet the survey objectives, the baseline survey will be designed in accordance with Chapters 4 and 5 of MARSSIM, as summarized in the following sections.

3.1 Survey Unit Classification

In accordance with Section 4.4 of MARSSIM (NUREG-1575), areas will be classified on the potential for contamination as follows using the DWP screening criteria:

- ***Class 1 Area.*** A radiologically impacted area that has a potential for radioactive contamination or known contamination in excess of the established screening criteria.
- ***Class 2 Area.*** A radiologically impacted area that has a potential for radioactive contamination that is not expected to exceed the established screening criteria.
- ***Class 3 Area.*** A radiologically impacted area that is not anticipated to contain any residual radioactivity.

The ASY site is not a radiological facility and is considered unimpacted; however, because the SSSB dismantlement is a radiological operation, the area will become potentially impacted as a result of project operations. As a result, the areas will be classified with the FSS in consideration to ensure sufficient data is collected as part of the baseline survey.

The SSSB will be placed atop mounting blocks with an impermeable barrier underneath the vessel. The majority of radiological activities will be performed within the confines of the vessel and radiological controls will be implemented to minimize any potential impact to the project site. A containment structure will also be erected to the east of the SSSB for use during sizing of sections of the vessel for disposal.

Although the potential for any residual contamination following dismantlement is anticipated to be very low, the immediate footprint for dismantlement will be surveyed as a Class 2 impacted area to be consistent with the FSS that will be performed upon completion of the D&D activities.

An additional Class 3 buffer area will be established around the immediate dismantlement footprint to encompass areas of potential run-off and support areas.

3.2 Survey Units

In order to ensure adequate survey coverage and measurement density, Section 4.6 of MARSSIM provides suggested survey unit (SU) sizes, which are summarized in Table 3-1.

Table 3-1
Suggested Survey Unit Areas

Classification	Suggested Area
Class 1	Up to 100 m^2 (structure) Up to 2,000 m^2 (open land)
Class 2	100 to 1,000 m^2 (structure) 2,000 to 10,000 m^2 (open land)
Class 3	No Limit (structure) No Limit (open land)

m^2 – square meters.

The project footprint and supporting areas will be delineated into SUs based on similar physical characteristics as follows:

- Paved areas within the security fence
- Unpaved areas within the security fence
- Stormwater sewer and catch basin and drainage ditch outfalls.

The majority of the immediate dismantlement footprint will be on paved/concrete surfaces, which for the purposes of the baseline survey, will be considered structural surfaces. Based on Table 3-1, the maximum structural SU size is approximately 1,000 m^2. Considering the preliminary SSSB D&D work area covers approximately 15,800 m^2 (~245 meters long [east-west] by ~64 meters long [north-south]), this results in about 16 Class 2 SUs.

An approximately 40-foot-wide Class 3 buffer area will be established surrounding the D&D work area. The planned storage area for packaged waste will also be considered Class 3. Although the Class 3 SU size is unlimited per Table 3-1, these buffer areas have been divided into six Class 3 SUs.

A diagram of the preliminary SUs is provided as Appendix A. The actual number and size of the SUs may be modified and will be established and documented prior to the baseline survey.

The stormwater drains, collection system and outfalls will also constitute a single Class 3 survey unit. As previously stated, the SSSB will be placed on a liner and a stormwater management system. The potential for uncontrolled discharge to the existing stormwater drains and outfalls is minimal.

3.3 Scan Coverage

Surface scan coverage will be based on the guidance in Section 5.5.3.1 of MARSSIM. A summary of the recommended scan coverages based on SU classification is provided in Table 3-2.

Table 3-2
Suggested Scan Coverage

SU Classification	Scan Coverage
Class 1	100%
Class 2	10 – 100%
Class 3	Up to 10%

Gamma walkover and beta scans will be performed at approximately 25% coverage for Class 2 impacted areas and approximately 10% for Class 3 areas in accordance with the MARSSIM guidance. Additionally, beta scans will only be performed on paved surfaces and structures such as the concrete catch basin. Beta scans will not be performed on unpaved areas.

All scans will be performed with the survey instruments coupled with a Global Positioning System (GPS) unit in order to map the scan coverage and to provide an estimate for the percent scans performed as applicable.

3.4 Number of Measurements

MARSSIM recommends a relative shift of 3 or more when designing surveys; however, this strongly depends on the scan detection sensitivities and the sample data set statistics, particularly the standard deviation. The baseline survey will be measuring background levels of radionuclides that do not naturally occur, so the standard deviation (σ) is expected to be low. As a result, a relative shift (Δ/σ) of 3 or more is anticipated and will be used as a basis. Setting the relative shift equal to 3, with Type I (false positive) and Type II (false negative) error rates of 5 percent each, the minimum number of samples, N, is estimated to be 14 (including the recommended 20 percent increase) per SU for the RCOPCs based on Table 5.5 of MARSSIM,

using the Sign test for conservatism (i.e., more required samples than the Wilcoxon Rank Sum [WRS] test).

To verify that an adequate number of samples were taken during the baseline, the data set results will be analyzed and the relative shift determined using the MARSSIM guidance as follows:

$$\frac{\Delta}{\sigma} = \frac{DCGL - LBGR}{\sigma}$$

Considering Co-60 is the primary RCOPC during the SSSB dismantlement, the applicable Co-60 guideline values (Derived Concentration Guideline Levels [DCGL]) and detection sensitivities will be used when evaluating soil samples or direct surface activity measurements. The Lower Bound of the Grey Region (LBGR) is a concentration less than the DCGL and is equivalent to the scan sensitivity. MARSSIM recommends that detection sensitivities be set at 50% of the applicable guideline values which is why for planning purposes MARSSIM recommends setting the LBGR as 50% of the DCGL. Following determination of the relative shift, Table 5-5 of MARSSIM will be consulted to ensure an adequate number of samples were collected. As necessary, additional samples will be collected.

The baseline distributions of lead and PCBs may also be confidently characterized with a total of 14 samples. Using the available concentration data for lead in eight recent stormwater drain samples (standard deviation of 0.343 milligrams per liter), 14 samples provide at least 95 percent confidence that the FSS median will be correctly declared to be no greater than the baseline survey median. In other words, there will be no more than a 5 percent probability of incorrectly concluding that the site is unimpacted when it is impacted.

3.5 Grid Spacing

To support the systematic sampling of the site, a grid will be established over each Class 2 SU and the sampling and fixed-point measurement locations will be identified using GPS. The grid spacing will be determined based on the number of samples to be taken and the SU size for a triangular grid. A random starting point will be established with a north/south grid. The grid spacing will be determined using the following formula and adjusted downward to ensure an adequate number of samples are taken.

$$L = \sqrt{\frac{A}{0.866 \cdot n}}$$

Where: A = survey area size (m^2)
n = number of sample locations

For Class 3 SUs, the sampling and measurement locations will be randomly generated.

3.6 Survey Protocols and Requirements

The survey protocols to be implemented for each SU are summarized in the following sections and in Table 3-3.

Table 3-3
Survey Design Summary

Survey Design Parameter	Paved/Structural Surface	Unpaved Areas	Stormwater Drains and Catch Basin
MARSSIM Class 2			
Beta surface scan	~25% with GPS map	NA	~25%
GWS	~25% with GPS map	~25% with map	~25%
Direct static beta	14 per survey unit	NA	14 per SU
Gross beta smears	14 per SU	NA	14 per SU
Samples	NA	14 (soil) per SU	14 (sediment) per SU
MARSSIM Class 3			
Beta surface scan	~10% with GPS map	NA	~10 %
GWS	~10% with GPS map	~10% with map	~10 %
Direct static beta	14 per SU	NA	14 per SU
Gross beta smears	14 per SU	NA	14 per SU
Samples	NA	14 (soil) per SU	14 (sediment) per SU

GWS – gamma walkover scan.
NA – not applicable.

3.6.1 Paved Work/Support Areas

Prior to commencing the baseline survey, each SU will be prepared by removing any equipment and materials as applicable and sweeping the pavement to remove any stones and materials that may damage instrument detectors. Any sweepings will be collected and disposed as general debris. GWS and beta surface scans will be performed coupled with a GPS unit for mapping purposes and reproducibility in accordance with Table 3-3 and the SU classification. Following surface scans, 14 direct beta measurements will be collected on a triangular grid with grid spacing as determined in Section 3.5 for Class 2 SUs and at random locations for Class 3 areas.

At each direct measurement location, smears for gross beta will be collected for analysis. Additional biased measurements may be taken based on any elevated scan results, as applicable.

3.6.2 Unpaved Work/Support Areas

Prior to commencing the baseline survey, each SU will be prepared by removing any equipment and materials as applicable. GWS will be performed coupled with a GPS unit for mapping purposes and reproducibility in accordance with Table 3-3 and the SU classification. No beta surface scans will be performed over unpaved areas. Following the GWS, 14 surface soil samples will be collected for gross alpha/beta, gross low-energy beta, and isotopic analysis for the RCOPCs. Samples will be collected on a triangular grid with grid spacing as determined per Section 3.5 for Class 2 SUs and at random locations for Class 3 areas. Additional biased sampling may be performed based on any elevated GWS results as applicable.

3.6.3 Stormwater Drains and Catch Basin

The stormwater drains within the security fence and immediately surrounding area, including the grate-covered catch basin to the east as shown in Appendix B, will constitute one Class 3 SU. As noted during the preliminary site walk, the stormwater drainage from the planned work area does not drain toward the slip. It is controlled by a series of storm drains constituting two drain fields. One storm drain field discharges to a grate-covered concrete collection basin or channel which then discharges to a drainage ditch located southeast of the site. The second storm drain system discharges directly to an outfall located further down the drainage ditch to the south of the project site (see Appendix B). Depending on the extent of the project site, the outfall located south of project site may not be impacted.

A gamma scan of the stormwater drains and collection basin will be performed. An approximately 10% beta surface scan will be performed within the accessible portions of the stormwater drains and collection basin. Following the surface scans, 14 direct beta measurements will be collected within the stormwater drains and collection basin on a random basis. At each direct measurement location, smears for gross beta will be collected for analysis. Additional biased measurements will be taken based on any elevated scan results, as applicable.

Finally, a total of 14 sediment samples will be collected from within the stormwater drains, collection basin, and outfalls on a random basis for gross beta, gross low-energy beta, and isotopic analysis for the RCOPCs.

3.7 Survey Records

Records of all surveys performed will be compiled into a survey package. The survey package will be used to track the completeness of the baseline survey to ensure all surveys and measurements are completed. The survey package will include the following records:

- Survey Package Worksheet providing the package identification, survey location information, general survey instructions, and any specific survey instructions
- Survey results
- SU diagram of the area to be surveyed as available
- Photographs of the survey area, as necessary, to show special or unique conditions
- Printout of laboratory analysis results (if performed)
- Maps of walkover beta and gamma scans with sampling locations.

4.0 Radiological Survey Instrumentation

Proper selection and use of radiological survey instrumentation will ensure sensitivities are sufficient to detect the RCOPCs at the minimum detection sensitivities required. In general, detection sensitivities will be established at approximately 50% the guideline values as applicable.

The Ludlum Model 2350-1 Data Logger or Model 2221 (or equivalent) will be used with a variety of detectors for direct static measurements for total beta surface activity as well as for gamma walkover surveys. Beta scan surveys will be performed using large-area gas-flow proportional detectors (584 or 821 cm^2) or 126 cm^2 gas-flow proportional detectors for hard-to-access locations, if required. Analysis for removable radioactivity will be performed using a Ludlum Model 2929 or Ludlum Model 3030 scalar counter or an automated smear counter.

Soil and material samples will be analyzed using liquid scintillation and high-purity germanium gamma spectroscopy counting systems by an off-site laboratory. Table 4-1 lists the survey instruments, types of radiation detected, and approximate detection sensitivities that may be utilized on site.

Table 4-1
Survey Instrumentation

Instrument/ Detector	Detector Type	Radiation Detected	Detection Sensitivity	Use
Ludlum Model 2350/2221 with 43-68	Gas-flow proportional (126 cm^2)	Beta	~600 dpm/100 cm^2 (fixed) ~1,900 dpm/100 cm^2 (scan)	Direct static measurements and surface scans
Ludlum Model 2350/2221 with 43-37 or 43-37-1	Gas-flow proportional (584 or 821 cm^2)	Beta	~1,100 dpm/100 cm^2 (scan)	Surface scans only
Ludlum Model 2929 or 3030	Phoswich	Beta	~85 dpm/100 cm^2	Smear counting
Ludlum Model 2350/2221 with 44-10	2x2 NaI(Tl)	Gamma	~3 pCi/g	Gamma walkover scans

2x2 NaI(Tl) – 2-inch by 2-inch thallium-activated sodium iodide.

4.1 Instrument Calibration

Instruments will be calibrated annually at an off-site facility in accordance with American National Standards Institute (ANSI) Standard N323A-1997, *American National Standard, Radiation Protection Instrumentation, Test and Calibration, Portable Survey Instruments* and APTIM procedure APTIM-SSSB-012, *Instrument Calibration and Maintenance*. Calibration labels showing the instrument identification number, calibration date, and calibration due date will be attached to all portable field instruments.

4.2 Sources

All sources used for calibration or efficiency determinations will be representative of the instrument's response to the identified radionuclides and will be National Institute of Standards and Technology (NIST) traceable. Field check sources may or may not be NIST traceable.

Technetium-99 will be used for calibration and field source checks of portable field instruments for beta activity, which is representative of the most limiting RCOPC (i.e., Co-60). A Cesium-137 source will be used for gamma field instruments.

The Project Radiation Safety Officer (PRSO) will control the radioactive sources used for instrument response checks and efficiency determination. Sources will be stored securely and signed out when needed in the field. A source sign-out log will track the location of all sources when they are removed from storage.

4.3 Minimum Detectable Activity – Fixed-Point Measurements

The MDA is dependent upon the counting time, geometry, sample size, detector efficiency, and background count rate. All fixed-point measurement MDAs will be calculated and documented as part of the baseline survey. *A priori* MDAs (i.e., detection sensitives) are presented in Table 4-1. As a DQO, the MDAs will be set to approximately equal to or less than 50 percent of the applicable screening value as attainable. For beta surveys, Co-60 is the beta-emitting radionuclide of interest. The equation used for calculating the MDA for portable field instrumentation is:

$$MDA = \frac{3 + 3.29 * \sqrt{R_b t_s \left(1 + \frac{t_s}{t_b}\right)}}{\varepsilon_i * \varepsilon_s * \frac{Area}{100} * t_s}$$

Where: R_b = background count rate (counts per minute)

t_s = sample counting time (minutes)

t_b = background counting time (minutes)

ε_i = intrinsic (2 pi) instrument counting efficiency

ε_s = surface efficiency (0.25 for beta emitters with maximum beta energy <0.4 mega-electron-volts. Smear counting MDA is based on 4 pi efficiency with no surface efficiency correction)

Area = area of measurement (cm^2).

Detection limits for the RCOPCs in soil are set at approximately 10 percent of the screening values for surface soil as applicable and attainable by the off-site laboratory's capabilities.

4.4 Scan Sensitivity

As part of MARSSIM, it is necessary to determine the scan sensitivity for instrumentation utilized during field scan surveys. The scan minimum detectable concentrations (MDC) will be calculated and documented as part of the baseline survey. Scan speeds will be established to the maximum extent practical to detect contamination at or below the screening limits in Section 2.4 with a goal of 50% of the screening limits as attainable. *A priori* scan MDCs (i.e., detection sensitivities) are presented in Table 4-1.

In order to determine the scan sensitivity, it is first necessary to determine the net minimum detectable count rate (MDCR) that a surveyor can distinguish from the background detector response. This is determined using the guidance of MARSSIM with the following equations:

$$s_i = d' \sqrt{b_i}$$

$$MDCR = s_i \text{ x } (60/i)$$

Where: s_i = minimum detectable source counts per counting interval

b_i = background counts per counting interval (minutes)

d' = detectability value (Table 6.5 of MARSSIM)

i = observation/counting interval (seconds).

For the purposes of these surveys, the detectability values will be set at 1.38 as recommended in MARSSIM for the first scanning stage for a true-positive proportion of 95 percent and a false-positive proportion of 60 percent. The counting interval is considered to be the amount of time

for the detector to pass completely over the field of view or the area of concern such as a defined hot spot with a specified width.

The scan MDC is then calculated using Equation 6-10 of MARSSIM as specified below:

$$Scan\,MDC = \frac{MDCR}{\sqrt{p} * \varepsilon_i \cdot \varepsilon_s \frac{probe\,area}{100\,cm^2}}$$

Where: p = surveyor efficiency (50 percent recommended by MARSSIM)

ε_i = 2 pi instrument efficiency

ε_s = surface efficiency.

The scan sensitivity for gamma-emitting radionuclides in surface soils will be determined following the guidance in Chapter 6 of NUREG-1507 (NRC, 2020). The *a priori* scan MDC for Co-60 in surface soil using a Ludlum Model 44-10 2x2 NaI(Tl) detector, with a scan speed of approximately 0.5 meters per second and a background level of 8 microroentgens per hour, is estimated to be approximately 3 pCi/g as listed in Table 4-1. The scan MDC will be updated and revised based on field conditions and the instrumentation used.

5.0 Quality Assurance and Quality Control

APTIM quality assurance/QC programs will ensure that all quality and regulatory requirements are satisfied. All activities affecting quality will be controlled by established APTIM procedures and the SSSB Project Quality Plan (APTIM, 2021c) as summarized in the following sections.

5.1 General Provisions

5.1.1 Selection of Personnel

Project management and lead survey personnel are required to have experience with the project procedures and be familiar with the requirements of NUREG-1575 (MARSSIM) and this Baseline Survey Plan. Management must have prior experience with the radionuclide(s) of concern and a working knowledge of the instruments used to detect the radionuclides on site.

APTIM will select lead survey personnel to direct the survey based upon their experience and familiarity with the survey procedures and processes. Likewise, health physics personnel who will perform the surveys will be selected based upon their qualifications and experience, especially with MARSSIM.

5.1.2 Instrumentation Selection, Calibration, and Operation

Instruments will be selected that are proven to reliably detect the radionuclides present. Instruments will be calibrated by a qualified vendor under approved procedures using calibration sources traceable to NIST.

All instruments and detectors will be inspected and source checked daily when in use to verify proper operation. Control charts and/or source check criteria will be established at the beginning of the project for reference in accordance with project procedures.

Procedures for calibration, maintenance, accountability, operation, and QC of radiation detection instruments implement the guidelines established in ANSI standards ANSI N323-1997 and ANSI N42.17A-2003, *American National Standard Performance Specifications for Health Physics Instrumentation-Portable Instrumentation for Use in Normal Environmental Conditions*.

Calibration, maintenance, and daily testing of radiological instrumentation are summarized in the SSSB Project Quality Plan and Radiation Protection Plan. Specific controls are provided in project procedures, including APTIM-SSSB-012, *Instrument Calibration and Maintenance,*

APTIM-SSSB-013, *General Operation of Portable Radiation Survey Instruments*, and APTIM-SSSB-014, *QA/QC of Radiation Survey Instruments*.

5.1.3 Surveys and Sampling

All surveys and samples will be performed and collected in accordance with project procedures APTIM-SSSB-009, *Performance of Radiological Surveys* and APTIM-SSSB-011, *Sample Collection* and the SSSB project Sampling and Analysis Plan (SAP) (APTIM, 2021d). These documents include the methods for collection of samples and the performance of surveys, including the QC of field instruments.

5.1.4 Field Quality Control Requirements

QC samples will be collected at a frequency of 5% or 1 sample for every 20 samples collected and may include either field duplicates or field splits.

5.1.5 Analytical Methods, MDAs, and Limit of Detection/Limit of Quantitation Requirements

The analytical methods for samples collected during the SSSB project are specified in the SAP. MDAs and limits of detection/limits of quantitation for all samples collected during this project will be set at 50% of any applicable guideline value.

5.1.6 Analytical SOPs, Calibration, and Maintenance Requirements

Analytical standard operating procedures (SOP), instrument calibrations, and instrument maintenance and testing for the field instruments to be used during the SSSB project are provided in the Radiation Protection Plan as summarized in Section 5.1.2. The offsite laboratories that will analyze SSSB project samples have established analytical SOPs as well as procedures for the calibration and maintenance of the analytical equipment they use as discussed in the SAP.

5.1.7 Survey Documentation

Records of surveys will be documented and maintained in accordance with APTIM procedure APTIM-SSSB-009, *Performance of Radiological Surveys*. Each survey measurement will be identified by the date, technician, instrument type and serial number, detector type and serial number, location code, type of measurement, mode of instrument operation, and QC sample number, as applicable.

5.1.8 Records Management

Generation, handling, and storage of survey data will be controlled in accordance with the Project Quality Plan.

5.1.9 Duplicate Review of Survey Results

The survey data will be reviewed by two separate people to verify all documentation is complete and accurate. This will include the surveyor (e.g., Radiological Control Technician) and an independent reviewer such as the PRSO, Certified Health Physicist (CHP), or designee.

5.2 Training

All project personnel will receive site-specific training to identify the specific hazards present in the work and survey areas as per the SSSB project Accident Prevention Plan (APP) (APTIM, 2021e). Training will also include a briefing and review of this plan and all other project work plans, procedures, and job hazard analyses.

During site orientation and training, survey personnel will become familiar with site emergency procedures specified in the APP and will follow these procedures in the event of an emergency.

6.0 Survey Documentation

Upon survey completion, survey documentation will be prepared for submittal to a CHP for review as discussed in this chapter.

6.1 Survey Documentation

Records of surveys will be documented and managed in accordance with project procedures. Survey measurements will be identified by the date, technician, instrument type and serial number, detector type and serial number, location code, type of measurement, mode of instrument operation, and QC sample number, as applicable.

The field data collected will be managed using standard forms and bound field notebooks. The data will be summarized in a manner that provides efficiency in data reduction, tabulation, and evaluation. All measurements taken during this project will be identified by source, type, and sample location to avoid ambiguity. Field records will include the following minimum information:

- A chronological listing of survey and sampling activities
- Site name, surveyor name, signature, and date on each page
- Site conditions, notes or sketches of sampling locations, and sample descriptions
- Sample times
- Record of all measurements (e.g., field screening parameters).
- Photographic log (if taken).

6.2 Data Analysis and Evaluation

All sample and survey results will receive an independent review to ensure the results are accurate and complete. The survey data will be used as a baseline for comparison to the FSS data on completion of the D&D activities. Each baseline data set will be statistically evaluated for the data distribution (including range, mean, median, and standard deviation) and visualized using box plots, histograms. or other appropriate techniques to enable statistical comparison of the baseline and FSS data sets (e.g., Sign test or WRS test).

6.3 Independent Review of Survey Results

Each survey package and survey data will receive a peer review to verify all documentation is complete and accurate prior to turnover to the APTIM CHP for inclusion in the Baseline Survey Report.

7.0 References

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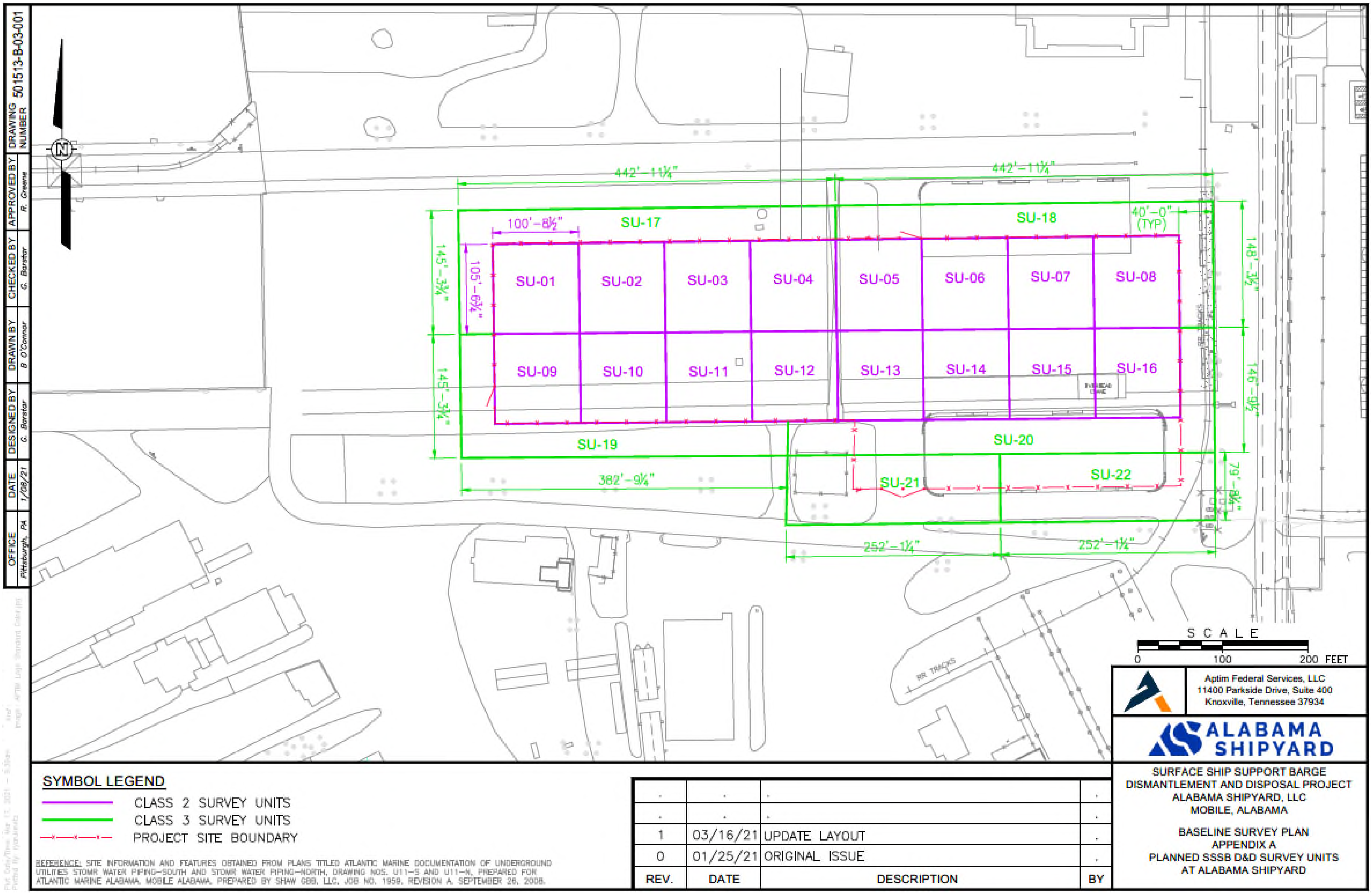
APPENDIX A

PRELIMINARY SURVEY UNITS AND CLASSIFICATION


SU-01
SU-02
SU-03
SU-04
SU-05
SU-06
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SU-11
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SU-16
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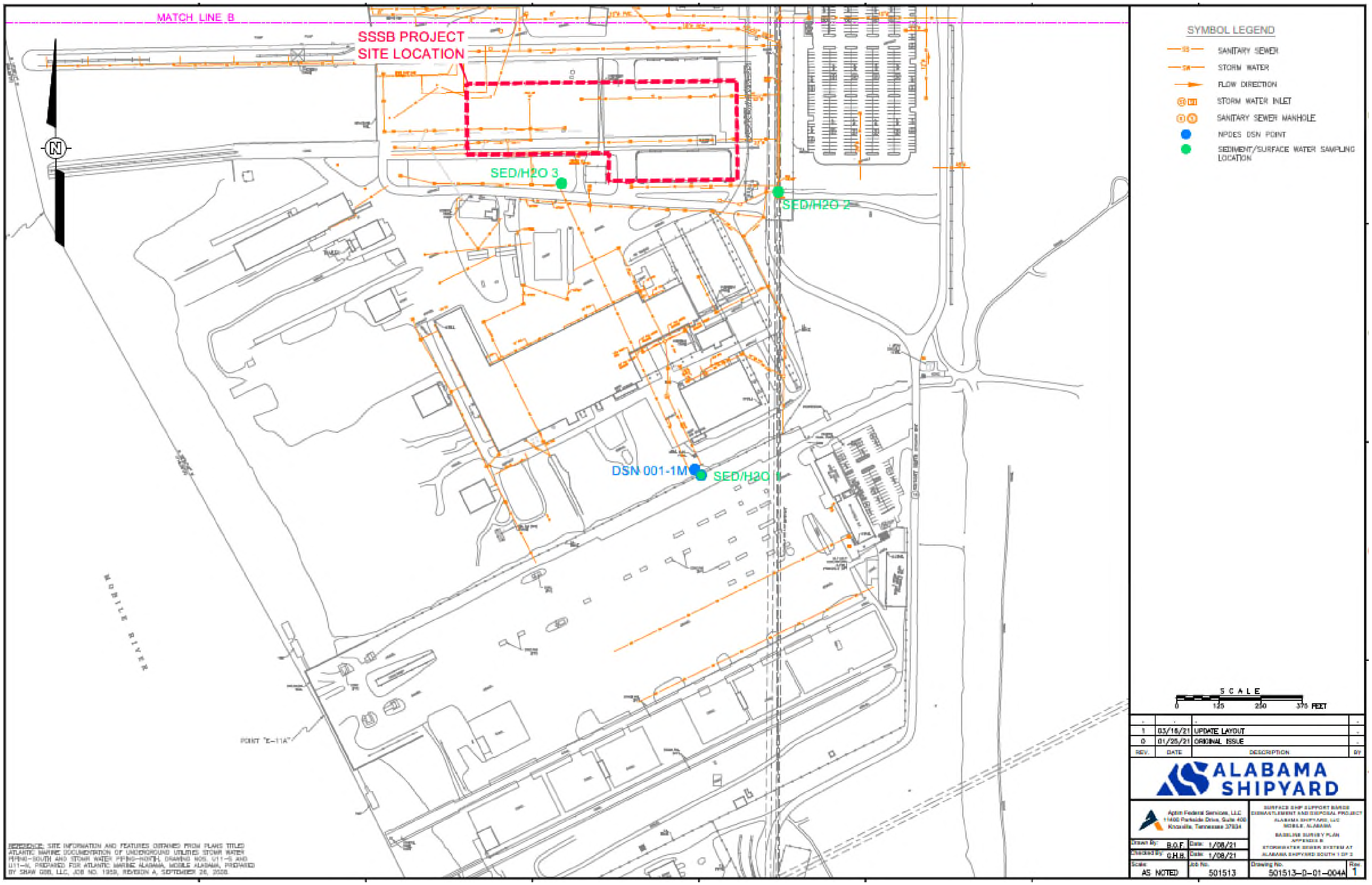
SU-18
SU-19
SU-20
SU-21
SU-22
442'–11¼"
442'–11¼"
100'–8½"
40'–0" (TYP)
145'–3¾"
105'–6¾"
145'–3¾"
148'–3½"
146'–9½"
79'–8¾"
382'–9¼"
252'–1¼"
252'–1¼"
SCALE
0 100 200 FEET
DRAWING NUMBER 501513-B-03-001
APPROVED BY R. Greene
CHECKED BY G. Barstar
DRAWN BY B. O'Connor
DESIGNED BY G. Barstar
DATE 1/08/21
OFFICE Pittsburgh, PA
SYMBOL LEGEND
CLASS 2 SURVEY UNITS
CLASS 3 SURVEY UNITS
PROJECT SITE BOUNDARY
REFERENCE: SITE INFORMATION AND FEATURES OBTAINED FROM PLANS TITLED ATLANTIC MARINE DOCUMENTATION OF UNDERGROUND UTILITIES STORM WATER PIPING–SOUTH AND STORM WATER PIPING–NORTH, DRAWING NOS. U11–S AND U11–N, PREPARED FOR ATLANTIC MARINE ALABAMA, MOBILE ALABAMA. PREPARED BY SHAW GBB, LLC, JOB NO. 1959, REVISION A, SEPTEMBER 26, 2008.
1 03/16/21 UPDATE LAYOUT
0 01/25/21 ORIGINAL ISSUE
REV. DATE DESCRIPTION BY
Aptim Federal Services, LLC
11400 Parkside Drive, Suite 400
Knoxville, Tennessee 37934
ALABAMA SHIPYARD
SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL PROJECT
ALABAMA SHIPYARD, LLC
MOBILE, ALABAMA
BASELINE SURVEY PLAN
APPENDIX A
PLANNED SSSB D&D SURVEY UNITS
AT ALABAMA SHIPYARD

APPENDIX B

ASY STORMWATER DRAINS


MATCH LINE B
SSSB PROJECT
SITE LOCATION
SED/H2O 3
SED/H2O 2
DSN 001-1M
SED/H2O 1
MOBILE RIVER
POINT "E-11A"
SYMBOL LEGEND
SANITARY SEWER
STORM WATER
FLOW DIRECTION
STORM WATER INLET
SANITARY SEWER MANHOLE
NPDES DSN POINT
SEDIMENT/SURFACE WATER SAMPLING LOCATION
SCALE
0 125 250 375 FEET
1 03/16/21 UPDATE LAYOUT
0 01/25/21 ORIGINAL ISSUE
REV. DATE DESCRIPTION BY
ALABAMA SHIPYARD
Drawn By: B.O.F. Date: 1/08/21
Checked By: G.H.B. Date: 1/08/21
Scale: AS NOTED
Job No. 501513
Drawing No. 501513-D-01-004A
Rev. 1
REFERENCE: SITE INFORMATION AND FEATURES OBTAINED FROM PLANS TITLED ATLANTIC MARINE DOCUMENTATION OF UNDERGROUND UTILITIES STORM WATER PIPING-SOUTH AND STORM WATER PIPING-NORTH, DRAWING NOS. U11-S AND U11-N, PREPARED FOR ATLANTIC MARINE ALABAMA, MOBILE ALABAMA, PREPARED BY SHAW GBB, LLC, JOB NO. 1959, REVISION A, SEPTEMBER 26, 2008.

ATTACHMENT 5

CONTRACT DATA REQUIREMENTS LIST

SURFACE SHIP SUPPORT BARGE (SSSB) DISMANTLEMENT AND DISPOSAL
TABLE OF CONTENTS
CONTRACT/PR NO: N00024-18-R-4339 **DD MMM YYYY**

CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.: ITEMS 0001, 0002 AND 0003

B. EXHIBIT: A

C. CATEGORY: TDP ____ TM ___ OTHER X

D. SYSTEM/ITEM: SSSB DISMANTLEMENT AND DISPOSAL

E. CONTRACT/PR NO.: N00024-18-R-4339

F. CONTRACTOR: TBD

1. DATA ITEM NO: A001

2. TITLE OF DATA ITEM: PROJECT PLANNING CHART

3. SUBTITLE: SCHEDULE

4. AUTHORITY (Data Acquisition Doc. No): DI-MGMT-80507C (SEE BLK 16)

5. CONTRACT REFERENCE: SECTION C PARA 5.1.4

6. REQUIRING OFFICE: PMS312

7. DD 250 REQ: N/A

8. APP CODE: A (SEE BLK 16)

9. DIST STATEMENT REQUIRED: B (SEE BLK 16)

10. FREQUENCY: ASREQ

11. AS OF DATE: SEE BLK 16

12. DATE OF FIRST SUBMISSION: SEE BLK 16

13. DATE OF SUBSEQUENT SUBMISSION: SEE BLK 16

14. DISTRIBUTION: SEE BLK 16

16. REMARKS

BLK 4: 3.17, 3.18 AND 3.19 DO NOT APPLY.
BLK 8: GOVERNMENT WILL REVIEW AND PROVIDE COMMENTS AS APPLICABLE.
BLK 9: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES (CRITICAL TECHNOLOGY) (DATE). OTHER REQUEST FOR THIS DOCUMENT SHALL BE REFERRED TO PEO CARRIERS, PMS 312.
BLK 11, 12 AND 13: AS MUTUALLY AGREED TO BETWEEN THE GOVERNMENT AND THE CONTACTOR.
BLK 14: EMAIL ELECTRONIC REPORT TO DISTRIBUTION CODES.

ADDRESSEES	Draft	Final Reg	Final Repro
A.1		1	
A.2		1	
A.3		1	
A.4		1	
A.5		1	
A.6		1	
B.1		1	
15. TOTAL		7	

17. PRICE GROUP

18. ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE

CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	ITEM 0003
B. EXHIBIT	A
C. CATEGORY	TDP ____ TM ____ OTHER _X_
D. SYSTEM/ITEM	SSSB DISMANTLEMENT AND DISPOSAL
E. CONTRACT/PR NO.	N00024-18-R-4339
F. CONTRACTOR	TBD
1. DATA ITEM NO	A002
2. TITLE OF DATA ITEM	WORK COMPLETION CERTIFICATION CERTIFICATE
3. SUBTITLE	CERTIFICATION OF WORK COMPLETION
4. AUTHORITY (Data Acquisition Doc. No)	DI-MGMT-82061 (SEE BLK 16)
5. CONTRACT REFERENCE	SECTION C PARA 4.3.1.3 AND 4.3.1.5
6. REQUIRING OFFICE	PMS312
7. DD 250 REQ	N/A
8. APP CODE	A (SEE BLK 16)
9. DIST STATEMENT REQUIRED	B (SEE BLK 16)
10. FREQUENCY	ASREQ (SEE BLK 16)
11. AS OF DATE	NA
12. DATE OF FIRST SUBMISSION	SEE BLK 16
13. DATE OF SUBSEQUENT SUBMISSION	SEE BLK 16
14. DISTRIBUTION	SEE BLK 16

14. DISTRIBUTION

ADDRESSEES	Draft	Final Reg	Final Repro
A.1		1	
A.2		1	
A.3		1	
A.4		1	
A.5		1	
A.6		1	
B.1		1	
15. TOTAL		7	

16. REMARKS

BLK 4: CERTIFICATION OF HULL AND MATERIAL/EQUIPMENT HAS BEEN COMPLETELY DISMANTLED. CERTIFICATION OF ALL HAZARDOUS AND REGULATED MATERIAL/WASTE REMOVAL AND DISPOSAL HAS BEEN ACCOMPLISHED. CONTRACTOR FORMAT IS AUTHORIZED.
BLK 8: APPROVAL FOR TECHNICAL CONTENT AND ADEQUACY.
BLK 9: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES (CRITICAL TECHNOLOGY) (DATE). OTHER REQUEST FOR THIS DOCUMENT SHALL BE REFERRED TO PEO CARRIERS, PMS 312.
BLK 10, 12 AND 13: AS MUTUALLY AGREED TO BY THE GOVERNMENT AND CONTRACTOR.
BLK 14: EMAIL ELECTRONIC REPORT TO DISTRIBUTION CODES.

17. PRICE GROUP	18. ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE

CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO. ITEM 0003	B. EXHIBIT A	C. CATEGORY TDP ____ TM ____ OTHER X
D. SYSTEM/ITEM SSSB DISMANTLEMENT AND DISPOSAL	E. CONTRACT/PR NO. N00024-18-R-4339	F. CONTRACTOR TBD

1. DATA ITEM NO A003	2. TITLE OF DATA ITEM CERTIFICATION/DATA REPORT	3. SUBTITLE REGULATORY AGENCY CORRESPONDENCE
4. AUTHORITY (Data Acquisition Doc. No) DI-MISC-80678 (SEE BLK 16)	5. CONTRACT REFERENCE SECTION C PARA 4.3.1.6	6. REQUIRING OFFICE PMS312

7. DD 250 REQ N/A	9. DIST STATEMENT REQUIRED B (SEE BLK 16)	10. FREQUENCY ASREQ	12. DATE OF FIRST SUBMISSION SEE BLK 16	14. DISTRIBUTION SEE BLK 16
8. APP CODE NA		11. AS OF DATE NA	13. DATE OF SUBSEQUENT SUBMISSION SEE BLK 16	

16. REMARKS

BLK 4: PARA 10.2.1, 10.2.2, 10.2.3, 10.2.4, 10.3, 10.3.1 AND 10.3.2 DO NOT APPLY.
PARA 10.4 SPECIFIC MATERIAL IS AS FOLLOWS: COPIES OF ALL CORRESPONDENCE WITH FEDERAL, STATE OR LOCAL REGULATORY AGENCIES INLCUDING LICENSE AND PERMITS, NOTIFICATION OF ANY REGULATORY AGENCY INSPECTION CONDUCTED AND SUMMARIZATION OF THE RESULTS, AND NOTICE OF VIOLATIONS, CITATIONS OR CAUTIONARY NOTICES RECEIVED FROM REGULATORS. COPIES SHALL BE PROVIDED AS ENCLOSURES.
BLK 9: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES (CRITICAL TECHNOLOGY) (DATE). OTHER REQUEST FOR THIS DOCUMENT SHALL BE REFERRED TO PEO CARRIERS, PMS 312.
BLK 12 AND 13: AS MUTUALLY AGREED TO BETWEEN THE GOVERNMENT AND THE CONTRACTOR.
BLK 14: EMAIL ELECTRONIC REPORT TO DISTRIBUTION CODES.

ADDRESSEES	Draft	Final Reg	Final Repro
A.1		1	
A.2		1	
A.3		1	
A.4		1	
A.5		1	
A.6		1	
B.1		1	
15. TOTAL		7	

17. PRICE GROUP	18. ESTIMATED TOTAL PRICE

G. PREPARED BY	**H. DATE**	**I. APPROVED BY**	**J. DATE**

CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved
OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Services Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **Please do not return your form to the above organization. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.**

A. CONTRACT LINE ITEM NO. ITEMS 0002 AND 0003	B. EXHIBIT A	C. CATEGORY TDP ____ TM ____ OTHER _X_
D. SYSTEM/ITEM SSSB DISMANTLEMENT AND DISPOSAL	E. CONTRACT/PR NO. N00024-18-R-4339	F. CONTRACTOR TBD
1. DATA ITEM NO A004	2. TITLE OF DATA ITEM ACCIDENT/INCIDENT REPORT	3. SUBTITLE ACCIDENT, INCIDENT, AND INJURY REPORT
4. AUTHORITY (Data Acquisition Doc. No) DI-SAFT-81563	5. CONTRACT REFERENCE SECTION C 4.1.6.2.	6. REQUIRING OFFICE PMS312

7. DD 250 REQ N/A	9. DIST STATEMENT REQUIRED B (SEE BLK 16)	10. FREQUENCY ASREQ (SEE BLK 16)	12. DATE OF FIRST SUBMISSION SEE BLK 16	14. DISTRIBUTION SEE BLK 16
8. APP CODE NA		11. AS OF DATE NA	13. DATE OF SUBSEQUENT SUBMISSION SEE BLK 16	

16. REMARKS

BLK 9: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES (CRITICAL TECHNOLOGY) (DATE). OTHER REQUEST FOR THIS DOCUMENT SHALL BE REFERRED TO PEO CARRIERS, PMS 312.
BLK 10, 12 AND 13: REQUIRED WITHIN ONE (1) DAY OF A CONDITION TRIGGERING THE REPORT. CONTRACTOR SHALL RECORD AND IMMEDIATELY, WITHIN ONE (1) DAY, REPORT TO THE OSR AND CONTRACTING OFFICER ALL AVAILABLE FACTS RELATING TO INJURY TO EITHER CONTRACTOR OR GOVERNMENT PERSONNEL OR EACH INSTANCE OF DAMAGE TO GOVERNMENT PROPERTY.
BLK 14: EMAIL ELECTRONIC REPORT TO DISTRIBUTION CODES.

ADDRESSEES	Draft	Final Reg	Final Repro
A.1		1	
A.2		1	
A.3		1	
A.4		1	
A.5		1	
A.6		1	
B.1		1	
15. TOTAL		7	

17. PRICE GROUP	18. ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE

SURFACE SHIP SUPPORT BARGE (SSSB) DISMANTLEMENT AND DISPOSAL
CONTRACT DATA REQUIREMENTS LIST (CDRL) EXHIBIT A
CONTRACT/PR NO: N00024-18-R-4339 **DD MMM YYYY**

CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved
OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Services Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **Please do not return your form to the above organization. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.**

A. CONTRACT LINE ITEM NO. ITEMS 0001, 0002 AND 0003	B. EXHIBIT A	C. CATEGORY TDP ____ TM ____ OTHER _X_
D. SYSTEM/ITEM SSSB DISMANTLEMENT AND DISPOSAL	E. CONTRACT/PR NO. N00024-18-R-4339	F. CONTRACTOR TBD
1. DATA ITEM NO A005	2. TITLE OF DATA ITEM CONTRACTOR'S PROGRESS, STATUS AND MANAGEMENT REPORT	3. SUBTITLE PROGRESS/STATUS REPORT
4. AUTHORITY (Data Acquisition Doc. No) DI-MGMT-80227	5. CONTRACT REFERENCE SECTION C PARA 4.3.1.4 AND 5.1.2	6. REQUIRING OFFICE PMS312

7. DD 250 REQ N/A	9. DIST STATEMENT REQUIRED B (SEE BLK 16)	10. FREQUENCY MONTLY	12. DATE OF FIRST SUBMISSION SEE BLK 16	14. DISTRIBUTION SEE BLK 16
8. APP CODE NA		11. AS OF DATE NA	13. DATE OF SUBSEQUENT SUBMISSION SEE BLK 16	

16. REMARKS

BLK 9: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES (CRITICAL TECHNOLOGY) (DATE). OTHER REQUEST FOR THIS DOCUMENT SHALL BE REFERRED TO PEO CARRIERS, PMS 312.
BLK 12: 30 DAYS AFTER CONTRACT AWARD.
BLK 13: 10TH DAY OF EACH MONTH.
BLK 14: EMAIL ELECTRONIC REPORT TO DISTRIBUTION CODES.

ADDRESSEES	Draft	Final Reg	Final Repro
A.1		1	
A.2		1	
A.3		1	
A.4		1	
A.5		1	
A.6		1	
B.1		1	
15. TOTAL		7	

17. PRICE GROUP

18. ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE

CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved
OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Services Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **Please do not return your form to the above organization. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.**

A. CONTRACT LINE ITEM NO. ITEMS 0001, 0002 AND 0003	B. EXHIBIT A	C. CATEGORY TDP ____ TM ____ OTHER X
D. SYSTEM/ITEM SSSB DISMANTLEMENT AND DISPOSAL	E. CONTRACT/PR NO. N00024-18-R-4339	F. CONTRACTOR TBD
1. DATA ITEM NO A006	2. TITLE OF DATA ITEM CONDITION FOUND REPORT	3. SUBTITLE NOTIFICATION OF ITEMS FOUND ON BOARD
4. AUTHORITY (Data Acquisition Doc. No) DI- MGMT-81648 (SEE BLK 16)	5. CONTRACT REFERENCE- SECTION C PARA 5.1.3	6. REQUIRING OFFICE PMS312

7. DD 250 REQ N/A	9. DIST STATEMENT REQUIRED B (SEE BLK 16)	10. FREQUENCY ASREQ	12. DATE OF FIRST SUBMISSION SEE BLK 16
8. APP CODE NA		11. AS OF DATE NA	13. DATE OF SUBSEQUENT SUBMISSION SEE BLK 16

14. DISTRIBUTION
SEE BLK 16

ADDRESSEES	Draft	Final Reg	Final Repro
A.1		1	
A.2		1	
A.3		1	
A.4		1	
A.5		1	
A.6		1	
B.1		1	
15. TOTAL		7	

16. REMARKS

BLK 4: PARAS 2 AND 3 ONLY APPLY.
BLK 9: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES (CRITICAL TECHNOLOGY) (DATE). OTHER REQUEST FOR THIS DOCUMENT SHALL BE REFERRED TO PEO CARRIERS, PMS 312.
BLK 12 AND 13: NOTIFY THE CONTRACTING OFFICER IMMEDIATELY UPON IDENTIFICATION OF ITEMS OR AS MUTUALLY AGREED TO BETWEEN THE GOVERNMENT AND THE CONTACTOR.
BLK 14: EMAIL ELECTRONIC REPORT TO DISTRIBUTION CODES.

17. PRICE GROUP	18. ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE

CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved
OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 110 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Executive Services Directorate (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **Please do not return your form to the above organization. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.**

A. CONTRACT LINE ITEM NO. ITEMS 0001 AND 0002	B. EXHIBIT A	C. CATEGORY TDP ____ TM ___ OTHER X
D. SYSTEM/ITEM SSSB DISMANTLEMENT AND DISPOSAL	E. CONTRACT/PR NO. N00024-18-R-4339	F. CONTRACTOR TBD
1. DATA ITEM NO A007	2. TITLE OF DATA ITEM STATUS REPORT	3. SUBTITLE DECOMMISIONING WORK PLAN AND TOW PLAN SUBMISSION REPORT
4. AUTHORITY (Data Acquisition Doc. No) DI-MGMT-80368A	5. CONTRACT REFERENCE SECTION C PARA 4.1.1.2, AND 4.2.1.1	6. REQUIRING OFFICE PMS312

7. DD 250 REQ N/A	9. DIST STATEMENT REQUIRED B (SEE BLK 16)	10. FREQUENCY ASREQ	12. DATE OF FIRST SUBMISSION SEE BLK 16	14. DISTRIBUTION SEE BLK 16
8. APP CODE NA		11. AS OF DATE NA	13. DATE OF SUBSEQUENT SUBMISSION SEE BLK 16	

16. REMARKS

BLK 9: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES (CRITICAL TECHNOLOGY) (DATE). OTHER REQUEST FOR THIS DOCUMENT SHALL BE REFERRED TO PEO CARRIERS, PMS 312.
BLK 12: SUBMIT NLT 5 CALENDAR DAYS AFTER DECOMMIONSIONING WORK PLAN SUBMITTAL TO NUCLEAR REGULATORY COMMISSION (NRC).
SUBMIT NLT 5 CALENDAR DAYS AFTER TOW PLAN SUBMITTAL TO NAVSEA 00C.
BLK 13: AS MUTUALLY AGREED TO BETWEEN THE GOVERNMENT AND CONTRACTOR.
BLK 14: EMAIL ELECTRONIC REPORT TO DISTRIBUTION CODES.

ADDRESSEES	Draft	Final Reg	Final Repro
A.1		1	
A.2		1	
A.3		1	
A.4		1	
A.5		1	
A.6		1	
B.1		1	
15. TOTAL		7	

17. PRICE GROUP	18. ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE

CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.	B. EXHIBIT	C. CATEGORY
ITEMS 0001, 0002 AND 0003	A	TDP ____ TM ____ OTHER X

D. SYSTEM/ITEM	E. CONTRACT/PR NO.	F. CONTRACTOR
SSSB DISMANTLEMENT AND DISPOSAL	N00024-18-R-4339	TBD

1. DATA ITEM NO	2. TITLE OF DATA ITEM	3. SUBTITLE
A008	CONTRACT SUMMARY REPORT	FINAL PROJECT REPORT

4. AUTHORITY (Data Acquisition Doc. No)	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
DI-ADMIN-80447A	SECTION C PARA 4.3.2.2	PMS312

7. DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION	14. DISTRIBUTION
N/A	B (SEE BLK 16)	OTIME	SEE BLK 16	SEE BLK 16
8. APP CODE		11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION	
NA		NA	NA	

16. REMARKS

BLK 9: DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES (CRITICAL TECHNOLOGY) (DATE). OTHER REQUEST FOR THIS DOCUMENT SHALL BE REFERRED TO PEO CARRIERS, PMS 312.
BLK 12: SUBMITTED NLT THIRTY (30) DAYS AFTER COMPLETION OF ALL WORK, INCLUDING SALE OR DISPOSAL OF ALL SCRAP AND REUSABLE MATERIAL/EQUIPMENT OR AS MUTUALLY AGREED TO BETWEEN THE GOVERNMENT AND CONTRACTOR.
BLK 14: EMAIL ELECTRONIC REPORT TO DISTRIBUTION CODES.

ADDRESSEES	Draft	Final Reg	Final Repro
A.1		1	
A.2		1	
A.3		1	
A.4		1	
A.5		1	
A.6		1	
B.1		1	
15. TOTAL		7	

17. PRICE GROUP	18. ESTIMATED TOTAL PRICE

G. PREPARED BY	H. DATE	I. APPROVED BY	J. DATE

Deliver Code / Short Title	**Delivery Information**
A.1 NAVSEA 02	Contracting Officer Commander Naval Sea Systems Command Attn: Mercedes Thurston, SEA 02431 1333 Isaac Hull Avenue SE Washington Navy Yard, DC 20376 Voice: (202) 781-1843 mercedes.thurston@navy.mil
A.2 PMS 312D	INAC Assistant Program Manager Program Executive Officer, Aircraft Carriers Attn: Ray Duff, PMS 312D 614 Sicard Street, SE Washington Navy Yard, DC 20376-7007 Voice: (202) 781-2129 Fax: (202) 781-4693 herbert.r.duff@navy.mil
A.3 PMS 312D	INAC Project Manager Program Executive Officer, Aircraft Carriers Attn: Jessica Carter, PMS 312D 614 Sicard Street, SE Washington Navy Yard, DC 20376-7007 Voice: (202) 781-0823 Fax: (202) 781-4693 jessica.l.carter@navy.mil
A.4 NAVSEA 08H	Nuclear Shipbuilding Contracts Manager Commander Naval Sea Systems Command Attn: John LeVering, SEA 08H 1240 Isaac Hull Avenue SE Washington Navy Yard, DC 20376 Voice: (202) 781-6193 Fax: (202) 781-6412 john.leveringnavy.mil
A.5 NAVSEA 08P	Nuclear Program Manager Commander Naval Sea Systems Command Attn: Stephen Picard, SEA 08P 1240 Isaac Hull Avenue SE Washington Navy Yard, DC 20376 Voice: (202) 781-6366 Fax: (202) 781-6412 stephen.picard@navy.mil
A.6 NAVSEA 08R	Nuclear Engineering Commander Naval Sea Systems Command Attn: Jeffrey Steele, SEA 08R 1240 Isaac Hull Avenue SE Washington Navy Yard, DC 20376 Voice: (202) 781-6192 Fax: (202) 781-6424 jeffrey.m.steele@navy.mil
B.1 On-Site Representative **TBD**	Title Organization Attn: Street Address City, State, Zip Code Voice: Fax: Email

ATTACHMENT 6

SSSB PROJECT
MATERIALS CATEGORIZATION, SURVEY, AND RELEASE PLAN

MATERIALS CATEGORIZATION, SURVEY, AND RELEASE PLAN

SURFACE SHIP SUPPORT BARGE
DISMANTLEMENT AND DISPOSAL

Project Number: 501513
Contract Number: N00024-20-C-4139

Prepared for

Naval Sea Systems Command
614 Sicard Street SE
Washington Navy Yard, DC 20376-7007

Prepared by

Aptim Federal Services, LLC
11400 Parkside Drive, Suite 400
Knoxville, Tennessee 37934

March 2021

Revision 0

MATERIALS CATEGORIZATION, SURVEY, AND RELEASE PLAN

SURFACE SHIP SUPPORT BARGE DISMANTLEMENT AND DISPOSAL

Prepared by

APTIM Federal Services, LLC
11400 Parkside Drive, Suite 400
Knoxville, Tennessee 37934

March 2021

Revision 0

Prepared by: Arthur J Palmer Date: March 18, 2021
Art Palmer, CHP
APTIM Technical Manager
865-765-7898

Reviewed/Approved by: Michael A Carr Date: March 18, 2021
Michael Carr, CHP
APTIM Project Radiation Safety Officer
865-250-2149

Reviewed/Approved by: Rick Greene Date: March 18, 2021
Rick Greene, CHP
APTIM Certified Health Physicist
865-604-2338

Reviewed/Approved by: Bruce A. Fox Date: March 18, 2021
Bruce A. Fox, PMP
APTIM Project Manager
208-901-2142

Reviewed/Approved by: Robert Biolchini Date: March 18, 2021
Robert Biolchini, PE
APTIM Site Manager
419-306-8994

Record of Revisions

Revision No.	Description of Revision	Date
0	Materials Categorization, Survey, and Release Plan	March 2021

Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

%	percent
AL	action level
ANSI	American National Standards Institute
APTIM	Aptim Federal Services, LLC
Bkg	background
cm^2	square centimeter
Co-60	cobalt-60
cpm	counts per minute
D&D	dismantlement and disposal
dpm	disintegrations per minute
DQO	data quality objective
DSV	default screening value
DWP	Decommissioning Work Plan
gal.	gallon
GFPC	gas flow proportional counter
GM	Geiger–Müller
I&E	Inspection and Enforcement
IA	initial assessment
keV	kiloelectron volt
lb.	pound
LLMW	low-level mixed waste
LLRW	low-level radioactive waste
µCi	microcurie
M&E	materials and equipment
MARLAP	Multi-Agency Radiological Laboratory Analytical Protocols Manual
MARSAME	Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCSRP	Materials Categorization, Survey and Release Plan
MDA	minimum detectable activity
MDC	minimum detectable concentration
MDCR	minimum detectable count rate
mg/cm^2	milligrams per square centimeter

MQC	minimum quantifiable concentration
MQO	Measurement Quality Objective
NRC	U.S. Nuclear Regulatory Commission
pCi/g	picocuries per gram
PRSO	Project Radiation Safety Officer
PWEFC	Prototype Waterborne Expended Fuel Container
QC	quality control
RCOPC	radionuclide contaminant of potential concern
RCS	Radiological Control Supervisor
RPP	Radiation Protection Plan
SOP	standard operating procedure
SSSB	Surface Ship Support Barge
SU	survey unit
Tc-99	technetium-99
V&V	verification and validation

1.0 Introduction

The U.S. Navy's Surface Ship Support Barge (SSSB) is a barge, (i.e., non-powered vessel) that was used to support refueling Navy nuclear-powered ships. The function of the SSSB was to receive, hold and prepare previously used reactor components designated for ship-out or reuse. The SSSB provided the ability to perform maintenance functions like those performed in a typical pressurized water reactor spent fuel pool except for long-term spent fuel storage. This Materials Categorization, Survey, and Release Plan (MCSRP) documents the radioactive contamination limits and survey procedures for releasing portions of the SSSB for unrestricted use during the SSSB dismantlement and disposal (D&D) project.

1.1 SSSB Description and History

The SSSB was originally a portion of the World War II-era T-2 tanker (SS CANTIGNY). CANTIGNY was constructed in 1945 by Sun Shipbuilding Company in Chester, Pennsylvania. Some of the remainder of CANTIGNY was reused with a new and larger midsection and bow constructed by Burmeister and Wain of Copenhagen, Denmark. The rebuilt CANTIGNY was operated until it was scrapped in Spain in 1984.

The CANTIGNY mid-body section was converted to a nuclear support facility in 1964 by Newport News Shipbuilding and was originally referred to as the Prototype Waterborne Expended Fuel Container (PWEFC). The PWEFC was constructed by Newport News Shipbuilding and Drydock Co. and used for support of the first and second CVN-65 (USS ENTERPRISE) refuelings. The SSSB was extensively refurbished by Newport News Shipbuilding in the late 1980s. Much of the original hull and tank structure was replaced and new longitudinal bulkheads were installed. In 1990 the PWEFC was upgraded by repair and alteration to provide an additional 50 years of service. During the repair the PWEFC was renamed the SSSB. Thus, the SSSB bears little resemblance to the original CANTIGNY. No new concepts in nuclear support facilities were used in the SSSB.

There is no U.S. Nuclear Regulatory Commission (NRC) license number associated with the SSSB. Radioactive material is possessed under contractual authorization with the U.S. Navy Nuclear Power Program. The SSSB was last used to support the final defueling of the Ex-Enterprise (CVN-65) in approximately 2016 and the vessel is currently in inactive layup status.

In 2021, the SSSB will be moved via heavy lift deck barge from Colonna's Shipyard in Norfolk, Virginia to the Alabama Shipyard facility in Mobile, Alabama where APTIM Federal Services,

LLC (APTIM) will perform dismantlement of the vessel. Figure 1-1 is an aerial photograph showing the SSSB in drydock.

Figure 1-1
SSSB in Newport News Shipbuilding Drydock 2

1.2 Purpose

The D&D of the SSSB will involve the isolation, removal, segregation, and disposal of the radioactively contaminated materials and equipment (M&E) and release for unrestricted use of those portions of the vessel demonstrated to meet unrestricted release criteria. This includes all structures, systems, and components comprising the SSSB. Although other hazards have been identified on the vessel (e.g., lead, polychlorinated biphenyls, asbestos), these hazards will be identified as part of the SSSB Characterization Survey Plan (APTIM, 2021a) and appropriate controls implemented while working with and around these hazards. These hazards will be addressed during shipbreaking following segregation of the portions of the vessel planned for unrestricted release.

With respect to the SSSB itself, all solid portions of the vessel will be dispositioned via one of four pathways:

1. Low-level radioactive waste (LLRW)
2. Low-level mixed waste (LLMW) (i.e., radioactive and hazardous waste)
3. Hazardous waste (unrestricted release), final disposition as required
4. Nonhazardous industrial waste (unrestricted release), recycle/disposal as required.

Approximately 85 percent (%) of the SSSB structures, systems, and components will be disposed as LLRW; roughly 15% will be surveyed for radiological unrestricted release and will be dispositioned through disposal at a hazardous waste landfill, a non-hazardous industrial waste landfill or recycled; and less than 1% is expected to be disposed as LLMW. The entire SSSB will be dispositioned via one of these pathways. Management and disposal of project-related solid and liquid wastes are addressed in the SSSB Waste Management Plan (APTIM, 2021b).

1.3 Scope

This MCSRP specifies the methodologies and protocols for performing surveys for final disposition of the portions of the SSSB designated for unrestricted release. Disposition surveys are designed and will be conducted in accordance with guidance contained in NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (NRC, 2000); NUREG-1575 Supplement 1, *Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual* (MARSAME) (NRC, 2009); and NUREG-1507, *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions* (NRC, 2020). This plan has been developed to demonstrate compliance with the unrestricted release criteria contained in NRC Inspection and Enforcement (I&E) Notice 81-07 (NRC, 1981), which are consistent with the license termination criteria of Title 10 Code of Federal Regulations Part 20, *Standards for Protection Against Radiation*.

2.0 Multi-Agency Radiation Survey and Assessment of Materials and Equipment Data Lifecycle

This MCSRP provides the technical basis for the design and implementation of surveys for the release and clearance of M&E in accordance with MARSAME. This plan incorporates the four components of the data life cycle as discussed in MARSAME, including planning, implementation, assessment, and decision-making phases. Figure 2-1 shows the MARSAME data life cycle. The data life cycle steps described in the following sections will be applied to the SSSB as outlined in this MCSRP.

2.1 Planning

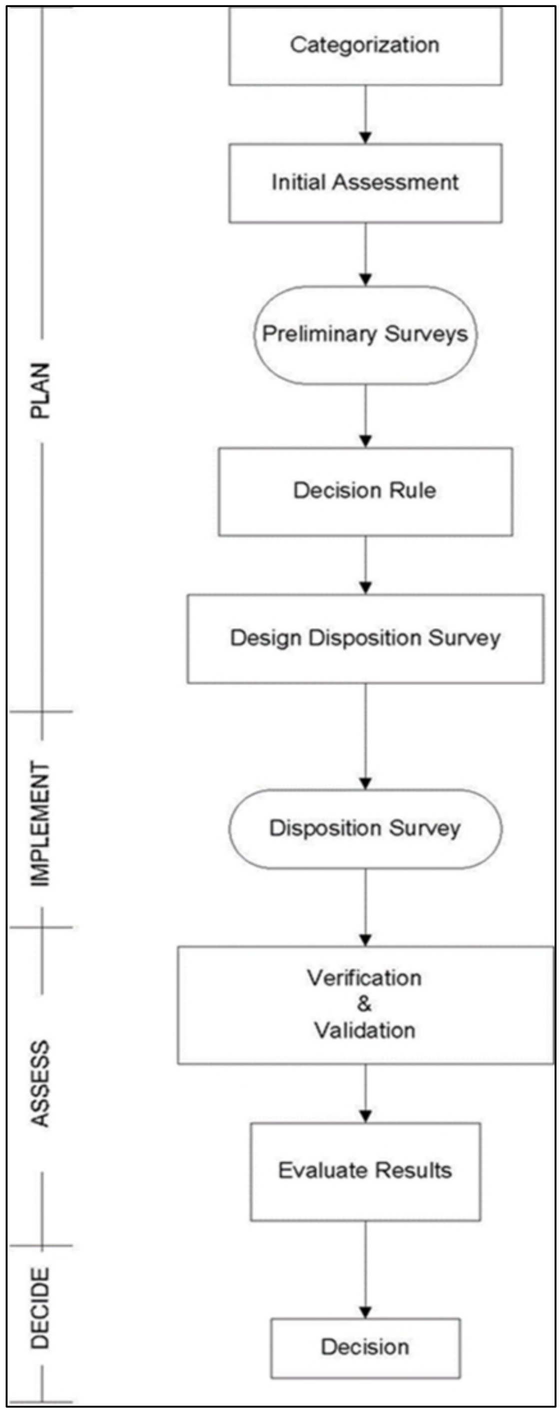
Planning is the initial and most extensive phase of the data life cycle. The planning process begins with categorization of the SSSB. Following categorization, the planning process continues with an initial assessment (IA) based on a review of the SSSB history, physical characteristics, process knowledge, and existing data. After the IA, preliminary characterization sampling and surveys (sentinel surveys) are performed to fill data gaps. Sentinel surveys, measurements, and sampling (biased or judgmental sampling and measurements) may also be performed in conjunction with the historical evaluation and process knowledge to categorize M&E as either “impacted” or “nonimpacted” from radiological operations; however, sentinel measurements cannot be used solely to categorize equipment as nonimpacted.

M&E that has been categorized as “impacted” will be further classified as Class 1, 2, or 3 in a manner equivalent to the MARSSIM methodology based upon the potential for contamination and in accordance with the Decommissioning Work Plan (DWP) (APTIM, 2021c). Classification will be used to determine the appropriate level of survey effort based on estimates of radioactivity levels. Class 1 areas require the greatest level of survey effort while Class 3 receives the least. Classification will be performed as follows:

- ***Class 1*** – M&E that have, or had, the following: (1) highest potential for, or known, radionuclide concentration(s) or radioactivity above the action levels (AL); (2) highest potential for small areas of elevated radionuclide concentration(s) or radioactivity; and (3) insufficient evidence to support reclassification as Class 2 or Class 3.
- ***Class 2*** – M&E that have, or had, the following: (1) low potential for, or known, radionuclide concentration(s) or radioactivity above the ALs; and (2) little or no potential for small areas of elevated radionuclide concentration(s) or radioactivity.

- ***Class 3*** – M&E that have, or had, the following: (1) little or no potential for, or known, radionuclide concentration(s) or radioactivity above background; (2) insufficient evidence to support categorization as non-impacted.

Figure 2-1
MARSAME Data Lifecycle



2.1.1 Materials and Equipment Description

Critical to the disposition survey design, survey approach, and decision-making is the identification of the physical and radiological attributes of the M&E. These attributes, in conjunction with process knowledge, visual inspections, and historical information, will determine the rigor and extent of the disposition surveys. All attributes will be compiled and included as part of the disposition survey package to support the final decision.

2.1.2 Physical Attributes

The physical attributes of the M&E include the physical dimensions, complexity, and accessibility. These aspects are critical in developing a survey design to assess inaccessible or difficult-to-measure areas and surfaces that are painted, porous, or corroded. This will aid in the segregation of M&E (grouping into lots) and the types and survey methods. Also included in the physical attributes is the inherent value of the M&E, which will be considered due to related costs of disposal, as well as the recycle or reuse options, based on condition.

2.1.3 Radiological Attributes

Radiological attributes of M&E include the radionuclide contaminants of potential concern (RCOPC), concentrations, distribution, and location of radioactivity. These attributes are important in determining the selection of instrumentation, ease of detecting contamination, types of surveys, and locations of sentinel measurements.

2.1.4 Disposition Options

The disposition of the M&E is typically a key factor in the design of the disposition surveys; however, for the SSSB project, there are only two final disposition options: release for unrestricted use or disposal as LLRW or LLMW. All materials designated for disposal as LLRW or LLMW will be managed in accordance with the SSSB project Waste Management Plan and the applicable waste acceptance criteria for the designated disposal facility. No materials will be released for reuse or continued use with radiological controls.

The SSSB history is well documented, although some details of the SSSB use in supporting surface ship refuelings have not been disclosed. Approximately 85% of the SSSB will be dispositioned as LLRW. Additional knowledge of the RCOPCs will be developed during the SSSB characterization survey, after which sufficient knowledge will be available to properly confirm the final disposition survey design. Radiological surveys of portions of the vessel that are not being released for unrestricted use will be focused on gathering data for occupational radiation protection and waste management purposes.

The IA focuses on the collection of information to develop a technically defensible position to categorize M&E and develop the disposition options and survey design for the portions of the vessel intended for unrestricted release. Once categorized, hypotheses are stated for each survey unit (SU), acceptable decision errors are defined, and decision rules are established. Decision rules specific to the M&E are developed and decision inputs are identified and incorporated into the disposition survey design. The survey design is then completed which includes the establishment of parameters of interest, ALs, and alternative actions for the final disposition of the M&E. Measurement Quality Objectives (MQO) and disposition survey packages for each SU are then developed to facilitate quality data collection to support the final decision.

2.2 Implementation

Implementation includes completion of survey packages for each SU that identify the planned and systematic measurements and sampling in the SU in accordance with the survey design. The survey package(s) describes the samples and measurements required to provide the information necessary to make the SU disposition decision. The survey package provides instructions to surveyors as well as the survey parameters for completing scans, making total and removable contamination measurements, and collecting samples. It includes scan rates and coverages, locations of measurements to be made, and media to be sampled. It also includes information regarding specifications (e.g., counting times and maximum background levels) for measurements and sample area or mass and analytes for samples to ensure survey data quality objectives (DQO) are met.

2.3 Assessment

The assessment phase consists of verification and validation (V&V) of field measurements and laboratory data to ensure complete and correct measurements were made in a manner that supports the DQOs. This will include verification that the data collected are of the correct type, quantity, and quality to support the final decision. The V&V process evaluates field and laboratory instrument performance through instrument quality assurance metrics and blank, matrix spike, and duplicate sample analysis performance. If any corrective measures are needed (e.g., obtaining additional measurements or samples), they are tracked to completion through quality assurance program procedures.

The data are evaluated against the applicable ALs to determine if additional investigations are needed for a particular area of measurement in a SU. Depending upon the data assessment, additional measurements may be required.

After data V&V, the complete set of data are evaluated against objective decision criteria in accordance with decision rules and statistical tests to accept or reject the null hypothesis.

2.4 Decision-Making

An objective decision as to whether the SU has rejected the null hypothesis is made in accordance with decision rules and appropriate statistical tests. If the null hypothesis has been rejected, the decision is made to release the SU for unrestricted use. If the null hypothesis is not rejected, the SU is not released for unrestricted use and is either disposed as radioactive waste or is remediated. In addition to remediation, a Class 2 or 3 SU that fails to reject the null hypothesis is reclassified as a Class 1 SU for resurvey or subdivided into additional SUs as applicable.

3.0 SSSB MARSAME Planning

The following sections describe the planning phase of the MARSAME data lifecycle as applied to the SSSB. The portions of the SSSB intended for unrestricted release include the bulkheads, decks, overheads, and structural members comprising Holds 3 and 9 Centerline, Port, and Starboard Tanks and the No. 3 Void Space. These areas will be surveyed in accordance with MARSAME survey protocols modified to address potential contaminants in paint. The survey procedures were developed in accordance with the guidance provided in MARSAME Chapter 3.0 together with MARSSIM-type scan and static surveys (MARSAME Section 4.4.3) and method-based surveys (MARSAME Section 4.4.4).

The MARSSIM and MARSAME processes are the methodologies used to demonstrate compliance with the endpoint criteria. Consequently, establishing the endpoint criteria is a fundamental input to implementing these processes. The SSSB disposition criteria based on NRC I&E Notice 81-07 are:

- No detectable surface beta activity during scans or static measurements with a minimum detectable concentration (MDC) not greater than 5,000 disintegrations per minute (dpm) per 100 square centimeters (cm^2) as measured by a thin-window (0.8 milligrams per square centimeter [mg/cm^2]) gas flow proportional detector, or detector of equivalent sensitivity.
- No detectable cobalt-60 (Co-60) activity in paint samples with a minimum detectable activity (MDA) less than or equal to 3.0 picocuries per gram (pCi/g)[1].
- Removable contamination less than 1,000 dpm/100 cm^2.

3.1 Categorization

The majority of the SSSB will be disposed as radioactive waste and will not require additional surveys for release in accordance with this MCSRP. M&E that may be considered for release and recycling with a reasonable potential to be affected by radiological operations of the SSSB will be categorized as “impacted” because they are potentially contaminated and will require further classification. These M&E are classified into one of three classes (Class 1, 2, or 3) similar to the methodology in MARSSIM depending on the potential for residual contamination. Depending upon this classification, the frequency of measurement and scrutiny of the survey design is increased to ensure the M&E may be released.

[1] 3.0 pCi/g is based on 1% of 5,000 dpm (2,250 pCi) contained in an area of 100 cm^2 coated with three layers of paint with an areal density of 25 mg/cm^2 for each layer.

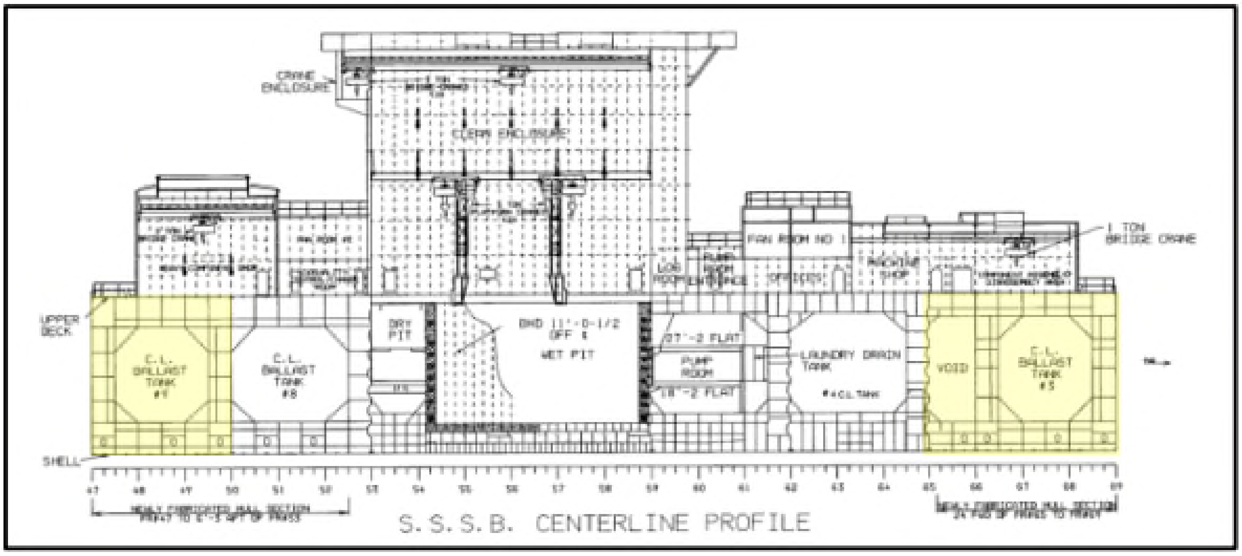
M&E with no potential to be radioactively contaminated are considered "nonimpacted," and no further surveys will be required other than documenting the supporting information for the final decision such as the historical and operational information and the results of any sentinel measurements. Non-impacted M&E will then be protected against becoming impacted during D&D operations through administrative controls limiting the access to the areas previously released.

All SSSB internal structures, systems and components have been categorized as "impacted" as reported in the DWP. The only non-impacted areas are the exterior surfaces of the hull below the main deck. The only portions of the SSSB that are candidates for unrestricted release are No. 3 Void; No. 3 Port, Starboard, and Centerline holds (ballast tanks); and No. 9 Port, Starboard, and Centerline holds (ballast tanks). These are listed on Table 3-1 and shown on Figure 3-1 and Figure 3-2.

Table 3-1
SSSB Categorization

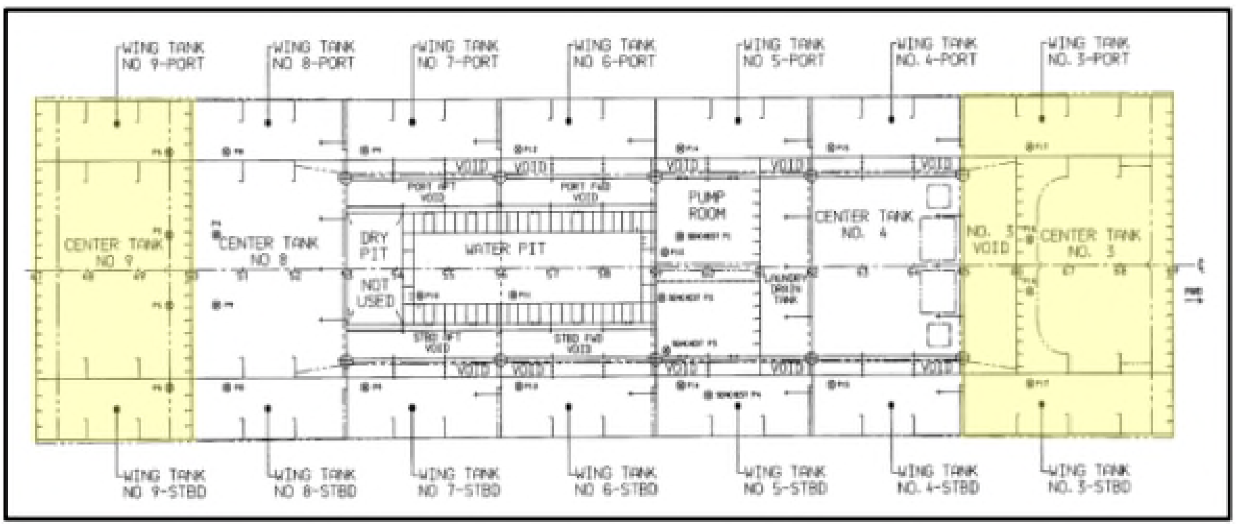
M&E Description	Categorization
SSSB Exterior Main Deck and Above	Impacted
SSSB Exterior Below Main Deck	Non-Impacted
Wing Tank No. 3 Port	Impacted
Center Tank No. 3 Centerline	Impacted
Wing Tank No. 3 Starboard	Impacted
No. 3 Void	Impacted
Wing Tank No. 9 Port	Impacted
Center Tank No. 9 Centerline	Impacted
Wing Tank No. 9 Starboard	Impacted
All other areas of the SSSB	Impacted

Figure 3-1
SSSB Elevation View Showing Areas Intended for Unrestricted Release



Note: areas for unrestricted release as shown in yellow.

Figure 3-2
SSSB Plan View Showing Areas Intended for Unrestricted Release



Note: areas for unrestricted release as shown in yellow.

3.2 Initial Assessment

The IA of the SSSB areas identified as candidates for unrestricted release includes historical documentation review regarding prior usage, modification, and release surveys of SSSB holds. In preparation for the reconstruction of the SSSB (then the PWEFC) in 1986, 22 potentially contaminated ballast tanks (all except No. 4 Centerline) were surveyed and released for

unrestricted use in 1984. The highest radioactivity level identified during sampling was 4.81 pCi/g Co-60 and most analysis results were less than MDAs, ranging from 0.01 to 1.0 pCi/g. Based on these results, total ballast tank activity prior to reconstruction was estimated at 230 microcuries (µCi) of Co-60.[2] It was estimated that half of that activity (115 µCi) would be removed during the reconstruction and the other half would remain based on the square footage of vessel being replaced.[3] Over the 37 years from 1984 to 2021, approximately seven Co-60 half-lives have transpired. Consequently, any Co-60 activity remaining after reconstruction has decreased to less than 1% of its 1984 activity level.

During the 1986 modifications radioactive piping and potentially contaminated paint were removed from Holds No. 3 and No. 9 Centerline, Port, and Starboard and No. 3 Void. The compartments were surveyed and found to be less than 5,000 dpm/100 cm^2 and scrap steel was released for unrestricted use. The No.3 Void/Holds and No. 9 Holds are separated from the Wet Pit by the No. 4 Hold and No. 8 Hold, respectively, and are physically isolated from the contaminated drain collecting systems.

In January and February 1998, 103 paint samples were collected throughout the SSSB.[4] Of these samples, 18 samples had detectable Co-60 activity ranging from 0.5 pCi/g to 8.9 pCi/g with an average activity of 2.3 pCi/g. Typical MDAs for the samples in which activity was not detected, ranged from approximately 0.4 pCi/g to 2 pCi/g. Each paint sample was also analyzed by liquid scintillation counting with all 103 samples reported as less than 450 pCi/100 cm^2.

Assuming the activity present was Co-60, more than four half-lives have transpired since this study was completed. Based on this, the maximum activity of 8.9 pCi/g identified in 1998 is now reduced to approximately 0.5 pCi/g and the average detected activity of 2.3 pCi/g is approaching 0.1 pCi/g.

Based on this history, the No. 3 Void, No. 3 Centerline, Port, and Starboard Holds, and No. 9 Centerline, Port, and Starboard Holds are categorized as impacted areas per MARSAME; these

[2] Memo Ser 08R/84-2579, Commander, Naval Sea Systems Command to Naval Sea System Command Representative, “Prototype Waterborne Expended Fuel Container – Release of Twenty-One Ballast Tanks for Unrestricted Use and Plan for Removal of Potentially Contaminated Piping from Ballast Tanks, Approval of Subject to Comment”, 26 July 1984.

[3] Memo WAPD-REO(SS)-691, G. N. Runge, Cognizant Engineer Surface Ship Refueling, Refueling Engineering & Operations to Manager, Pittsburgh Naval Reactors Office, “Prototype Waterborne Expended Fuel Container (PWEFC) Ballast Tank Currie Content” (sic), 14 March 1984

[4] “Summary of Paint Sample Results”, 18 February 1998.

spaces are further classified as Class 2 areas based on a prudently conservative approach considering their radiological history.

3.3 Sentinel Surveys

Sentinel surveys in MARSAME are similar to “scoping” and “characterization” surveys in MARSSIM. When needed, sentinel surveys are performed to address the lack of sufficient information needed to adequately categorize and/or classify M&E and support the disposition survey. Preliminary sentinel surveys are performed to gather additional information necessary to support fully developing the MARSAME process for unrestricted release. Sentinel surveys are performed as an element of, and are described in, the SSSB Characterization Survey Plan.

As the SSSB characterization surveys remain to be completed, including confirmation of radionuclides and relative scaling factors, the disposition survey design is preliminary and will be finalized after sentinel survey and sampling data are received.

3.4 Materials and Equipment Description

Critical to the disposition survey design, survey approach, and decision-making is the identification of the physical and radiological attributes. These attributes, in conjunction with process knowledge, visual inspections, and historical information, will determine the rigor and extent of the disposition surveys. All attributes will be compiled and included as part of the disposition survey package to support the final decision.

3.4.1 Physical Attributes

The physical attributes of the M&E include the physical dimensions, complexity, and accessibility. These aspects are critical in developing a survey design to assess inaccessible or difficult-to-measure areas and surfaces that are painted, porous, or corroded. This will aid in the segregation of M&E (grouping into lots) and the types and survey methods. Also included in the physical attributes is the inherent value of the M&E, which will be considered due to related costs of disposal, as well as the unrestricted release options, based on condition.

3.4.2 Radiological Attributes

Radiological attributes of the M&E include the RCOPCs, concentrations, distribution, and location of radioactivity. These attributes are important in determining the selection of instrumentation, ease of detecting contamination, types of surveys, and locations of sentinel measurements.

3.5 Disposition Options

The disposition of the M&E is typically a key factor in the design of the disposition surveys; however, for the SSSB project, there are only two final disposition options: (1) unrestricted release or (2) disposal as LLRW or LLMW. All materials designated for disposal as LLRW or LLMW will be managed in accordance with the SSSB Waste Management Plan and the applicable waste acceptance criteria for the designated disposal facility. No materials will be released for reuse or continued use without being surveyed and released for unrestricted use.

4.0 Decision Inputs

The decision inputs are specific information necessary to evaluate the disposition options, data assessment, and final decisions. These specifically include the RCOPCs, parameters of interest, and action or decision levels. This will allow for a specific decision rule(s) to be evaluated and the determination of the need for any alternative options.

4.1 Radiological Contaminants of Potential Concern

Although characterization has not yet been performed, the predominant radionuclides in the SSSB are expected to be Co-60 and nickel-63. Table 4-1 lists the isotopes that are anticipated to be present at greater than 1% of the total radioactivity based on general characterization data for U.S. Navy Unfiltered Shipyard Waste[5]. Their concentrations and relative presence will be fully developed following characterization of SSSB waste streams in accordance with Title 10 of the Code of Federal Regulations Part 61. The preliminary list of potential radiological constituents of potential concern consists of the following:

Table 4-1
Radiological Contaminants of Potential Concern

Isotope	Half Life (years)	SSSB Fractional Abundance	Soil DSV (pCi/g)	Surface DSV (dpm/100 cm^2)
Carbon-14	5,730	0.0538	12	3,700,000
Iron-55	2.73	0.0988	10,000	4,500,000
Cobalt-60	5.27	0.57	3.8	7,100
Nickel-63	100.1	0.261	2,100	1,800,000
Cesium-137	30	0.0104	11	28,000
Total		0.994		

DSV – default screening value.

There is no documented disassembly of fuel-bearing regions of fuel assemblies associated with the operation of the SSSB. As a result, alpha-emitting radionuclides and the more common mixed fission products (e.g., cesium-137) are not anticipated to be present in any significant quantities. This is supported by survey and sampling results of the SSSB performed during previous refurbishment efforts and while in lay-up prior to decommissioning.

[5] Commander, Naval Sea Systems Command, “Revised Method for Determining Radionuclide Concentrations in Shipyard Low-Level Radioactive Waste”, Ser 08R/06-04529, December 14, 2006.

It should be noted that NRC DSVs shown above are not used for clearance of SSSB structures, systems, or components and are provided for comparison with the disposition criteria below.

4.2 Parameter(s) of Interest

The parameters of interest are typically a combination of individual measurement criteria such as activity levels (total and removable activity or concentration) and population parameters (mean, median, range, maximum, and percentile) that are integral in the decision-making process. These are referred to as the action or decision levels. For the purposes of the SSSB project, population parameters will not be utilized for decision-making. All measurements shall be below the applicable ALs in order for the M&E to be released. As a result, the only parameters of interest are the ALs.

4.3 Action Levels

ALs can encompass surface or volumetric contamination limits or both. ALs can be a dose- or risk-based regulatory standard, an activity-based standard or regulatory threshold, as low as reasonably achievable, or other considerations (e.g., detection limits). For the SSSB project, the ALs are based on no detectable activity per NRC I&E Notice 81-07 expressed as:

- No detectable total surface beta activity during scans or static measurements with an MDC not greater than 5,000 dpm/100 cm^2 as measured by a thin-window (0.8 mg/cm^2) gas flow proportional counter (GFPC) or detector of equivalent sensitivity.
- Removable contamination less than 1,000 dpm/100 cm^2.
- No detectable Co-60 activity in paint samples with an MDA less than or equal to 3.0 pCi/g[6].

4.4 Alternative Actions

Alternative actions are specified if the criteria for the unrestricted release disposition option are not met. For the SSSB project, the alternative actions are decontamination and resurvey of the M&E or the disposal of the M&E as LLRW or LLMW. If decontaminated, the M&E will be resurveyed for release following decontamination. This process will be repeated as determined necessary until the M&E has been demonstrated to meet the disposition option or is properly disposed.

[6] 3.0 pCi/g is based on 1% of 5,000 dpm (2,250 pCi) contained in an area of 100 cm^2 coated with three layers of paint with an areal density of 25 mg/cm^2 for each layer.

5.0 Disposition Survey Design

Disposition surveys will be designed and developed for the adequate detection of the RCOPCs against the applicable ALs such that the data will meet the established DQOs and MQOs. SUs will be established with defined boundaries and the M&E will be segregated as necessary to optimize survey efforts. The data collected will be of sufficient quality and quantity to support the data assessment to reach a defensible disposition decision.

The disposition survey design is a combination of scans with pre-established coverage requirements based on area classification together with direct measurements, wipes, and samples at pre-determined locations within each SU.

The potential for activity on and within painted-on coatings is addressed through a combination of scan measurements, static measurements, and samples. Scan measurements are effective for identifying and measuring activity on the surface and covered over by up to one layer of paint. Static measurements are effective for identifying and measuring activity at the required detection limit both on the surface and covered over by one to two layers of paint. Paint samples are collected from the full thickness of the coating and are analyzed by the off-site laboratory to assess activity that may be located more than one to two paint layers deep.

Total activity measurements will be made with a GFPC with nominal detector window sizes of 126 cm^2 (Ludlum Model 43-37) and either 584 cm^2 (Ludlum Model 43-37) or 821 cm^2 (Ludlum Model 43-37-1).

Removable contamination measurements will be made by wiping a filter paper over an approximately 100 cm^2 area and analyzing the filter paper for beta-gamma activity on a Ludlum Model 2929 (or equivalent detector). Scan survey coverage will be at least 25% coverage in Class 2 areas.

It is anticipated that many, if not all, survey location surfaces are painted. Paint samples will be collected from each sample location that is covered with paint and analyzed for Co-60 activity by gamma spectroscopy with a required MDC of <3.0 pCi/g.

5.1 Classification

All structures, systems, and components of the SSSB are considered impacted except the external hull and exposed deck surfaces, which are categorized as non-impacted.

The portions of the SSSB being considered for release include the No. 3 Void, No. 3 Port, Starboard, and Centerline tanks, and No. 9 Port, Starboard, and Centerline tanks. Although there are no recommended SU size limitations in MARSAME, in the initial survey design the floors, walls, and overheads of each of these compartments will be treated similarly to MARSSIM impacted Class 2 areas with a SU area limit of 1,000 square meters.

5.2 Survey Units

To make decisions concerning the disposition of M&E, it is necessary to define the amount of M&E for which a separate disposition decision is made. This requires the establishment of SUs with clearly defined boundaries. For discrete items, this is simple; however, decisions are typically made for complex situations (e.g., bulk materials), which will be the case for the SSSB.

5.2.1 Survey Unit Boundaries

The SU boundaries will depend on how the SU is defined, including the categorization and classification of the M&E. This will impact the size and complexity of the SU. MARSAME recommends a clear delineation of SU boundaries, primarily based on the assumptions used to develop the ALs. These can be based on surface area or by a certain quantity of material (e.g., truck load in the case of volumetric materials such as concrete and copper).

For the SSSB, SUs consist of general areas within the vessel. Physical boundaries will be used to the maximum extent practical to aid in defining the SU boundaries for ease in the survey design. SSSB SUs as presently planned are listed in Table 5-1.

Table 5-1
SSSB Survey Units

Compartment	Class	Surface Area (m^2)	Number of Survey Units
3 Port Deck, Walls & Overheads	2	570	1
3 Starboard Deck, Walls & Overheads	2	570	1
3 Centerline Deck, Walls & Overheads	2	917	1
3 Void Deck, Walls & Overheads	2	534	1
9 Port Deck, Walls & Overheads	2	451	1
9 Starboard Deck, Walls & Overheads	2	451	1
9 Centerline Deck, Walls & Overheads	2	917	1

5.2.2 Segregation

For the SSSB, SU segregation is accomplished by physical separations between SUs (e.g., decks and bulkheads). Each hold has an individual separate access and there are no passageways through or between the compartments. Systems that may contain residual radioactivity will be removed prior to performing the disposition survey.

5.3 Design

The disposition survey will be designed to collect measurements of sufficient type, quantity, and quality for comparison to the applicable ALs in order to perform a data assessment to reach a defensible decision regarding the disposition option. There are four basic MARSAME survey types and designs: scan only, in situ survey design, combination of scans and static measurements (MARSSIM-type), and method-based surveys. For the purposes of the SSSB project, the disposition surveys will be a combination of MARSSIM-type and method-based surveys.

The surveys will include direct static measurements for gross beta (Co-60) surface activity, removable activity measurements for gross beta activity, surface scans for beta activity, and paint samples for isotopic analysis for volumetric materials.

5.3.1 Number of Sample Locations

The primary radionuclide of concern for the SSSB is Co-60. Since Co-60 does not exist naturally, the statistical test which would be used for hypothesis testing is the Sign test. However, the decision criteria require no detected activity at specified MDAs. Consequently, while the Sign test is not used for hypothesis testing, it is used to determine the number of required measurements and sample locations. To develop a preliminary estimate of the number of samples required per SU, the acceptable probability of making Type I (α) and Type II (β) decision errors is set at 0.05 and the relative shift (Δ/σ) is assumed to be 2[7]. From MARSSIM Table 5.5 the value for N is 15.

5.3.2 Class 1 Survey Units

There are no Class 1 SUs presently identified on SSSB. However, if a SU should be re-classified as such in the future, the Class 1 SU design will be a combination of MARSSIM-type and method-based surveys consisting of the following:

[7] The DWP assumed the relative shift to be 3; using a value of 2 is a change in a conservative direction and increases the number of required samples.

- 100% beta surface scan of accessible surfaces to the maximum extent practical.
- Minimum of 15 direct static measurements for beta activity per SU.
- Smears for gross beta analysis at each direct static measurement location.
- Volumetric paint samples for isotopic analysis at each direct static location as applicable.
- Additional measurements as required by the Radiological Control Supervisor (RCS) and approved by the Project Radiation Safety Officer (PRSO).

Systems and equipment will be required to be opened as directed by the RCS to access internal surfaces as necessary. Direct static measurements generally will be biased measurements for equipment, systems, and overheads, while the floors and walls will be systematically located with a random starting location. All measurement locations will be marked and documented.

5.3.3 Class 2 Survey Units

All SUs on the SSSB are presently classified as Class 2 SUs. The Class 2 SU design is similar to a Class 1 survey with the exception of the beta surface scans. Beta scans will be judgmental, with a scan coverage of at least 25% as directed by the RCS and approved by the PRSO. The Class 2 SU design will be a combination of a MARSSIM-type and method-based surveys consisting of the following:

- At least 25% beta surface scan of accessible surfaces.
- Minimum of 15 direct static measurements for beta activity per SU.
- Smears for gross beta analysis at each direct static measurement location.
- Volumetric paint samples for isotopic analysis at each direct static location as applicable.
- Additional measurements as required by the RCS and approved by the PRSO.

All measurement locations will be marked and documented.

5.3.4 Class 3 Survey Units

There are no Class 3 SUs presently identified on SSSB; however, if one is identified in the future, the Class 3 SU design will be a combination of a MARSSIM-type and method-based surveys consisting of the following:

- Approximately 10% judgmental beta surface scan of accessible surfaces.

- Minimum of 15 direct static measurements for beta activity per SU.
- Smears for gross beta analysis at each direct static measurement location.
- Volumetric paint samples for isotopic analysis at each direct static location as applicable.
- Additional measurements as required by the RCS and as approved by the PRSO.

5.4 Survey Package Development

A survey package will be developed for each SU and reviewed and approved by the PRSO. The survey package will include the supporting information from the IA; a description of the M&E; categorization and classification of the material/SU; and the survey design, including the method, type, and quantity of measurements and samples to be collected to support a defensible decision for final disposition. Photographs of the SU will also be included as part of the documentation. An example survey package outline is provided as Appendix A.

6.0 Implementation

Survey implementation focuses on the collection of measurements and samples in accordance with the survey design while controlling measurement uncertainties and any associated MQOs. Specifically, this entails the selection of instrumentation and measurement techniques and methods to ensure quality data with adequate sensitivity.

6.1 Measurement Quality Objectives

MARSAME introduces MQOs, which are a subset of the DQOs, designed to identify the characteristics of a measurement method that are essential in meeting the survey objectives. Six MQOs are discussed in the MARSAME methodology: measurement method uncertainty; detection capability; and measurement quantifiability, range, specificity, and ruggedness. The first three cited MQOs are statistically based while the other three are application based. Additional MQOs may be established as needed.

6.1.1 Measurement Method Uncertainty

All measurements include uncertainty, which must be considered when the measurement results are used in the decision-making process. In accordance with Section 3.8.1 of the *Multi-Agency Radiological Laboratory Analytical Protocols Manual* (MARLAP, 2004), the measurement method uncertainty refers to the "predicted uncertainty of a measured value that would likely result from the performance of a measurement at a specified concentration, typically the action level."

For the SSSB project, population statistics will not be used in evaluating the decision rules other than in determining the required number of measurements. Each measurement will be evaluated individually against the AL.

6.1.2 Decision Errors

Type 1 ($Z_{1-\alpha}$) and Type 2 ($Z_{1-\beta}$) errors for MARSAME Scenario A will be established (Scenario A assumes the level of activity associated with the M&E exceeds the AL). These include false-negative and false-positive errors, respectively. Both the Type 1 and Type 2 errors will be established at 5% based on a normal distribution for all static fixed beta measurements and smears.

For beta surface scans, the sensitivity index will be set at 1.38, which is a combination of the Type 1 and Type 2 errors. This is based on a true-positive rate of 95% (i.e., false-negative error rate of 5%) and a false-positive error rate of 60% per Table 6.5 of MARSSIM.

6.1.3 Detection Capability

The measurement detection capability can be assessed by two measurement values: the critical value and the MDC. The critical value, expressed as counts per minute (cpm), is the minimum measured value required for a specified probability that a positive (non-zero) amount of activity is present in the material. The MDC, on the other hand, is the minimum detectable activity or concentration for a measurement.

The instrument's detection capability is a function of several factors or variables, including the ambient background count rate, background and sample count times, size of the detector, scan speeds, decision error rates, and detector efficiencies. The measurement variables that will be modified in order to meet the detection sensitivity requirements will be the background and sample count times and scan speeds as necessary based upon the technology available. For the SSSB project, the AL is no detectable contamination with a required detection limit of 5,000 dpm/100 cm^2 for total surface activity measurements and 1,000 dpm/100 cm^2 for removable contamination measurements.

6.1.3.1 Paint Density Thickness

Paint density thickness is used to assess the effect of paint thickness on detector efficiency and to calculate the required MDC for laboratory paint sample analysis equivalent to 5,000 dpm/100 cm^2.

SSSB historical information indicates that Devran 220 was used for hull painting. The manufacturer's specifications for Devran 220 are as follows:

- Paint density: 11.65 pounds (lb.)/gallon (gal.)
- Theoretical coverage at 1 mil dry: 1,075 square feet/gal.
- Film Thickness: 5-7 mils dry – 7 mil thickness is assumed.

Calculating paint area density thickness based on application specification of 7 mils (0.007 inch) is as follows:

$$11.65 \text{ lb./gal. (gal./231 cubic inches) (454 grams/lb.) (0.007 inch) (1 square inch/6.45 cm}^2\text{)} = 0.025 \text{ grams/cm}^2 = 25 \text{ mg/cm}^2$$

This value is consistent with paint thickness studies conducted during decommissioning of the U.S. Army Corps of Engineers Sturgis MH-1A reactor which found an average areal density of 25.5 mg/cm^2. However, it is approximately 10 times greater than the average single layer paint thickness density of 2.53 mg/cm^2 used in NUREG-1507 Table 5-8, Effects of Paint Density

Thickness on Source Efficiency and MDC (Gas Proportional – α + β)[8]. Table 5-8 also provides a specific regression equation for estimating efficiency for various isotopes from density thickness of interposed materials. Technetium-99 (Tc-99) (E_{Bmax} = 293.6 kiloelectron volts [keV]) data is appropriate for estimating Co-60 (E_{Bmax} 317.9 keV) surface efficiencies due to Tc-99's slightly lower maximum beta energy. Surface efficiencies for Tc-99 for various thicknesses of paint are slightly lower (i.e., slightly more conservative) than those for Co-60. From Table 5-8 of NUREG-1507, the Ludlum 43-68 surface efficiency equation for Tc-99 is:

$$e_s = 0.628\ e^{-0.110x}$$

where: x = density thickness of the surface material in mg/cm^2.

The equation in NUREG-1507 Table 5-8 was developed using a Ludlum Model 43-68 detector with a detector face of 0.4 mg/cm^2 plus two sheets of mylar for a total window thickness of 0.84 mg/cm^2. For the SSSB surveys, GFPC detector windows will consist of a detector face of 0.4 mg/cm^2 plus two sheets of mylar with a density thickness of 0.22 mg/cm^2 each for the total window thickness of 0.84 mg/cm^2. Assuming a Ludlum Model 43-68 detector with a total window thickness of 0.8 mg/cm^2 window plus a 25 mg/cm^2 layer of paint for a total surface material density thickness of 25.8 mg/cm^2, the source efficiency (ε_s) is 0.037 using the Tc-99 regression equation above. When combined with the instrument efficiency (ε_i) of 0.364, the total detector efficiency (ε_t) is 0.0135.

6.1.3.2 Static Measurements

The MDC formula used in NUREG-1507 is:

$$MDC = \frac{3 + 4.65\sqrt{B}}{(\varepsilon_t)(A)}$$

where: B = number of background counts in one minute
A = ratio of detector area to 100 cm^2.

Under the assumptions of NUREG-1507 (i.e., background of 301 cpm and sample count time = background count time = one minute), the Ludlum Model 43-68 static MDC is 4,919 dpm/100 cm^2 through one layer of paint.

[8] NUREG-1507 (Rev. 1) Table 5-8 measures the effect on detector efficiency from a total of five paint layers with a total density thickness of 12.63 mg/cm^2, equivalent to an average layer density thickness of 2.53 mg/cm^2.

Assuming like efficiencies as the Model 43-68 and a background of 1,500 cpm, the static one-minute count MDC of the Ludlum Model 43-37 GFPC with 584 cm^2 window is 2,322 dpm/100 cm^2. Representative static measurement MDCs for Ludlum Model 43-68, 43-37, and 43-37-1 detectors are presented in Table 6-1.

Table 6-1
Static Measurement MDCs for Select Ludlum Detectors

Detector	Bkg (cpm)	Layers of Paint	Density-Thickness (mg/cm^2)	Instrument Efficiency (ε_i)	Source Efficiency (ε_s)	Total Efficiency (ε_t)	Probe Area (cm^2)	MDC (dpm/100 cm^2)
Ludlum 43-68	301	0 (surface)	0.8	0.364	0.626	0.228	126	291
		1	25.8	0.364	0.037	0.013	126	4,962
		2	50.8	0.364	0.002	0.001	126	77,625
Ludlum 43-37	1,500	0 (surface)	0.8	0.364	0.626	0.228	584	138
		1	25.8	0.364	0.037	0.013	584	2,343
		2	50.8	0.364	0.002	0.001	584	36,647
Ludlum 43-37-1	2,000	0 (surface)	0.8	0.364	0.626	0.228	821	98
		1	25.8	0.364	0.037	0.013	821	1,920
		2	50.8	0.364	0.002	0.001	821	26,068

Bkg – background.

6.1.3.3 Scan MDCs

Scan measurements will be used for identifying and measuring activity on exposed surfaces. As part of MARSSIM, it is necessary to determine the scan sensitivity for field instrumentation utilized during field scan surveys. Scan MDCs will be calculated and documented as part of the survey package for each SU. Scan speeds will be established to the maximum extent practical to detect contamination on painted surfaces at or below an MDC of 5,000 dpm/100 cm^2.

To determine the scan sensitivity, it is first necessary to determine the net minimum detectable count rate (MDCR) that a surveyor can distinguish from the background detector response. This is determined using MARSSIM guidance with the following equations:

$$s_i = d'\sqrt{b_i}$$

$$MDCR = s_i \; x \; (\frac{60}{i})$$

Where: s_i = minimum detectable source counts per counting interval

b_i = background counts per counting interval (minutes)

d' = detectability value (Table 6.5 of MARSSIM)

i = observation/counting interval (seconds).

For the purposes of the SSSB surveys, the detectability value (d') will be set at 1.38 as recommended in MARSSIM for the first scanning stage for a true-positive proportion of 95% and a false-positive proportion of 60%. The counting interval is the amount of time for the detector to pass completely over the field of view or the area of concern such as a defined hot spot with a specified width.

From MARSSIM Table 6.6, for a typical Ludlum Model 43-68 background of 350 cpm and a two-second observation interval, the MDCR is 140 cpm and the scan sensitivity is 490 gross cpm. For a typical Ludlum Model 43-37 background of 1,500 cpm and a two-second observation interval, the MDCR is 290 cpm and the scan sensitivity is 1,790 gross cpm by calculation. For a typical Ludlum Model 43-37-1 background of 2,000 cpm and a two-second observation interval, the MDCR is 340 cpm and the scan sensitivity is 2,340 cpm.

The scan MDC is then calculated using Equation 6-10 of MARSSIM as specified below:

$$Scan\ MDC = \frac{MDCR}{\sqrt{p} \cdot \varepsilon_i \cdot \varepsilon_s \frac{probe\ area}{100cm^2}}$$

where: p = surveyor efficiency (50% recommended by MARSSIM)

ε_i = 2 pi instrument efficiency (0.36 per MARSSIM example)

ε_s = surface efficiency (0.54 per MARSSIM example p. 6-43)

Total efficiency ($\varepsilon t = \varepsilon i \times \varepsilon s$) equals 0.194. For first-stage scanning with a 126 cm^2 GFPC at a specified level of performance of 95% true-positive rate and 60% false-positive rate, the detectability value (d') equals 1.38, and the scan MDC is 810 dpm/100 cm^2 on the paint surface. Through a paint coating of 25 mg/cm^2 the total efficiency (εt) is 0.0135 and the scan MDC is 11,640 dpm/100 cm^2.

For a 584 cm^2 GFPC, the surface scan MDC is 360 dpm/100 cm^2 using the MARSSIM efficiency values. The scan MDC through a paint coating of 25 mg/cm^2, assuming total efficiency, $\varepsilon t = 0.0135$, the scan MDC is 5,200 dpm/100 cm^2.

For an 821 cm^2 GFPC, the surface scan MDC is 300 dpm/100cm^2 using the MARSSIM efficiency values. The scan MDC through a paint coating of 25 mg/cm^2, assuming total efficiency, $\varepsilon t = 0.0135$, the scan MDC is 3,830 dpm/100 cm^2.

Following the disposition survey design, the survey is implemented by selecting measurement techniques and methods while ensuring the MQOs are met. This will include the development and implementation of disposition survey packages identifying the survey requirements. The specified number, type, and location of measurements will be performed and documented in accordance with the survey design.

Representative scan MDCs for Ludlum Models 43-68, 43-37, and 43-37-1 detectors are presented in Table 6-2.

6.1.4 Measurement Quantifiability

Measurement quantifiability is an extension of the MDC and refers to the minimum quantifiable concentration (MQC). The MQC applies to the measurement population or data set. Since population statistics will not be used in evaluating the decision rule(s), the MQC will not apply.

Each individual measurement will be evaluated against the AL. As a result, the measurement quantifiability will be established as the MDC for each measurement.

6.1.5 Range

Range applies to the selection of instrumentation (field and laboratory) that has a sufficient response range to provide a measurement result for the RCOPCs at the desired levels. For the SSSB project, this is a surface contamination MDC of 5,000 dpm/100cm^2 for Co-60.

6.1.6 Specificity

Specificity is the ability of the measurement method to measure the RCOPCs in the presence of interferences. For the SSSB project, the primary interferences will include natural ambient background, natural activity in construction materials, and the presence of radioactive waste.

Prior to performing disposition surveys in “impacted” areas, all radioactive waste and materials will be removed. Additionally, the ambient background and background in construction materials will be evaluated in order to correct measurements for the presence of background interferences.

Table 6-2
Scan Measurement MDCs for Select Ludlum Detectors

Detector	Background (cpm)	Layers of Paint	Density-Thickness (mg/cm²)	Instrument Efficiency (ε_i)	Source Efficiency (ε_s)	Total Efficiency (ε_t)	s_i	MDCR (cpm)	Probe Area (cm²)	Scan MDC (dpm/100 cm²)
Ludlum 43-68	350	0 (surface)	0.8	0.360	0.540	0.194	4.71	141	126	817
		1	25.8	0.364	0.037	0.013	4.71	141	126	11,862
		2	50.8	0.364	0.002	0.001	4.71	141	126	185,550
Ludlum 43-37	1,500	0 (surface)	0.8	0.360	0.540	0.197	9.76	293	584	361
		1	25.8	0.364	0.037	0.013	9.76	293	584	5,298
		2	50.8	0.364	0.002	0.001	9.76	293	584	82,876
Ludlum 43-37-1	1,800	0 (surface)	0.8	0.360	0.540	0.194	10.69	321	821	284
		1	25.8	0.364	0.037	0.013	10.69	321	821	4,128
		2	50.8	0.364	0.002	0.001	10.69	321	821	64,579

6.1.7 Ruggedness

Ruggedness relates to the ability of the instrument to perform in hostile, hazardous, or variable environments. For example, it is not uncommon for field measurements to be conducted in elevated temperature and humidity conditions. Instrumentation will be selected that will be reliable in the environments in which it will be used.

6.2 Survey Unit/M&E Preparation

Prior to implementing the disposition surveys, the M&E may be prepared. Preparation may include partial disassembly as required to access inaccessible or difficult-to-measure surfaces. Loose materials and scale may also be removed with the goal that the “as found” condition will be measured to accurately assess the condition of the areas in order to make an informed and defensible decision.

6.3 Measurement Techniques and Methods

The measurement techniques and methods used for clearance of M&E will include surface scans for beta activity, direct static measurements for beta activity, smears for removable gross beta activity, and paint samples for isotopic analysis via gamma spectroscopy. Additional measurement techniques and methods that may be utilized as directed by the RCS or PRSO include general gamma scans or in situ gamma spectroscopy measurements.

Surface scans will be performed by passing the detector over the surface of the M&E at a distance of approximately one-half inch from the surface and at a lateral speed such that the scan MDCs can be demonstrated to meet the applicable ALs. Direct static measurements will be performed by placing the detector on contact with the surface of the M&E and collecting a scalar count over a specified time (typically one minute) to ensure the proper detection sensitivities. Each smear will be collected over an area of approximately 100 cm^2. Gross beta smears will be dry paper or cloth smears.

All surveys will be performed and all samples will be collected in accordance with project field standard operating procedures (SOP), the SSSB Radiation Protection Plan (RPP) (APTIM, 2021d), and the SSSB Sampling and Analysis Plan (SAP) (APTIM, 2021e).

6.4 Instrumentation

Instruments will be selected that can adequately detect the RCOPCs at the necessary detection sensitivities in the field and laboratory environments. A list of instruments that may be used during the SSSB project is provided in Table 6-3. Instruments used for both direct measurements

and surface scans have detection sensitivities presented for both fixed-point measurements and scans. Detection limits for instruments used for total contamination measurements will have a detection sensitivity of no greater than 5,000 dpm/100 cm^2.

Table 6-3
Survey Instrumentation

Instrument/ Detector	Detector Type	Radiation Detected	Calibration Source	Typical Detection Capability	Use
Ludlum Model 2350/2221 w/43-68, 43-98 or 43-94	GFPC (126 cm^2)	Beta	Tc-99 (beta)	~350 dpm/100 cm^2 ~1,500 dpm/100 cm^2	Direct measurements and surface scans
Ludlum Model 2350/2221 w/43-93	Plastic Scintillation (100 cm^2)	Beta	Tc-99 (beta)	~600 dpm/100 cm^2 ~3,000 dpm/100 cm^2	Direct measurements and surface scans
Ludlum Model 2350/2221 w/43-37	GFPC (550 cm^2)	Beta	Tc-99 (beta)	~2,000 dpm/100 cm^2	Surface scans only
Ludlum Model 2350/2221 w/44-40	Shielded GM (15.5 cm^2)	Beta	Tc-99 (beta)	~2,000 dpm/100 cm^2 ~6,000 dpm/100 cm^2	Direct measurements and surface scans
Ludlum Model 2929 or 3030	Shielded GM	Beta	Tc-99 (beta)	~120 dpm/100 cm^2 ~50 pCi/sample	Smear and air sample counting

GM – Geiger–Müller.

The instrument detection capabilities presented in Table 6-3 are based on background and sample count times of one minute, a scan speed of one detector width per second, a surface efficiency of 50%, and typical background count rates. Where two values are presented in the table, the first value corresponds to the detection sensitivity for direct measurements while the second value is for surface scanning. The count times and scan speeds may be modified as necessary for better detection sensitivities as necessary.

6.5 Measurement Performance Indicators

Measurement performance indicators will be used to evaluate the measurement methods. These include the use of background measurements, measurement replicates, and analysis of method spikes or standards. These are performed to measure the potential bias in measurements and measurement accuracy.

6.5.1 Blanks/Background

Ambient background measurements will be performed on all instruments prior to use. This will be performed as one of the instrument performance indicators and used to determine if the

instrumentation has become contaminated. The daily background will be plotted to track any trends and identify any underlying concerns that may need to be addressed.

6.5.2 Replicate Measurements

Replicate measurements will be performed at a frequency of 5% to assess the accuracy of the measurements. This will include either duplicate measurements for each disposition survey performed at a frequency of one duplicate measurement for every 20 measurements collected or the reperformance of a full-disposition survey at a frequency of one survey for every 20 surveys performed. The preference is to reperform a full survey, as the statistics will be more comparable on a population basis rather than on an individual measurement. The same replicate frequency will apply for analytical samples such as smears and volumetric samples.

6.5.3 Method Spikes or Standards

Method spikes will not be utilized for on-site measurements; however, the analysis of standards will be performed daily as part of the instrument performance indicators and will be used to measure potential bias in the field measurements and samples.

6.6 Instrument Performance Indicators

Prior to the use of any instrument, a general inspection of the operational condition of the instrument will be performed. Performance tests shall meet the requirements of American National Standards Institute (ANSI) N323A (ANSI, 1997) and APTIM radiological instrumentation operation procedures. These may include visual inspection and battery conditions, verification of current calibration, background check, and response checks.

6.6.1 Instrument Inspection

All instrumentation will be inspected daily, prior to use, and based on physical damage that may impact the instrument’s use and reliability. This includes all cable connections, the detector’s active surface, and the instrument’s display and output. Instruments requiring quench gases will also be verified to have an adequate supply as required.

6.6.2 Calibration

Proper calibration of survey instrumentation is essential to ensure adequate measurement of the radioactive emissions and energies of interest. All instrumentation will be calibrated annually and following any repair that may affect the instrument’s calibration. Instruments will be calibrated by an approved vendor using sources traceable to the National Institute of Standards and Technology. A copy of the calibration certification will be retained as a project record.

6.6.3 Daily Performance Test

Upon receipt and verification of a valid instrument calibration, all instruments will receive baseline testing in accordance with project SOPs. This will include a background evaluation and statistical testing such as Chi Square testing for scalar counters and a baseline response for ratemeters. These will be performed to establish performance standards in accordance with the SOPs for daily testing when the instruments are in use. Instruments passing the daily testing criteria will be approved for continued use whereas instruments failing the daily testing criteria will be removed from service, repaired as necessary, and/or sent for maintenance and recalibration.

All daily performance tests and background and source checks will be documented and plotted against the performance testing criteria to check for subtle trends that may indicate a developing problem with the instrumentation. This documentation will be retained as a project record.

7.0 Evaluation

The data evaluation and assessment phase of the data life cycle includes the interpretation of the disposition survey results. For the SSSB project, this review has been simplified in that all measurements must be below the ALs and the decision rules will be directly assessed. Population statistics and the statistical evaluation of the data and any elevated area assessments will not be utilized in the evaluation of the M&E.

7.1 Data Quality Assessment

The data quality assessment will determine that the data collected are of the correct type, quality, and quantity to support the final decision. This includes a review of the survey design, collected data and any assumptions that have been made, and a statistical testing of the data to ensure they support the conclusions that have been made.

The survey package and disposition survey design will be assessed by the Project Health Physicist (or designee) to ensure the measurements as specified have been completed and to identify any deficiencies or deviations that may need to be addressed. As stated previously, population statistics will not be evaluated, greatly simplifying the data assessment; however, simple statistics will be performed on the data sets to ensure an adequate number of measurements have been performed to support the final decision. The number of measurements required will be determined in accordance with Section 5.5.2 of MARSSIM by calculating the relative shift of the data set and using Table 5.5 of MARSSIM to verify that an adequate number of measurements were collected.

7.2 Sign Test

MARSAME implementation typically includes a statistical evaluation of the data using either the Sign test or Wilcoxon Rank Sum test nonparametric tests. For the SSSB project, the Sign test will not be performed, as each measurement will be directly assessed against the applicable ALs; however, as previously stated, all measurements will be required to meet the ALs, thereby simplifying any statistical testing.

7.3 Evaluate Results

The survey and measurement results will be evaluated to ensure adequate sensitivity to be able to evaluate the data against the ALs and decision rules. Additionally, the daily instrument performance test during the time the surveys were performed will be reviewed to ensure the survey instrumentation was performing properly to ensure the validity of the data.

8.0 Decision

Decision-making is the final phase of the data life cycle. Once all the data have been reviewed and assessed, a decision is required as to whether to accept or reject the null hypothesis. The decision rules presented previously in Section 4.3 will be used to reach the final decision.

For the SSSB project, the MARSAME Scenario A hypothesis will be utilized. Scenario A assumes the level of activity associated with the M&E exceeds the AL. In the event any individual measurement exceeds the AL and/or the decision rules are proven true, the null hypothesis will be verified and the alternate action will apply. If all measurements are below the ALs and the decision rules are proven false, then the null hypothesis will be rejected and the M&E will be released for unrestricted use.

9.0 Quality Assurance and Quality Control

Quality control (QC) surveys will be performed to monitor the effectiveness of the disposition survey process. All SUs will have 5% of the fixed readings, scans, and smears repeated. Smears will be repeated in the same general vicinity of (i.e., adjacent to) the original measurement location.

QC samples will be collected at a frequency of at least 5% (one QC sample per 20 samples). Survey and sample data will be generated during implementation of this plan. This will include direct monitoring results, scan survey results, smear sample results, and bulk material sample results for paint, water, and other materials collected during D&D operations. As a result, data quality will be of vital importance to ensure representative data, detection sensitivities and data accuracy, and reproducibility. This will be controlled through the implementation of the project SAP and the project SOPs. Specific sections of the SAP as they apply to the generation of survey data and sampling data are summarized in the following sections.

9.1 Sampling Design and Rationale

As specified in Chapter 1.0 of this plan, the D&D of the SSSB will involve the removal of portions of the vessel for unrestricted release after they have been found to meet the release criteria. The remaining portions of the vessel and any M&E not surveyed in accordance with this plan for unrestricted release will be disposed as LLRW or LLMW to prevent the inadvertent release of radioactively contaminated M&E to the public.

In order to demonstrate compliance with the ALs, surveys will be performed, samples collected, and data evaluated as summarized in this plan and the SAP. Each defined survey area will be documented in a survey package so that the data can be assigned to a specific area/section of the vessel.

9.2 Sampling Locations

Sampling locations will be defined in each survey package. A random-start triangular grid pattern will be used to layout sample locations in Class 1 and Class 2 SUs. The number of calculated survey locations (n) is used to determine the spacing (L) of a systematic pattern by:

$$L = \sqrt{\frac{A}{0.866\,n}} \qquad for\ a\ triangular\ grid$$

where: A = area of the SU.

After ‘L’ is determined, a random coordinate location is identified for a survey pattern starting location.

Sampling locations in Class 3 survey packages will consist of both randomly selected and biased locations. Scans, if less than 100% of the area, will be biased to include floors and horizontal surfaces and any other areas dirt and dust would accumulate. Paint samples will be collected at fixed measurement and smear sampling locations identified in the survey packages. Additional biased samples and measurements will be collected at locations that will be most representative of the material to be released and the most likely to contain elevated activity.

All survey and sample results will be documented and reviewed to ensure M&E to be released for unrestricted use meets the unrestricted release criteria. Survey package documentation will be retained as a project record.

9.3 Sampling Methods

All surveys will be performed and all samples will be collected in accordance with the project field SOPs, RPP, and SAP. These include the methods for collection of samples and the performance of surveys, including the QC of field instruments.

9.4 Instrument Selection, Calibration, and Operation

Instruments and equipment will be selected to measure the RCOPCs at adequate detection sensitivities to ensure that survey measurements can assess the RCOPCs in accordance with the unrestricted release criteria. All samples, including smears for isotopic analysis, will be analyzed by the approved off-site laboratory. Smear and material samples may also be analyzed with onsite counting equipment for more rapid results prior to shipment to the off-site laboratory for further analysis.

The instruments and equipment that are scheduled to be used for this plan are the following:

- Ludlum Model 2350/2221 with 43-37, 43-68, 43-93, 43-98, or 43-94
- Ludlum Model 2350/2221 with 44-10
- Ludlum Model 2929, 3030, or equivalent
- Gamma spectroscopy system (off-site laboratory).

Other portable radiological survey instruments may be used after demonstrating their surface MDCs are less than or equal to 5,000 dpm/100 cm^2. The calibration, maintenance, testing, and inspection protocols for the field equipment listed above are provided in the project SOPs.

9.5 Field Quality Control Requirements

Replicate measurements will be performed at a frequency of 5% to assess the accuracy of the measurements. This will include either duplicate measurement for each disposition survey performed at a frequency of one duplicate measurement for every 20 measurements collected or the reperformance of a full disposition survey at a frequency of one survey for every 20 surveys performed.

For analytical samples (e.g., smears and volumetric samples for isotopic analysis), the same replicate frequency will apply.

9.6 Analytical Methods Minimum Detectable Activity and Limit of Detection/Limit of Quantitation Requirements

The analytical methods, minimum detectable activity, and limits of detection/limits of quantitation requirements for all samples collected during this project are provided in the SAP.

9.7 Analytical SOPs, Calibration, and Maintenance Requirements

Analytical SOPs, instrument calibrations, and maintenance, testing, and inspections for this project are provided in the SAP.

10.0 References

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MARLAP, 2004, ***Multi-Agency Radiological Laboratory Analytical Protocols Manual,*** Nuclear Regulatory Commission NUREG-1576, Environmental Protection Agency EPA 402-B04-001A, National Technical Information Service NTIS PB2004-105421, July.

U.S. Nuclear Regulatory Commission, Title 10 Code of Federal Regulations Part 20, ***Standards for Protection Against Radiation***.

U.S. Nuclear Regulatory Commission, 2020, ***Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions,*** NUREG-1507, Revision 1, August.

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U.S. Nuclear Regulatory Commission (NRC), 2000, ***Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM),*** NUREG-1575, Rev. 1; EPA 402-R-97-016, Rev. 1; DOE/EH-0624, Rev. 1; Revision 1, August.

U.S. Nuclear Regulatory Commission (NRC), 1981, ***Control of Radioactively Contaminated Material***, I&E Circular No. 81-07, May.

APPENDIX A

EXAMPLE SURVEY PACKAGE OUTLINE

SSSB
MARSAME Survey Package
SSSB-SU-001
Hold No. 3 Starboard
(Example Outline)

Reviewed by: ____________________________________
Radiological Controls Supervisor (RCS)

Approved by: ____________________________________
Project Radiation Safety Officer (PRSO)

- 1.0 OBJECTIVE
- 2.0 BACKGROUND
- 3.0 INITIAL ASSESSSMENT
  - 3.1 Categorization
  - 3.2 Description
    - 3.2.1 Physical Attributes
    - 3.2.2 Radiological Attributes
  - 3.3 Sentinel Surveys
  - 3.4 Disposition Options
- 4.0 DECISION INPUTS
  - 4.1 Null Hypothesis
  - 4.2 Radionuclides of Concern
  - 4.3 Action Levels
  - 4.4 Decision Rules
- 5.0 SURVEY DESIGN
  - 5.1 Survey Unit
  - 5.2 Survey Boundaries
  - 5.3 Design
- 6.0 IMPLEMENTATION
  - 6.1 Measurement Techniques
  - 6.2 Measurement Quality Objectives
    - 6.2.1 Decision Errors
    - 6.2.2 Detection Limits
    - 6.2.3 Measurement Uncertainty
    - 6.2.4 Detection Capability
    - 6.2.5 Range
    - 6.2.6 Specificity
    - 6.2.7 Ruggedness
- 7.0 EVALUATION
  - 7.1 Data Quality Assessment
  - 7.2 Sign Test
  - 7.3 Reference Area
- 8.0 DECISION
- 9.0 QUALITY ASSURANCE

10.0 REFERENCES

Survey Package Figure 1 – Survey Unit Location Map

Survey Package Figure 2 – Survey Unit Photograph

Survey Package Figure 3 – Survey Unit Radiological Survey Map

Survey Package Figure 4 - Survey Unit Radiological Survey Instructions

Survey Package Figure 5 – Survey Unit Radiological Survey Data Sheet

ATTACHMENT 7

FINAL STATUS SURVEY SUMMARY

The information supplied in this summary of the Final Status Survey (FSS) for the SSSB includes the topics listed in NUREG-1757, Vol. 2, Section 4.4 and the general site conditions anticipated after completion of SSSB D&D activities. This summary includes the following:

- Brief overview describing the FSS design;
- Description and map or drawing of impacted areas of the site, area, or building classified by residual radioactivity levels (Class 1, 2, or 3) and divided into survey units, with an explanation of the basis for division into survey units (maps should have compass headings indicated);
- Description of the background reference areas and materials, if they will be used, and a justification for their selection;
- Summary of the statistical tests that will be used to evaluate the survey results, including the elevated measurement comparison, if Class 1 survey units are present; a justification for any test methods not included in MARSSIM; and the values for the decision errors (α and β) with a justification for α values greater than 0.05;
- Description of scanning instruments, methods, calibration, operational checks, coverage, and sensitivity for each media and radionuclide;
- Description of the instruments, calibration, operational checks, sensitivity, and sampling methods for in situ sample measurements, with a demonstration that the instruments and methods have adequate sensitivity;
- Description of the analytical instruments for measuring samples in the laboratory, including the calibration, sensitivity, and methodology for evaluation, with a demonstration that the instruments and methods have adequate sensitivity;
- Description of how the samples to be analyzed in the laboratory will be collected, controlled, and handled; and
- Description of the FSS investigation levels and how they were determined.

1.0 Overview of FSS Design

1.1 Data Quality Objectives

The MARSSIM DQO development process consists of six steps:

1. State the Problem
2. Identify the Decision
3. Identify Inputs to the Decision
4. Define the Study Boundary
5. Develop a Decision Rule
6. Specify Limits on Decision Errors

1.1.1 State the Problem

A portion of the Alabama Shipyard (ASY) will be used for dismantlement and disposal (D&D) of the SSSB. After the SSSB D&D is complete, the portion of the ASY where D&D took place must meet the license termination criteria of 10 CFR 20.1402 in accordance with the Notional Framework for Regulation of SSSB Dismantlement and Disposal[1].

1.1.2 Identify the Decision

Following completion of demolition of the SSSB and removal of all radioactive waste from the D&D site at ASY, a Final Status Survey (FSS) will be performed on the ASY D&D site to demonstrate that the residual radioactivity meets the license termination criteria of 10 CFR Subpart E Section 1402[2], summarized as Total Effective Dose Equivalent (TEDE) <25 mrem/y to an average member of the critical group and As Low As Reasonable Achievable (ALARA) below that level.

The FSS is comprised of media-specific scans, fixed-point total and removable contamination measurements, and samples designed to demonstrate license termination criteria have been met

[1] Solicitation No. N0002418R4339,05 November 2019, Issued by Naval Sea Systems Command (HQ), Attachment J-7 – Framework for Regulation of SSSB Dismantlement and Disposal

[2] A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels which are ALARA must consider any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

using the protocols and guidance contained in NUREG-1575 (MARSSIM) for open land areas and structures for the expected radionuclides of concern associated with the SSSB D&D project.

The decision to be made is whether the portion of the ASY used to perform SSSB D&D meets the license termination criteria of 10 CFR 20.1402.

1.1.3 Identify Inputs to the Decision

Inputs to the decision consist of measurements and laboratory data collected from:

- Surface scans
- Total contamination measurements
- Removable contamination measurements
- Media samples collected from pre-established locations
- Biased investigational samples and measurements.

These measurements and samples are collected from reference areas (i.e., survey unit baseline surveys performed prior to SSSB arrival) and from survey units during the FSS.

Inputs to the decision

Survey Unit Type	Surface scans	Direct Measurements	Smears	Samples	Biased Measurements and Samples
Structures (concrete, asphalt)	Beta	Beta	Beta	NA	As determined necessary from measurement and sample data
Open land areas (soil, sediment, limestone and crushed gravel)	Gamma	Gamma	NA	Media samples	

Radiological Constituents of Potential Concern (RCOPC)

The predominant radionuclides in the SSSB are expected to be Co-60 and Ni-63. Table 1 lists the isotopes that are anticipated to be present at greater than 1% of the total radioactivity based on general characterization data for U.S. Navy Unfiltered Shipyard Waste. Their concentrations and relative presence will be fully developed following characterization of SSSB waste streams in accordance with 10 CFR 61.

Table 1
Radiological Constituents of Potential Concern

Isotope	Half Life (years)	SSSB Fractional Abundance	Soil DSV (pCi/g)	Surface DSV (dpm/100 cm^2)
Carbon-14	5,730	5.38E-2	12	3,700,000
Iron-55	2.73	9.88E-2	10,000	4,500,000
Cobalt-60	5.27	5.70E-1	3.8	7,100
Nickel 63	100.1	2.61E-1	2,100	1,800,000
Cesium-137	30	1.04E-2	11	28,000
Total		9.936E-1		

Based on currently available information on radionuclide fractional abundance and published NRC default screening values (DSV), Co-60 is the limiting (bounding) isotope. Co-60 is the bounding radionuclide because, for other radionuclides present, either the radionuclide's fractional abundance is very low (e.g., C-14 and Cs-137); the DSV is very high (e.g., C-14 surface, Fe-55 and Ni-63 soil and surface) or the combination of both lower abundance and higher DSV indicate they are not limiting (e.g., C-14 and Cs-137 soil). This will be reviewed and confirmed following completion of SSSB characterization.

Consequently, non-isotope-specific beta and gamma measurements are attributed to Co-60. That is, gross beta activity and gross gamma activity above background reference is considered to be due to Co-60.

For the FSS, the Derived Concentration Guideline Limit (DCGL) equals the DSV for each radionuclide. Radionuclide concentrations will be measured with minimum detectable concentrations (MDC) that are at least as low as the default screening values for the matrix surveyed or sampled.

1.1.4 Define the Study Boundaries

Map and Description of Area

The ASY area currently expected to be used for radioactive material processing, storage, and shipment is show on Figure 1. A pre-SSSB placement baseline radiological survey will be performed on existing soils and structures prior to installation of a lined stormwater containment system under the SSSB work area. All dismantlement operations take place after the SSSB has been placed "on-the hard" in the ASY dismantlement area. The baseline survey will establish initial conditions and will be used as reference areas for the FSS. Baseline survey and sample methodologies and media including instrumentation, survey parameters and sampling densities will match the FSS to facilitate data comparison.

During SSSB D&D, the significant majority of radioactivity is contained within the confines of the wet pit located inside the clean enclosure (i.e., the SSSB superstructure). The wet pit and its contents (e.g., empty fuel storage racks, tools, and equipment) will be sectioned and packaged onboard the SSSB for disposal at a radioactive waste disposal facility. SSSB components with significant radioactivity (e.g., resin vessels and filters) will be removed from their respective systems and packaged for disposal onboard the SSSB.

In parallel with wet pit decommissioning, forward and aft portions of the SSSB intended for unrestricted release will be surveyed in accordance with MARSAME protocols, separated from the rest of the SSSB, and then staged for sectioning and release.

At the time of the FSS, it is anticipated that the portion of ASY used for SSSB D&D will be categorized and classified as an Impacted Class 2 area. A Class 3 buffer area with a 40-foot nominal width will be designated around the Class 2 area(s) . Packaged waste storage areas will be treated as Impacted Class 3 areas. No Class 1 areas are presently anticipated. Survey unit areas will be consistent with the MARSSIM suggested survey unit areas as shown in Table 2.

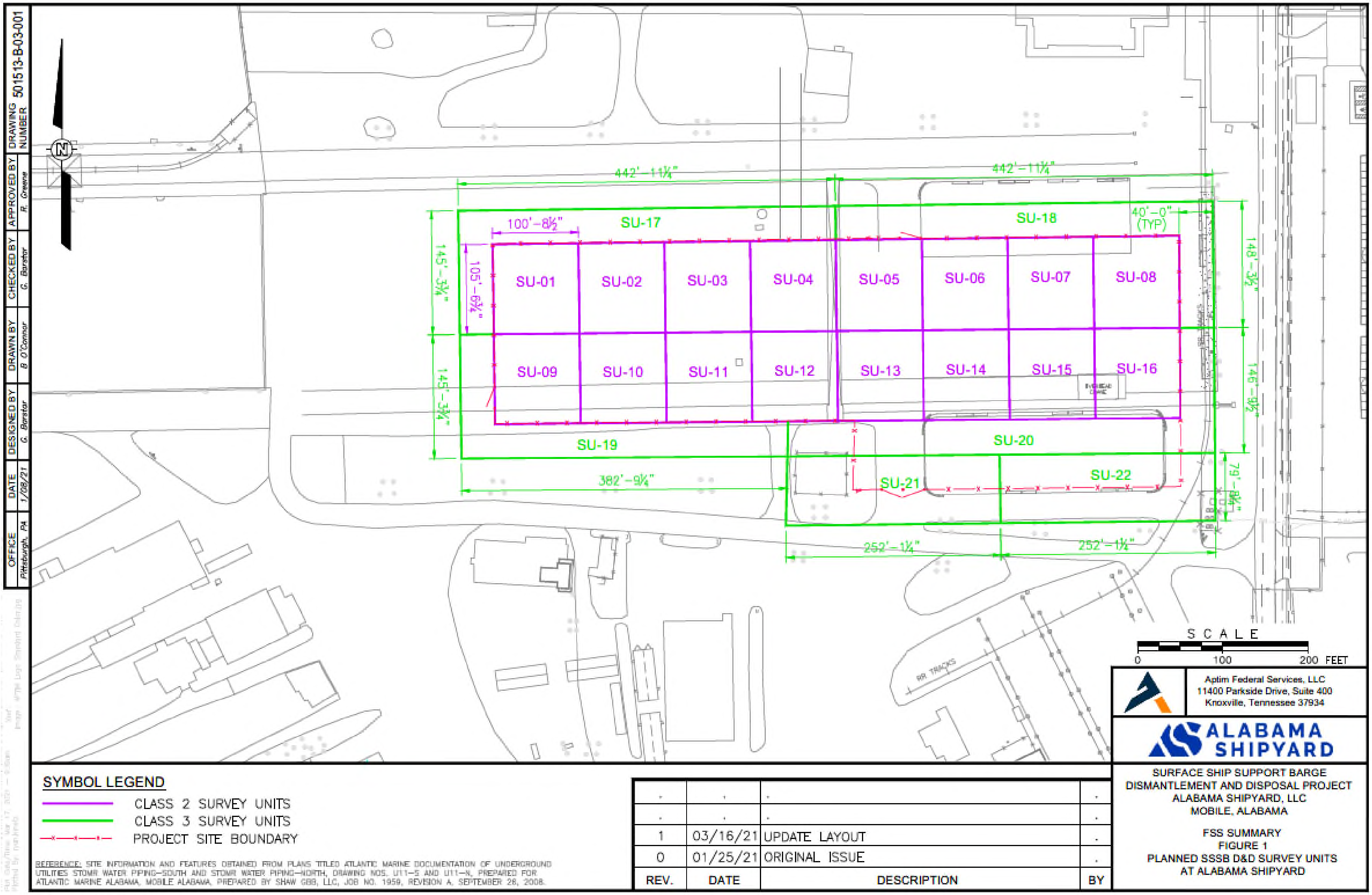
Table 2
MARSSIM Suggested Area Limits

Classification	Suggested Area
Class 1	
Structures	Up to 100 m^2
Land Areas	Up to 2,000 m^2
Class 2	
Structures	100 m^2 to 1,000 m^2
Land Areas	2,000 m^2 to 10,000 m^2
Class 3	
Structures	No limit
Land Areas	No limit

If an area classification is increased (e.g., from Class 3 to Class 2), SU area sizing will be decreased to be consistent with the new classification size limits.

Figure 1 shows the currently anticipated portions of the ASY site in which SSSB D&D activities will occur. These areas are divided into Class 2 and Class 3 survey units consistent with residual radioactivity levels expected during SSSB D&D. Boundaries will be adjusted to reflect the actual ASY area used for D&D and to separate structures from open land areas (e.g., concrete structures from gravel-filled areas).

Figure 1
Planned SSSB D&D Survey Units at Alabama Shipyard



Nearly all the radioactivity present in the SSSB is contained in the wet pit and in systems attached to the wet pit such as wet pit circulating system. This waste will be removed and packaged for transport within the confines of the SSSB and containment enclosure. The work area below the SSSB will be lined with a linear low-density polyethylene (LLDPE) geomembrane and protective vehicle mats. The D&D approach together with the radiological controls implemented during D&D will minimize contamination potential of the lined stormwater containment system under the SSSB.

The SSSB D&D work area is a roughly 170,000 ft^2 (15,800 m^2) area approximately 810 feet long in the east-west direction by 210 feet in the north-south direction and is planned to meet the definition of a MARSSIM Impacted Class 2 area:

> *Class 2 areas are impacted areas where concentrations of residual activity that exceed the $DCGL_w$ are not expected.*

The D&D work area is bordered on all sides by a 40-foot-wide buffer area that is planned to meet the definition of a MARSSIM Impacted Class 3 area:

> *Class 3 areas are impacted areas that have a low probability of containing areas with residual radioactivity.*

This buffer area is divided into four survey units (SU-17 through SU-20), each approximately 22,000 ft^2 (2,000 m^2) in area. Packaged waste will be stored in a designated area approximately 500 feet by 80 feet located adjacent to the south side buffer area on the east end. The packaged waste storage area consists of two Class 3 survey units (SU-21 and SU-22) with a combined size of approximately 40,000 ft^2 (3,700 m^2), as shown on Figure 1.

Background Reference Areas and Materials

SSSB RCOPCs include mixed activation products associated with corrosion deposits activated during reactor operation, the most prominent radionuclide (based on concentration and emission) being Co-60. Activated corrosion products are not commonly encountered as a component of natural background.

Additionally, ASY has no history of work involving nuclear-powered vessels or other non-sealed radioactive sources; consequently, activated corrosion products are not expected to be present on the site. This assumption will be validated by baseline surveys of the work areas prior to positioning the SSSB for D&D.

Prior to the arrival of the SSSB at ASY, background reference data will be collected during the baseline survey from the same SUs and locations that will be surveyed during the FSS after the physical SSSB D&D is completed. Collecting baseline data (i.e., background reference data) prior to SSSB arrival provides reliable data on the initial conditions at the portion for the ASY used for SSSB D&D.

Background reference data will be collected for each type of surface (e.g., structures and soil) and each matrix (concrete, asphalt, soil, and base materials, including existing limestone and crushed gravel) during the baseline survey for use with gross activity (i.e., non-radionuclide specific) data.

Baseline data for soil and fill areas will include static measurements and surface scans with a Ludlum Model 44-10 2-inch by 2-inch sodium-iodide (2x2 NaI) detector (or equivalent) and sample collection for isotopic analysis.

Baseline data for structures, including concrete pads, are static measurements and surface scans for beta activity using a Ludlum Model 43-68 gas flow proportional counter (GFPC) and a Ludlum Model 43-37 large area gas flow proportional counter or detectors of approximately equivalent sensitivity.

1.1.5 Develop a Decision Rule

The FSS data quality objectives are based on rejecting the hypothesis that the survey unit exceeds the release criteria established based on the unity rule and accepting the alternative hypothesis that the survey unit meets the release criteria:

> H_o: the residual radioactivity in the survey unit exceeds the release criterion.
>
> H_a: the residual radioactivity in the survey unit meets the release criterion.

Since multiple radionuclides may be present at the site, each sample collected (i.e., soil, sediment, and base materials including existing limestone and crushed gravel) will be analyzed for gamma-emitting RCOPCs and naturally occurring and environmental radionuclides (e.g., K-40, Ra-226, and Cs-137) by gamma spectroscopy and by liquid scintillation for low-energy beta emitters (0-100 keV), including H-3 ($E_{\beta max}$ = 18.6 keV), C-14 ($E_{\beta max}$ = 156 keV), and Ni-63 ($E_{\beta max}$ = 66 keV). The unity rule will be applied to evaluate the isotopic results obtained from samples collected from each location. That is:

$$\sum_{1}^{i} \frac{C_i}{DCGL_i} \leq 1$$

Where: C_i = measured activity mass of the i^{th} radionuclide in pCi/g
$DCGL_i$ = derived concentration guideline level for the i^{th} radionuclide in pCi/g

Explicitly, for each location, the Sum of Fractions (SoF) is:

$$SoF = \frac{C_{LEB}}{DCGL_{C14}} + \frac{C_{Co60}}{DCGL_{Co60}}$$

If the mean of the Sum of Fractions exceeds 1, the SU fails to meet the release criterion and the null hypothesis, H_o, is accepted.

If the unity rule is satisfied for every sample location (i.e., SoF ≤1), the average SU residual radioactivity meets the release criterion and H_o is rejected.

If the unity rule is not satisfied for every sample location, statistical testing is used to evaluate the average activity of the survey unit based on the random start samples.

Per MARSSIM Section 8.2.3, the Wilcoxon Rank Sum (WRS) test should be used when the radionuclide of concern appears in background or if measurements are made that are not radionuclide specific. The Sign test should be used if radionuclide specific measurements are made and the contaminant is not present in background. The Sign test may also be used if the contaminant is present at such a small fraction for the $DCGL_W$ value as to be considered insignificant.

As slightly more samples are collected from the SU when using the Sign test than when using the WRS test, the number of samples required (N) will be determined from MARSSIM Table 5.5.

1.1.6 Specify Limits on Decision Errors – Fixed Data Points

A Type I decision error occurs when the null hypothesis is rejected when it is true (i.e., false-positive error). The probability of making a Type I error is denoted by alpha (α) and is set at 0.05 (alpha = 0.05).

A Type II decision error occurs when the null hypothesis is accepted when it is false (i.e., false-negative error). The probability of making a Type II error is denoted by beta (β) and is set at 0.05 (beta=0.05).

2.0 Final Status Survey

2.1 Radiological Survey Instrumentation

Proper selection and use of radiological survey instrumentation will ensure sensitivities are sufficient to detect the RCOPCs at the minimum detection sensitivities required. Table 3 lists the instruments, types of radiation detected, and calibration sources that may be utilized on site.

Table 3
Survey Instrumentation

Instrument/Detector*	Detector Type	Radiation Detected	Calibration Source	Use
Ludlum Model 2350/2221 with 43-68.	Gas-flow prop. (126 cm^2)	Beta	Tc-99 (β)	Direct static measurements and surface scans
Ludlum Model 2350/2221 with 43-37-1	Gas-flow prop. (821 cm^2)	Beta	Tc-99 (β)	Surface scans only
Ludlum Model 2929 or 3030	Phoswich	Alpha/Beta	Tc-99 (β)	Smear counting
Ludlum Model 2350/2221 with 44-10	2x2 NaI(Tl)	Gamma	Cs-137 (γ)	Gamma walkover scans

* or functional equivalent

2.2 Instrument Calibration

Instruments will be calibrated annually at an off-site facility in accordance with American National Standards Institute Standard N323A-1997, *American National Standard, Radiation Protection Instrumentation, Test and Calibration, Portable Survey Instruments*. Calibration labels showing the instrument identification number, calibration date, and calibration due date are attached to all portable field instruments.

2.3 Sources

All sources used for calibration or efficiency determinations for the survey will be representative of the instrument's response to the identified radionuclides and are traceable to National Institute of Standards and Technology (NIST). The NIST traceable source which will be used during the surveys will be Tc-99 for portable field beta measuring instruments, which is representative of the most limiting RCOPC, Co-60. The Cs-137 button sources used for response checks are not NIST traceable, and NIST traceability is not a requirement for response check sources.

The PRSO will control the radioactive sources used for instrument response checks and efficiency determination. Sources will be stored securely and signed out when needed in the field. A source sign-out log will track the location of all sources when they are removed from storage.

2.4 Scan Surveys

2.4.1 Scan Coverage

Surface scan coverage will be based on the guidance in Section 5.5.3.1 of MARSSIM. A summary of the recommended scan coverages based on survey unit classification is provided in Table 4.

Table 4
Suggested Scan Coverage

Survey Unit Classification	Scan Coverage
Class 1	100%
Class 2	10 – 100%
Class 3	Up to 10%

Because of the ease for performing gamma walkover scans, the gamma scan coverage will be approximately 100% of the area surveyed; however, beta scans performed will be at approximately 10% coverage in accordance with the scan coverage for a Class 3 impacted area and at 25% for Class 2 impacted areas. Additionally, beta scans will only be performed on paved surfaces and structures such as the concrete catch basin. Beta scans will not be performed on unpaved areas or structure covered over with dirt or sediment. Such structures will be identified during the Baseline Survey and the FSS. Depending on the amount of soil/sediment present they will either be cleaned and assessed as structures or the sediments will remain and they will be assessed via soil samples and surface gamma measurements.

All scans will be performed with data logging scalers coupled with a GPS unit in order to map the scan coverage and to provide an estimate for the percent scan performed.

2.4.2 Open Land Area Scans

Open land area scans will be performed using a Ludlum Model 44-10 2x2 NaI detector equipped with a Trimble GPS recorder (or equivalent). The detector will be calibrated at least annually to Cs-137. Detector operability will be verified daily, prior to use.

The scan rate is approximately 0.5 m/s. Per the manufacturer's website, the nominal Model 44-10 response to background direct radiation is 900 cpm per µR/hr. For purposes of estimating instrument detection capability, a background direct radiation level of 8 µR/hr is assumed equivalent to a background count rate of 7,200 cpm.

Determining the scan MDC is based on the premise that there are two stages of scanning. That is, scanning consists of two components: continuous monitoring during which the surveyor listens for a detectable increase in the count rate; followed by stationary sampling as the surveyor pauses after noting increased counts. Since scanning is divided into two stages it is necessary to consider the survey scan sensitivity for each of the stages. The first stage scanning minimum detectable count rate (MDCR) will be higher since the observation interval is 1 second while the second stage pause may be several seconds. The first stage scan MDCR is used to determine the surveyor scan sensitivity.

In addition to real-time, two-stage scanning, walkover scan data will be GPS located, time stamped, logged, and post-processed after the scans are completed.

Per MARSSIM Section 6.7.2.1, an "index of sensitivity" (*d'*), representing the distance between the means of the background and background plus signal in units of their common standard deviation, can be calculated for various decision errors. Selected values for *d'* are tabulated in MARSSIM Table 6.5. From MARSSIM Table 6.5. assuming a true-positive proportion of 0.95 and a false-positive proportion of 0.60 the value of *d'* is 1.38.

For an ideal surveyor the number of source counts required for a specified level of performance is determined by:

$$s_i = d' \sqrt{b_i} \qquad \text{MARSSIM Equation 6-8}$$

Where: s_i = the minimum detectable net source counts in the interval
b_i = the number of background counts in the interval.

For a 7,200 cpm [120 counts per second (cps)] background and a 1-second interval:

$$s_i = 1.38\sqrt{120} = 15 \text{ net cps}$$

The MDCR in counts per minute (cpm) is:

$$MDCR = s_i \times \left({}^{60}/_{i}\right) \qquad \text{MARSSIM Equation 6-9}$$

In this instance the MDCR is equal to 900 net cpm (ncpm) for an observation interval of 1 second or 8,100 gross cpm (gcpm).

The surveyor's actual performance as compared with that which is ideally possible (using the ideal observer construct) provides an indication of the efficiency of the surveyor. Surveyor efficiency was empirically derived to be between 0.5 and 0.75 in NUREG-1507. MARSSIM recommends using an efficiency value of 0.5 when making MDC estimates. However, when detectors are directly coupled to data-logging scalers with GPS tracking, the human surveyor is removed from signal processing and interpretation. Consequently, the surveyor performance factor becomes unity (1).

$$MDCR_{surveyor} = MDCR/\sqrt{p}$$ MARSSIM Section 6.7.2.1

Where: p represents the surveyor efficiency.

For the 2x2 NaI detector coupled with data logging scaler and GPS position recording, the $MDCR_{surveyor}$ equals 900 ncpm.

2x2 NaI Detector Response

The MicroShield® code was used to model 2x2 NaI detector response to 1.0 pCi/g Co-60 (1.6 pCi/cm^3 assuming soil density of 1.6 g/cm^3). The soil contamination area was modeled using the following parameters contained in MARSSIM Section 6.7.2.1:

- Soil density of 1.6 g/cm^3
- Soil radius 28 cm
- Soil thickness 15 cm
- Soil surface to detector distance 10 cm.

The MicroShield® summary is attached to this document. The detector response is calculated following the methodology of NUREG-1507 Rev. 1 Section 6.2.5, Scan MDCs for Land Areas, using the Ludlum Model 44-10 detector response coefficients contained in NUREG-1507 Table 6.3 as summarized in Table 5.

Table 5
Detector Response Calculations

Energy (MeV)	Exposure Rate with Buildup (mR/hr)	NUREG-1507 Table 6.3 Energy Response (cpm per μR/hr)	Response to 1 pCi/g Co-60 (cpm per pCi/g)
0.6	4.299E-08	1,010	4.34E-2
1.0	4.176E-04	550	2.30E+2
1.5	5.801E-4	350	2.03E+2
Total	9.978E-4	---	4.33E2

Assuming a surveyor performance factor of 1, the $MDCR_{surveyor}$ is 900 ncpm and the scan MDC is 2.1 pCi/g Co-60. Assuming a surveyor performance factor of 0.5, the $MDCR_{surveyor}$ is 1,270 ncpm and the scan MDC is 3.0 pCi/g Co-60.

Prior to the FSS, the area will be prepared by sweeping the pavement. The sweepings will be disposed as radioactive waste. For Class 2 areas, approximately 25% gamma walkover scan (GWS) will be performed coupled with a GPS for mapping purposes and reproducibility. For Class 3 areas, GWS coverage will be at least 10%.

2.4.3 Structure and Building Surface Scans (Concrete and Paved Work Areas)

Concrete and paved work areas will be scanned with large area Gas Flow Proportional Counter (GFPC) such as Ludlum Model 43-37-1. Manufacturer's specifications for this detector are:

- Beta-gamma window thickness – 3.4 mg/cm^2
- Detector active area dimensions – 24.25 in. x 5.25 in. = 127.3 in2
- Active detector area – 821 cm2
- Tc-99 4π efficiency (beta only mode) – 30%
- Background (10μ/hr) – 1,000 to 1,800 cpm

Two-stage scanning will be employed with alpha = 0.05 and beta = 0.60. From MARSSIM Table 6.5, the value of d' is 1.38. For an ideal surveyor the number of source counts required for a specified level of performance is determined by:

$$s_i = d'\sqrt{b_i}$$ MARSSIM Equation 6-8

Assuming a scan rate of two detector widths/second (~10 in/s) and a background of 1,500 cpm (25 cps) the interval is 0.5 second and b_i = 12.5 cps. The net source counts per interval (s_i)

needed to yield better than 95% detections with about 60% false positives is 4.9. The MDCR in counts per minute (cpm) is calculated by:

$$MDCR = s_i \times \left({}^{60}/_{i}\right) \qquad \text{MARSSIM Equation 6-9}$$

The MDCR is equivalent to 588 ncpm (2,088 gcpm).

Surveyor efficiency was empirically derived to be between 0.5 and 0.75 in NUREG-1507. MARSSIM recommends using an efficiency value of 0.5 when making MDC estimates. However, when detectors are directly coupled to data-logging scalers with GPS tracking the human surveyor is removed from signal processing and interpretation. Consequently, the surveyor performance factor (*p*) becomes unity (1).

$$MDCR_{surveyor} = MDCR/\sqrt{p} \qquad \text{MARSSIM Section 6.7.2.1}$$

The scan MDC calculation for structure surfaces is:

$$Scan\ MDC = \frac{MDCR}{\sqrt{p}\varepsilon_i\varepsilon_s\frac{probearea}{100\ cm^2}} \qquad \text{MARSSIM Equation 6-10}$$

$$Scan\ MDC = \frac{588}{\sqrt{1}\,(0.30)(0.25)(8.21)} = 950\ dpm/100\ cm^2$$

2.5 In-situ Measurements and Sampling

2.5.1 Open Land Areas

2.5.1.1 Number of Samples and Measurement Locations

The Shift (Δ) is defined as the difference between the DCGL and the Lower Bound of the Gray Region (LBGR) per MARSSIM Section 5.5.2.2:

$$\Delta = DCGL - LBGR$$

The Relative Shift is defined as the difference between the DCGL and the LBGR divided by σ.

$$\frac{\Delta}{\sigma} = \frac{DCGL - LBGR}{\sigma}$$

Estimates of contaminant variability (σ) are developed from baseline survey data. For purposes of estimating the required number of in situ samples and measurements, the LBGR will be adjusted such that $\Delta/\sigma = 3$.

For the WRS test the number of samples for both the survey unit and the reference area (N/2) required is determined from MARSSIM Table 5.3 for the condition where:

alpha (α) = 0.05, beta (β) =0.05 and $\frac{\Delta}{\sigma} = 3.0$

From Table 5.3: N/2 = 10.

For the Sign test the number of samples for the survey unit and required for use with the Sign test is determined from MARSSIM Table 5.5 for the condition where:

Alpha (α) = 0.05, beta (β) =0.05 and $\frac{\Delta}{\sigma} = 3.0$

From Table 5.5: N = 14.

2.5.1.2 Class 2 Sample and Measurement Locations

For Class 2 areas, a random start triangular grid systematic sampling pattern is used. The calculated number of sample locations is used to determine the spacing, L, of the systematic triangular grid pattern. For a triangular grid:

$$L = \sqrt{\frac{A}{0.866\, n}}$$

MARSSIM Equation 5-7

For areas of 1,050 m^2 $L = 9.6$ m.

For structures and surfaces, total and removable contamination measurements are taken at the same location. For open land areas, solid samples are collected and 2x2 NaI detector direct radiation measurements are made at the same locations.

2.5.1.3 Class 3 Measurement and Sampling Locations

For Class 3 locations, measurement and sampling locations are determined by choosing random x and y sampling coordinates within the SU. For structures and surfaces, total and removable contamination measurements are taken at the same location. For open land areas, solid samples are collected and 2x2 NaI detector direct radiation measurements are made at the same locations.

2.5.2 Structures and Surfaces

2.5.2.1 Minimum Detectable Activity – Fixed Point Measurements

The MDA is dependent upon the counting time, geometry, sample size, detector efficiency, and background count rate. As a data quality objective, the MDAs will be set to approximately equal to or less than 50 percent of the applicable screening value. For beta surveys, Co-60 is the beta-emitting radionuclide of interest. The equation used for calculating the MDA for portable field instrumentation is:

$$MDA = \frac{3 + 3.29 * \sqrt{R_b t_s \left(1 + \frac{t_s}{t_b}\right)}}{\varepsilon_i * \varepsilon_s * \frac{Area}{100} * t_s}$$

Where: R_b = Background count rate (counts per minute)

t_s = Sample counting time (minutes)

t_b = Background counting time (minutes)

ε_i = Intrinsic (2π) instrument counting efficiency

ε_s = Surface efficiency (0.25 for beta emitters with maximum beta energy < 0.400 MeV. Smear counting MDA is based on 4 pi efficiency with no surface efficiency correction)

Area = Area of measurement (cm^2).

Detection limits for the RCOPCs in solid samples (e.g., soil, sediments, gravel) are set at 10 percent or less of the screening values for surface soil. The MDA and MDC requirements for all samples collected during this project are provided in the SSSB project Sampling and Analysis Plan.

2.5.3 Removable Contamination

Removable contamination is measured by wiping a dry filter paper over a 100 cm^2 area and analyzing the wipe for beta and alpha contamination on a portable laboratory counter scaler (e.g., Ludlum Model 2929).

Detection limits are set at half the Co-60 surface contamination screening value.

2.5.4 Volumetric Activity

Solid samples are collected, logged and packaged in accordance with chain of custody procedures for shipment to a commercial laboratory for analysis. Laboratory analysis include gamma spectroscopy for gamma-emitting activation products and liquid scintillation counting for beta-emitting radionuclides.

Detection limits are set at half the radionuclide specific screening value.

2.5.5 Investigation Levels

Investigation levels are listed in Table 6:

Table 6
Summary of Investigation Levels

Survey Unit Classification	Flag Direct Measurement or Sample Result When:	Flag Scanning Measurement When:
Class 1	>DCGLw	>DCGLw
Class 2	>DCGLw	>DCGLw
Class 3	>0.5 DCGLw	>0.5 DCGLw or >MDC whichever is greater

2.5.6 Statistical Tests

MARSSIM-based statistical testing will be used to evaluate SU compliance with unrestricted release criteria. Where reference SU data are needed, pre-D&D baseline SU data will be used for reference area data. Summary statistics including number of measurements, minimum, maximum and mean values will be determined for each SU data set. There are no statistical methods used that are not included in MARSSIM. Statistical testing will be performed as described in MARSSIM Table 8.2, Summary of Statistical Tests, as presented below.

For survey units in which the RCOPCs are not present in background (i.e., Co-60 and activated corrosion products), the Sign Test will be used to evaluate survey results. For survey units in which the contaminant is present in background and/or gross contamination measurements are being evaluated, the Wilcoxon Rank Sum (WRS) test will be used. Decision errors for static measurements will be set at 5% for Type I and Type II errors (i.e., $\alpha = \beta = 0.05$).

Variabilities in background and contaminant levels will be estimated from the baseline survey data. The LBGR will be adjusted so that the relative shift (Δ/σ) is between 1 and 3.

For the Sign Test the number of data points will be established from MARSSIM Table 5.5. For the WRS Test the number of data points (N/2) will be established from MARSSIM Table 5.3 for each survey unit and reference area.

There are no Class 1 SUs planned for the SSSB D&D, consequently elevated measurements comparisons (EMC) should not be needed. If a SU is upgraded to a Class 1 SU due to the presence of residual radioactivity above the DCGLw, the survey unit(s) will be divided and sized to meet the MARSSIM Suggested Area Size Guidelines for Class 1 areas and the scan percentage will be increased to 100% coverage. Statistical tests are summarized in Table 7.

Table 7
Summary of Statistical Tests

Survey Result	Conclusion
Radionuclide not in background and radionuclide-specific measurements made	
All measurements less than DCGLw	Survey unit meets release criterion
Average greater than DCGLw	Survey unit does not meet release criterion
Any measurement greater than DCGLw and the average is less than DCGLw	Conduct Sign test and elevated measurement comparison
Radionuclide in background or radionuclide non-specific (gross) measurements made	
Difference between maximum survey unit measurements and minimum reference area (i.e. baseline) measurements is less than DCGLw	Survey unit meets release criterion
Difference of survey unit average and reference area (i.e. baseline) average is greater than DCGLw	Survey unit does not meet release criterion
Difference between any survey unit measurement and any reference area (i.e. baseline) measurement greater that DCGLw and the difference of survey unit average and reference area (i.e. baseline) average is less that DCGLw	Conduct WRS test and elevated measurement comparison.

MICROSHIELD® OUTPUT FOR 2X2 SODIUM-IODIDE DETECTOR RESPONSE

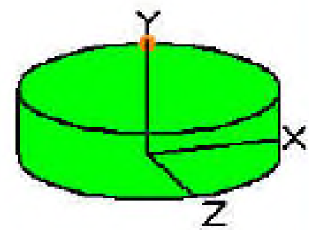
MicroShield 8.03
Aptim (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
SSSB-1.msd	December 22, 2020	7:02:37 PM	00:00:00

Project Info	
Case Title	SSSB-1
Description	NaI Response 1.0 pCi/g 1.6 pCi/cc Co 60 at 10 cm
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	15.0 cm (5.9 in)
Radius	28.0 cm (11.0 in)



Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	25.0 cm (9.8 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	3.69e+04 cm³	Concrete	1.6
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	µCi/cm³	Bq/cm³
Co-60	5.9112e-008	2.1872e+003	1.6000e-006	5.9200e-002

Buildup: The material reference is Source
Integration Parameters

Radial	20
Circumferential	10
Y Direction (axial)	10

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.6	3.568e-01	1.199e-05	2.202e-05	2.340e-08	4.299e-08
1.0	2.187e+03	1.429e-01	2.265e-01	2.633e-04	4.176e-04
1.5	2.187e+03	2.407e-01	3.448e-01	4.050e-04	5.801e-04
Totals	**4.375e+03**	**3.836e-01**	**5.714e-01**	**6.683e-04**	**9.978e-04**