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RECORD OF DECISION FOR OPERABLE UNIT 9 (OU 9) SITE 34 FORMER OIL GASIFICATION PLANT BUILDING 62 NSY PORTSMOUTH ME

9/1/2013

TETRA TECH

RECORD OF DECISION

OPERABLE UNIT 9 – SITE 34
(FORMER OIL GASIFICATION PLANT, BUILDING 62)

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

CONTRACT NUMBER 62470-08-D-1001
CONTRACT TASK ORDER WE26

September 2013

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Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
BAP	Benzo(a)pyrene
bgs	Below ground surface
CDI	Chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of concern
COPC	Chemical of potential concern
CSF	Cancer slope factor
CTE	Central tendency exposure
EPC	Exposure point concentration
ER,N	Environmental Restoration, Navy
FFA	Federal Facility Agreement
FS	Feasibility Study
GHG	Greenhouse gas
HHRA	Human health risk assessment
HI	Hazard index
HQ	Hazard quotient
IR	Installation Restoration
ISCO	In-situ Chemical Oxidation
LUC	Land use control
MEDEP	Maine Department of Environmental Protection
mg/kg	Milligram per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPW	Net present worth
O&M	Operation and maintenance
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PNS	Portsmouth Naval Shipyard
RAB	Restoration Advisory Board
RAO	Remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RfD	Reference dose

RI	Remedial Investigation
RME	Reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SF	Slope factor
SSI	Site Screening Investigation
SVOC	Semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TEQ	Toxicity equivalency quotient
UCL	Upper confidence limit
USC	United States Code
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Portsmouth Naval Shipyard (PNS)
United States Environmental Protection Agency (USEPA) ID No. ME7170022019
Operable Unit (OU) 9 – Site 34 (Former Oil Gasification Plant, Building 62)
Kittery, Maine

1.2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the Selected Remedy for contamination at OU9. This remedy was chosen by the Navy and USEPA in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code (USC) §9601 et seq., as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300 et seq., as amended. This decision is based on information contained in the Administrative Record for the site. The Maine Department of Environmental Protection (MEDEP) concurs with the Selected Remedy (see Appendix A). The OU9 area of PNS is shown on Figure 1-1.

FIGURE 1-1. SITE LOCATION MAP

1.3 ASSESSMENT OF SITE

The response action alternative selected in this ROD is necessary to protect human health and the environment from actual or threatened releases of pollutants or contaminants from OU9 that may present an imminent and substantial endangerment to public health or welfare. A CERCLA action is required because concentrations of carcinogenic polycyclic aromatic hydrocarbons (PAHs) in subsurface soil pose potential unacceptable risk to hypothetical future residents and because PAH-contaminated ash that may be present beneath the foundation of Building 62 Annex poses potential unacceptable future risk to receptors at the site if the material was exposed.

1.4 DESCRIPTION OF SELECTED REMEDY

The Selected Remedy for OU9 is implementation of land use controls (LUCs) via a LUC Remedial Design (RD) to restrict residential land use, require management of excavated subsurface soil, and prevent unrestricted industrial exposure to the subsurface beneath the foundation of Building 62 Annex.

Five-year site reviews would be conducted to ensure that the remedy remains protective of human health and the environment.

The Selected Remedy for OU9 implements LUCs for Building 62 Annex to prevent potential unacceptable industrial exposure to contamination beneath the building and implements LUCs to prevent residential exposure to subsurface contamination within the LUC boundary. The Selected Remedy for OU9 is expected to achieve substantial long-term risk reduction and allow the property to be used for current and reasonably anticipated future industrial land use.

This ROD documents the final remedial decision for OU9 and does not include or affect any other sites at the facility. Implementation of this decision is consistent with current uses and the overall cleanup strategy for PNS to clean up sites to support base operations.

1.5 STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

The Selected Remedy does not satisfy the statutory preference for remedies that use treatment as a principal element to reduce the toxicity, mobility, or volume of hazardous substances, pollutants, and contaminants. Based on the types, depths, and small volume of contamination at OU9, the Navy concluded that it was impracticable to treat the chemicals of concern (COCs) in a cost-effective manner.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years of initiation of the remedial action, and every 5 years thereafter, to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 ROD Data Certification Checklist

The locations in Section 2.0, Decision Summary, of the information required to be included in the ROD are summarized in Table 1-1. Additional information can be found in the Administrative Record file for PNS.

Table 1-1. ROD Data Certification Checklist

Data	Location in ROD
COCs and their respective concentrations	Sections 2.5 and 2.7
Baseline risk represented by the COCs	Section 2.7
Cleanup levels established for COCs and the basis for these levels	Section 2.8
How source materials constituting principal threats are addressed	Section 2.11
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the risk assessment	Section 2.6
Potential land and groundwater uses that will be available at the site as a result of the Selected Remedy	Section 2.12.3
Estimated capital, operating and maintenance, and total net present worth (NPW) costs; discount rate; and number of years over which the remedy costs are projected	Appendix F
Key factors that led to the selection of the remedy	Section 2.12.1

If previously unknown contamination posing an unacceptable risk to human health or the environment is discovered after execution of this ROD and is shown to be a result of Navy activities, the Navy will undertake the necessary actions to ensure continued protection of human health and the environment.

1.7 Authorizing Signatures

The signatures provided below and on the following page validate the selection by the Navy and USEPA of the final remedy for contamination at OU9. MEDEP concurs with the Selected Remedy.

William Greene

W. C. Greene
Captain, United States Navy
Commanding Officer
Portsmouth Naval Shipyard

9/27/13

Date

Nancy Barmakian for

James T. Owens, III, Director
Office of Site Remediation and Restoration
USEPA Region 1

09/30/13

Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

PNS, USEPA ID number ME7170022019, is a military facility with restricted access on an island located in the Piscataqua River, referred to on National Oceanic and Atmospheric Administration nautical charts as Seavey Island, with the eastern tip given the name Jamaica Island. Clark's Island is to the east attached by a rock causeway to Seavey Island. The Piscataqua River is a tidal estuary that forms the southern boundary between Maine and New Hampshire. PNS is located in Kittery, Maine, north of Portsmouth, New Hampshire, at the mouth to the Great Bay Estuary (commonly referred to as Portsmouth Harbor). The shipbuilding history of PNS dates back to the 1800s, and the facility has been engaged in the construction, conversion, overhaul, and repair of submarines for the Navy since 1917.

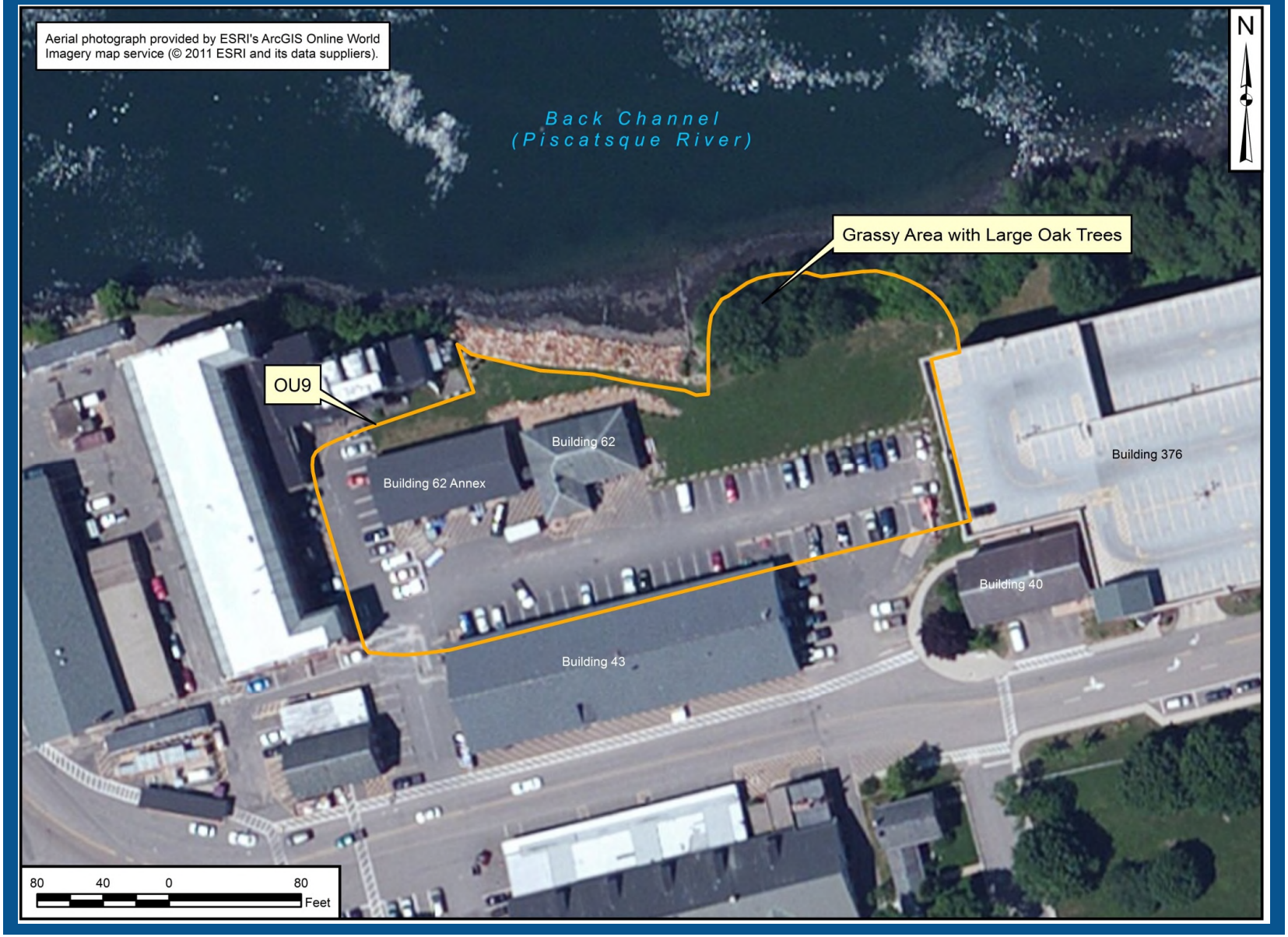
OU9 consists of Site 34 (Former Oil Gasification Plant, Building 62) and is located in the northwestern portion of PNS, as shown on Figure 1-1. The site includes Building 62 and Building 62 Annex as shown on Figure 2-1, which shows the layout of OU9.

The majority of the OU9 area has been used for industrial activities since the late 1800s. Industrial activities at OU9 included oil gasification plant operations, blacksmith operations, and storage. Coal was used to provide heat for oil gasification operations from the 1870s to the early 1900s. From 1915 to 1930, Building 62 was used as a blacksmith shop. The primary source of contamination at OU9 is ash from past oil gasification and blacksmithing operations. Tar generation during the oil gasification process and pesticide storage activities at Building 62 (from the 1960s to 1985) were also identified as potential sources of OU9 contamination.

Current land use is industrial. Building 62 and Building 62 Annex are used for temporary storage of non-hazardous materials by the PNS Public Works Department. Outside of these buildings, OU9 is covered with pavement, crushed stones, or grass, with some trees and shrubs in the far northeastern portion of the site. Adjacent to OU9 are other buildings and paved areas. Future land use is anticipated to remain the same as current land use.

PNS is an active facility, and environmental investigations and remediation at the facility are funded under the Environmental Restoration, Navy (ER, N) Program. The Navy is the lead agency for CERCLA activities at the facility, and USEPA and MEDEP are support agencies.

FIGURE 2-1. SITE FEATURES



2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Table 2-1 provides brief summaries of previous investigations at OU9. Results of these investigations indicate that carcinogenic PAHs are present in OU9 subsurface soil at concentrations that exceed the cleanup level.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION

INVESTIGATION	DATE	ACTIVITIES
Soil and Sediment Sampling	1998	Site 34 was identified as a potentially contaminated site when ash was observed in a pile on the northern side of Building 62. The Navy collected soil and sediment samples in 1998 to support further investigation. One soil sample from the ash pile, one soil sample near the ash pile, and two sediment samples in the intertidal offshore area were collected and analyzed. Based on the sampling results, additional investigation was recommended.
Limited Ash Excavation	1999	Ash was excavated from the pile on the northern side of Building 62; however, excavation was terminated when the volume of ash encountered exceeded the estimated two 55-gallon drums.
Site Screening Investigation (SSI)	2003	Soil (including ash) and sediment sampling was conducted to determine whether site operations may have impacted soil or sediment. Temporary monitoring wells were installed at several borings; however, groundwater was not present in overburden soil, and the wells were subsequently abandoned. Chemical fractions analyzed in soil and ash included Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals, cyanide, and dioxin/furans. Sediment samples collected from a wash pad catch basin and near the storm water outfall (OF-49) were analyzed for pesticides. The SSI concluded that PAHs, antimony, lead, and mercury were the potential contaminants associated with ash at OU9, and that by removing the ash, the majority of site risks would be addressed. The SSI Report indicated that contamination had not migrated from the ash to underlying soil, and the SSI determined that pesticides are not contaminants at OU9. The SSI Report recommended that a Remedial Investigation (RI) be performed after a removal action to remove ash to evaluate potential residual risks from site operations. Additional investigation to delineate the extent of ash to support the removal action was also recommended.
Ash Extent Evaluation	2004	The visual presence of ash was used to determine the approximate extent of ash to support a non-time-critical removal action. Gray to off-white ash was only observed inside the ash pile. Burnt material outside the ash pile was mostly fine- to coarse-grained sands and clinkers.
Removal Action	2007	The removal action included removal of ash and burnt material across most of the site. Ash/burnt material was excavated, and the excavation area was backfilled with fill from an off-base borrow source. As part of the removal action, ash and soil mixed with ash were removed by excavating from the surface until native material with no ash was observed. Native and non-native materials were identified based on their color. Most areas were excavated to 2 to 4 feet below ground surface (bgs); the ash pile area was excavated to 6 to 7 feet bgs. As part of the removal of the foundation of former Building 63 (located east of Building 62), a thin layer of ash found under the foundation was removed. Although minor ash/burnt material is present in the grassy area northeast of Building 62, no excavation was conducted to preserve large oak trees in this area (see Figure 2-1). Ash was also not removed under a storm water line north of Building 62.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION		
INVESTIGATION	DATE	ACTIVITIES
RI	2009 and 2010	Conducted to determine the nature and extent of contamination and to evaluate potential risks to human receptors after the 2007 removal action. Borings were drilled below the floor of Building 62, and soil samples were collected from areas where ash was previously excavated and from unexcavated areas of the site. An unexpected pocket of ash and burnt material in the subsurface was discovered beneath the excavated area north of Building 62 by a main water line. Minor amounts of ash/burnt material remain in the subsurface elsewhere at the site, including under a storm water line and in the area with large oak trees. Tar and ash suspected to be under the floor of Building 62 were not found. A total of 57 soil samples were collected and analyzed for antimony, lead, mercury, and PAHs. Carcinogenic PAHs were identified as the main contaminants and are generally associated with residual ash. Antimony, lead, and mercury were detected at low concentrations. Sufficient ecological habitat was not identified at OU9, and an ecological risk assessment was not conducted. The RI Report (completed in 2012) concluded that with the removal of the majority of ash in 2007, there was no longer a risk for migration of contamination at OU9 to offshore sediment. Sediment contamination from past releases to sediment in the offshore area is being addressed as part of OU4 (offshore OU). Potential unacceptable risks were estimated for future residential exposure to subsurface soil with elevated PAH concentrations. The subsurface beneath the foundation of Building 62 Annex was not investigated; however, based on site history and use and the presence of ash beneath the foundation of former Building 63, ash with similar concentrations of PAHs as were detected in ash samples collected around Building 62 Annex is presumed to be present beneath the foundation of Building 62 Annex. If present, this material would pose potential unacceptable risks to current and future site users, if the foundation of Building 62 Annex was removed exposing the material.
Feasibility Study (FS)	2012	Conducted to develop and evaluate potential cleanup alternatives for OU9.
Proposed Plan	2012	Presented the Navy's Preferred Alternative to address contamination at OU9.

On May 31, 1994, PNS was placed on the National Priorities List by USEPA pursuant to CERCLA of 1980 and SARA of 1986. The National Priorities List is a list of uncontrolled or abandoned hazardous waste sites identified by USEPA as requiring priority remedial actions. The Navy and USEPA signed the Federal Facility Agreement (FFA) for PNS in 1999 to ensure that environmental impacts associated with past and present activities at PNS are thoroughly investigated and that the appropriate remedial actions are pursued to protect human health and the environment. In addition, the FFA establishes a procedural framework and timetable for developing, implementing, and monitoring appropriate responses at PNS, in accordance with CERCLA (and SARA of 1986, Public Law 99-499), 42 USC §9620(e)(1); the NCP, 40 CFR 300; Resource Conservation and Recovery Act (RCRA), 42 USC §6901 et seq., as amended by the Hazardous and Solid Waste Amendment of 1984; Executive Order 12580; and applicable state laws. There have been no cited violations under federal or state environmental law or any past or pending enforcement actions pertaining to the cleanup of OU9.

2.3 COMMUNITY PARTICIPATION

The Navy has been conducting community relations activities for the Installation Restoration (IR) Program at PNS since the program began. From 1988 to November 1994, Technical Review Committee meetings were held on a regular basis. In 1994, a Restoration Advisory Board (RAB) was established to increase public participation in the IR Program process. Many community relations activities for PNS involve the RAB, which historically met quarterly and recently has met two to four times per year. The RAB provides a forum for discussion and exchange of information on environmental restoration activities between the Navy, regulatory agencies, and the community, and it provides an opportunity for individual community

members to review the progress and participate in the decision-making process for various IR Program sites including OU9. Details of the history, objectives, and implementation techniques of community relations activities at PNS can be found in the 2012 Final Community Involvement Plan Update.

The following community relations activities are conducted at PNS as part of the Community Relations Program:

Information Repositories: The Public Library in Portsmouth, New Hampshire, and the Rice Public Library in Kittery, Maine, are the designated Information Repositories for the PNS IR Program. Documents are available on the public website at http://go.usa.gov/vvb.

Key Contact Persons: The Navy has designated information contacts related to PNS. Materials distributed to the public, including any fact sheets and press releases, will indicate these contacts.

Regular Contact with Local Officials: The Navy arranges regular meetings to discuss the status of the IR Program with the RAB.

Press Releases and Public Notices: The Navy issues press releases and public notices as needed to local media sources to announce public meetings and comment periods and the availability of reports and to provide general information updates.

Public Meetings: The Navy conducts informal public meetings to keep residents and town officials informed about cleanup activities at PNS and significant milestones in the IR Program. Meetings are conducted to explain the findings of RIs, to explain the findings of FSs, and to present Proposed Plans, which explain the preferred alternatives for cleaning up individual sites.

Fact Sheets and Information Updates: The Navy develops fact sheets to mail to public officials and other interested individuals and/or to use as handouts at public meetings. Fact sheets are used to explain certain actions or studies, to update readers on revised or new health risks, or to provide general information on the IR Program process.

Responsiveness Summary: The Responsiveness Summary summarizes public concerns and issues raised during the public comment period on the Proposed Plan and documents the Navy's formal responses. The Responsiveness Summary may also summarize community issues raised during the course of the FS.

Announcement of the ROD: The notice of the final ROD will be published by the Navy in a major local newspaper prior to commencement of the selected remedial actions.

Public Comment Periods: Public comment periods allow the public an opportunity to submit oral and written comments on the proposed cleanup options. Citizens have at least 30 days to comment on the Navy's preferred alternatives for cleanup actions as indicated in the Proposed Plan.

Technical Assistance Grant: A Technical Assistance Grant from USEPA can provide up to $50,000 to a community group to hire technical advisors to assist them in interpreting and commenting on site reports and proposed cleanup actions. A Technical Assistance Grant has been awarded for a community organization.

Site Tours: The PNS Public Affairs Office periodically conducts site tours for media representatives, local officials, and others.

A notice of availability of the Proposed Plan for OU9 was published on July 16, 2013, in the Portsmouth Herald and Fosters Daily Democrat. The Proposed Plan and other documents related to the site are available to the public at the PNS Environmental Restoration Program public website (http://go.usa.gov/vvb). Additionally, an index of available documents is available at the PNS Information Repositories located at the Portsmouth Public Library in Portsmouth, New Hampshire, and Rice Public

Library located in Kittery, Maine. A copy of the notices and the Proposed Plan are included in Appendix B of this ROD.

The Proposed Plan notice of availability invited the public to attend a public meeting at the Kittery Town Hall in Kittery, Maine, on July, 23, 2013. The public meeting presented the proposed remedy and solicited oral and written comments. At the public meeting, personnel from the Navy, USEPA, and MEDEP were available to answer questions from the attendees during the informal portion of the meeting. In addition, public comments on the Proposed Plan were formally received and transcribed. The transcript from the public meeting is provided in Appendix C. Responses to the comments received during the public comment period are discussed in the Responsiveness Summary in Section 3.0 of the ROD.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

OU9 is part of a comprehensive environmental investigation and cleanup program currently being performed at PNS. In accordance with Section 120(e) of CERCLA, an FFA was entered into between the Navy and USEPA in 1999. Eleven sites are included in the IR Program at PNS. Ten of the sites (excluding Site 30) are included within one of the seven OUs at PNS. Final decisions regarding remedial actions have been made for Sites 8, 9, and 11 in the OU3 ROD (2001), for Site 10 in the OU1 ROD (2010), for Sites 6 and 29 in the OU2 ROD (2011), and Site 5 in the OU4 ROD (2013). Decision documents are being prepared for Site 32 (OU7) and Site 30. Site 34 is OU9, which is the subject of this ROD. One site, Site 31 (OU8), is in the RI/FS stage. The Site Management Plan for PNS further details the schedule for IR Program activities and is updated annually.

OU9 addresses past releases of contamination from historical industrial activities (e.g., oil gasification plant operations) at Site 34 to the onshore area. OU9 is not a current source of contaminants that may pose unacceptable risk to the offshore area. Concerns associated with past releases from OU9 to the offshore (to Back Channel of the Piscataqua River) are being addressed as part of OU4. Investigations at OU9 indicated the presence of soil contamination that poses potential unacceptable risk to human health. Previous OU9 remedial actions included a limited ash excavation in 1999 and a removal action for ash in 2007 (see Table 2-1).

The remedy documented in this ROD will achieve the remedial action objectives (RAOs) for OU9, as listed in Section 2.8. Implementation of this remedy will allow continued use of the site, which is consistent with the current and reasonably anticipated future industrial use of this site and the overall cleanup strategy for PNS of restoring sites to support Shipyard operations.

2.5 SITE CHARACTERISTICS

Site characteristics, including physical characteristics, conceptual site model, and nature and extent and fate and transport of contamination are discussed herein. Elevations discussed herein are based on the 2002 PNS Vertical Datum, which equates 0 feet in the North American Vertical Datum of 1988 to 96.78 feet.

2.5.1 Physical Characteristics

OU9 is located in the northwestern portion of PNS, east of a bridge from the mainland to PNS. OU9 is approximately 1 acre in size and includes Building 62 and Building 62 Annex, pavement and grass surrounding the buildings, and a grassy area with large oak trees. Former Building 63 was located east of Building 62. The majority of OU9 has continued to be used for industrial activities since the late 1800s. Building 62 and Building 62 Annex are used for temporary storage of non-hazardous materials by PNS Public Works.

OU9 is relatively flat, with a gentle slope from south of the site toward the area north of Building 62 and a steep slope to the water's edge at the shoreline of the Piscataqua River Back Channel. Areas west and

south of Building 62 Annex and south and southeast of Building 62 are paved, and areas north and east of Building 62 and Building 62 Annex are covered with crushed stones, grass, or other vegetation. The majority of the current topography at OU9 was created by the 2007 removal action. A portion of the excavated area was repaved and is used for parking; other portions were vegetated. The area around the large oak trees was not included in the removal action to preserve the trees. The average site elevation is 118 feet with an elevation along the top of the steep slope of approximately 113 feet. In the vicinity of OU9, the 100-year flood zone is at an elevation of approximately 105 feet, and no portion of the site is between the 100-year and 500-year coastal flood zones. Mean high and low tides are at elevations of approximately 100.6 and 92.5 feet, respectively.

Based on depths to refusal during several different investigations, bedrock depths across the site vary from 1 to 17 feet bgs, and the bedrock surface generally slopes to the north toward the Back Channel. The elevation of bedrock typically ranges from 105 to 112 feet. Bedrock consists of a dark gray or greenish-gray quartzite. OU9 native overburden material is typically silty sand. In the excavated area, material above the 2007 excavation surface is backfill soil consisting of primarily silty sand with little to no gravel. Material below the 2007 excavation surface consists of silty sand, silt/silty clay, and sand and gravel or gravel present in noncontiguous mixed zones, indicating that it is likely a mixture of reworked native material and historical fill. Isolated pockets of ash and burnt material are also present. An estimated 5 percent of the overburden at OU9, excluding overburden under buildings, contains ash/burnt material. The majority of this material is in the subsurface (approximately 2 to 8 feet bgs) in an approximately 175-square-foot area north of Building 62, by a main water line. Minor amounts of ash/burnt material were also found in the grassy area with large oak trees (in the unexcavated area) and under a storm sewer line in the excavated area.

No ash or burnt material was found under Building 62. However, the subsurface beneath Building 62 Annex was not investigated. Ash/burnt material from past Building 62 activities may be present beneath the foundation of Building 62 Annex, which was built after Building 62 ash-generating operations ended. During the 2007 removal action, ash/burnt material was found beneath the foundation of Building 63 and in the subsurface surrounding Building 62 Annex. Based on the apparent disposal of ash in the area surrounding Building 62, it is likely that ash was not removed prior to construction of Building 62 Annex. Therefore, ash and burnt material are presumed to be present beneath the foundation of Building 62 Annex.

OU9 is located within the area of PNS placed on the National Register of Historic Places and is described as an area with moderate historical archaeological resource sensitivity. During the 2004 Ash Extent Investigation, subsurface soil borings were inspected by an archaeologist for cultural artifacts. No cultural artifacts were found at any of the subsurface boring locations.

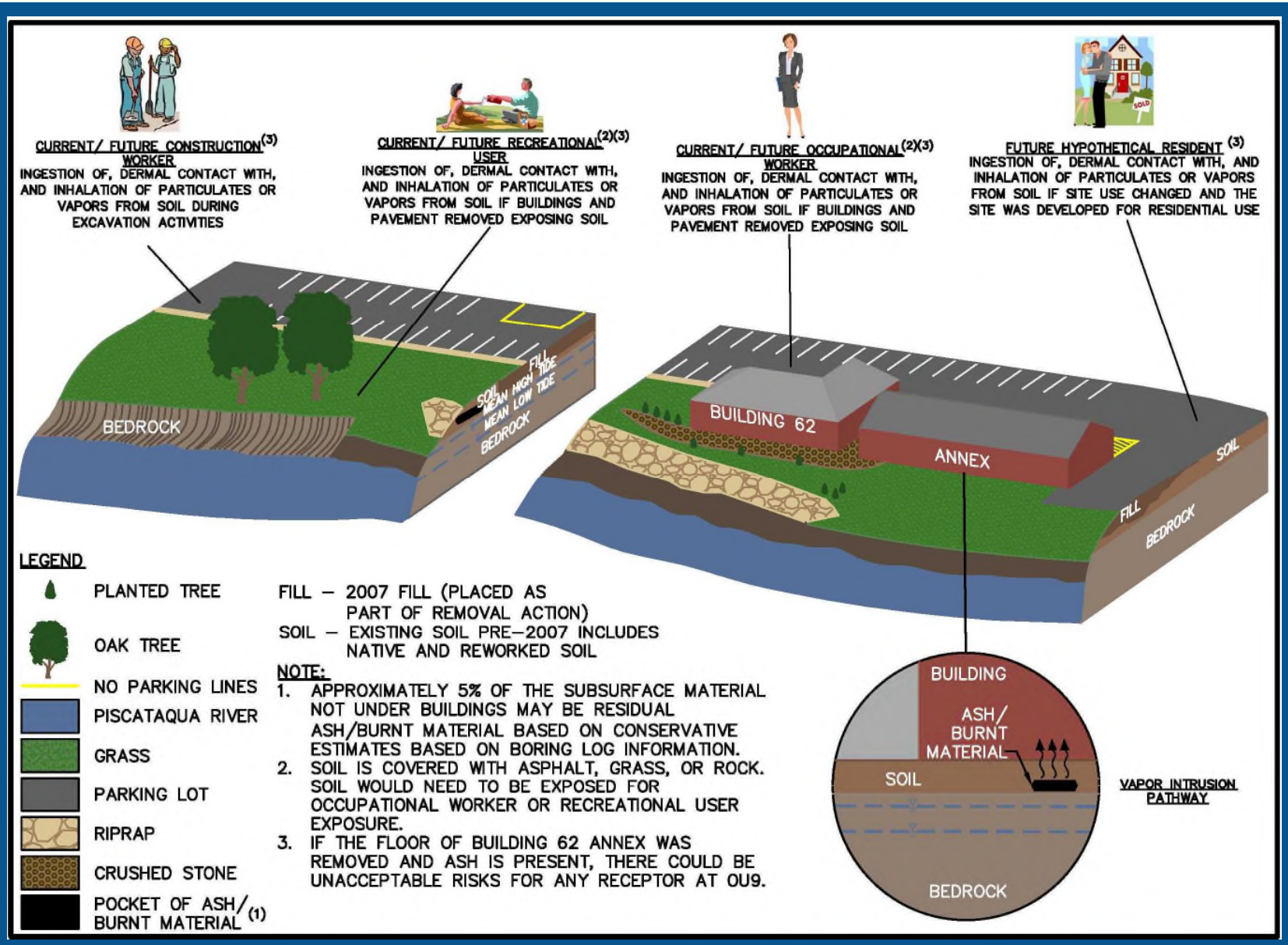
Groundwater is not present in overburden materials at the site. Bedrock groundwater was not investigated. As stated in Table 2-1, OU9 does not provide sufficient habitat for ecological receptors. No known endangered, threatened, or protected species or critical habitats are located within the boundaries of PNS, including OU9. PNS is a well-developed highly industrialized area with limited natural surface water drainage. PNS is equipped with an extensive storm water collection system that drains to the Piscataqua River. Direct surface water runoff also enters the Piscataqua River. Surface water offshore of OU9 is saline and is not used for drinking.

2.5.2 Conceptual Site Model

Figure 2-2 presents the OU9 conceptual site model, which identifies contaminant sources, transport routes, and potential receptors. The source of contamination is associated with ash from coal (fuel) combustion during past industrial operations (i.e., oil gasification operations, blacksmithing). Industrial activities at the site that resulted in release of contamination (ash) were conducted from 1870 to 1930.

Coal combustion during the oil gasification process and during blacksmithing activities in Building 62 led to the generation of ash at the site. Ash mixed with clinkers (metallic impurities from burnt coal), assumed

FIGURE 2-2. CONCEPTUAL SITE MODEL



to be from the combustion of coal (and potentially including ash from a fire in the building in 1919), was piled primarily north of Building 62. During initial environmental investigations, the ash pile was found to cover an area approximately 100 feet long (along the length of Building 62 and Building 62 Annex) and 30 feet wide. Ash was also found under asphalted areas around Buildings 62, 62 Annex, and 63 and under the Building 63 foundation. The ash from past operations at OU9 has elevated levels of PAHs. The majority of ash and burnt material was removed during the 2007 removal action. Minor amounts of ash/burnt material remains in the subsurface, excluding under buildings. No ash was found under Building 62 during RI sampling; however, the soil beneath Building 62 Annex has not been investigated. Based on site use and the presence of ash beneath the foundation of former Building 63, ash is presumed to be present beneath the foundation of Building 62 Annex.

Current land use is industrial, and site use is likely to remain the same in the future. Current construction workers could be exposed to surface/subsurface soil during construction activities (e.g., excavation or utility line repair). The Shipyard Department of Public Works uses Building 62 and Building 62 Annex for storage, and occupational workers may work in these buildings. Portions of the site are vegetated and could be used for recreation (e.g., picnicking). Because all areas of the site are covered either by buildings, pavement, or vegetation, no current occupational or recreational activities would result in exposure to soil; however, these receptors might be exposed to soil in the future if the buildings, pavement, or vegetation were removed. Hypothetical future residential exposure to soil was considered if the site use changed and the site was developed for residential use. Vapor intrusion into Building 62 Annex may be an exposure pathway if volatile PAHs are present at concentrations beneath the foundation that could present a risk to occupational workers in the building. No overburden groundwater is present at OU9 and groundwater is not used for drinking at PNS; therefore, there is no potential exposure to groundwater at the site.

Potential contaminant migration pathways associated with infiltration of precipitation through contaminated soil and overland runoff causing erosion of contaminated soil were eliminated in 2007 with the removal of the majority of ash and burnt material. The remaining contamination is in the subsurface and is not subject to erosion. The remaining contamination is also not in contact with groundwater and PAHs bind to soil and are relatively immobile; therefore, migration of contamination from soil to groundwater and subsequent migration via groundwater discharge to the offshore area is not a transport pathway for OU9.

The site is currently and has historically been located within an industrial area of PNS, and no sufficient ecological habitat has been identified at the site. Therefore, ecological exposure is not considered significant, and there are no onshore concerns for ecological risk. Ecological concerns from past OU9 contaminant releases to the offshore area are being addressed as part of OU4.

2.5.3 Nature and Extent and Fate and Transport of Contamination

The primary source of contamination at OU9 is ash from coal combustion during past industrial operations, and carcinogenic PAHs were identified as the primary contaminants in ash at the site. Post-excavation PAH concentrations were generally low in surface soil and subsurface soil across the site and indicated that contamination was removed during the 2007 removal action in the excavated area to address the majority of risk and that the unexcavated area was not adversely impacted by past contaminant releases at OU9. However, during the RI, a pocket of ash was found in the subsurface north of Building 62 by the main water line. Based on review of information on removal action excavation depths and boring logs from the SSI and RI, an estimated 5 percent of the overburden at OU9, excluding overburden under buildings, contains ash/burnt material. The majority of this material is in the subsurface in the area north of Building 62. This area is approximately 175 square feet, and ash/burnt material in this area was found from 2 to 8 feet bgs. Minor amounts of ash/burnt material were also found in the grassy area with large oak trees in the unexcavated area and under a storm sewer line in the excavated area. Concentrations of carcinogenic PAHs, evaluated collectively in terms of the benzo(a)pyrene (BAP) toxicity equivalency quotient (TEQ), were greater than 10 milligrams per kilogram (mg/kg) in subsurface soil

within the pocket of ash north of Building 62. Carcinogenic PAH concentrations were less than 10 mg/kg in other samples, including locations with minor amounts of ash/burnt material.

The RI indicated that there was no ash/burnt material under the foundation of Building 62. However, the subsurface under Building 62 Annex was not investigated. As discussed in Section 2.5.1, ash/burnt material are likely to be present under the foundation of Building 62 Annex. Based on observations of ash/burnt material under the foundation of Building 63 and in the subsurface around Building 62 Annex during the 2007 removal action, an estimated 2-foot-thick layer of ash is presumed to be present under the entire foundation of Building 62 Annex (approximately 3,500 square feet). Based on characterization of ash from past operations at OU9 as containing elevated levels of PAHs, it is presumed that, if present, ash beneath the foundation of Building 62 Annex would have concentrations of PAHs similar to those detected in ash sampled outside of Building 62 Annex.

As discussed in Section 2.5.2, because a small amount of contamination in the subsurface remains, overburden groundwater is not present, and PAHs bind to soil and are relatively immobile, transport of contamination through erosion or infiltration of precipitation are not pathways of concern for OU9.

2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The current land use patterns at PNS are well established and are not expected to change in the foreseeable future. Industrial areas that support maintenance of submarines are in the western portion of the facility and include all of the dry docks and submarine berths and numerous buildings that house trade shops related to the maintenance activities. Uses of other portions of PNS include administration offices, officers' residences, equipment storage, parking, and recreational facilities.

OU9 currently and historically has been used for industrial activities. Current and future anticipated land use is industrial. Building 62 and Building 62 Annex are currently used for temporary storage of non-hazardous materials by the PNS Public Works Department. The site is covered with pavement, crushed stone, and grass with some trees and shrubs in the far northeastern portion of the site. The Shipyard does not have any current plans to remove Building 62 or Building 62 Annex or to change portions of the site that are paved, have crushed stone, or are vegetated.

PNS does not use groundwater for any purpose. Potable water is supplied to PNS from the Kittery Water District, which uses surface reservoirs located in the vicinity of York, Maine. There is no overburden groundwater at the site. The Piscataqua River water is saline and is not suitable for human consumption. Various vessels operate in Portsmouth Harbor, including commercial tankers, cargo ships, fishing trawlers, lobster boats, recreational vessels, and submarines located at PNS. Commercial and recreational fishing occur in the harbor, including in the vicinity of PNS. The area offshore of OU9 is not easily accessible from OU9 because of the steep slope to the water's edge.

2.7 SUMMARY OF SITE RISKS

The baseline risk assessment estimates what risks the site poses if no action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. A human health risk assessment (HHRA) was conducted in 2012 as part of the OU9 RI to estimate the probability and magnitude of potential adverse human health effects from exposure to contaminants associated with the site. Ecological risk assessment was not required for OU9.

2.7.1 Summary of Human Health Risk

The quantitative HHRA was conducted using chemical concentrations detected in soil samples at OU9. Key steps in the risk assessment process included identification of chemicals of potential concern (COPCs), exposure assessment, toxicity assessment, and risk characterization. The HHRA results discussed below are based on weighting chemical concentrations from ash/burnt material (5 percent) and

from soil (95 percent) excluding material under Building 62 Annex. Ash/burnt material presumed to be present under the floor of Building 62 Annex was considered separately, as further discussed below.

Identification of Contaminants of Potential Concern

Tables 3.5 and 3.6 from Appendix C.1 of the OU9 RI Report (included in Appendix D of this ROD) include the exposure point concentrations (EPCs) for the COPCs identified in surface soil and subsurface soil at OU9 excluding under Building 62 Annex. EPCs are the concentrations used in the risk assessment to estimate exposure and risk from each COPC. For each COPC, information in the tables includes the EPC and how the EPC was derived. The EPCs were calculated to represent site conditions based on 5 percent of the overburden containing ash/burnt material. For each COPC, a mean concentration for samples containing ash/burnt material and a mean concentration for samples consisting of soil were calculated and then a weighted EPC was calculated. Based on the statistical distributions of the data, 95-percent upper confidence limits (UCLs) on the mean were used as the EPCs for all COPCs.

For evaluation of potential risks for contamination presumed to be in the subsurface under Building 62 Annex, it was assumed that concentrations of COPCs in ash/burnt material were the same as in ash/burnt material outside the building. For evaluation of potential for vapor intrusion of contaminants into Building 62 Annex from ash presumed to be beneath the foundation of the building, chemicals detected in RI soil samples were evaluated to determine whether they were sufficiently volatile and toxic via the inhalation pathway to pose a potential vapor intrusion risk. Naphthalene was identified as a COPC for vapor intrusion. The 95-percent UCL of naphthalene concentrations in pre-excavation surface soil samples that contained ash/burnt material was used as the EPC.

Exposure Assessment

During the exposure assessment, current and potential future exposure pathways through which humans might come into contact with the COPCs identified in the previous step were evaluated. Surface soil and subsurface soil were identified as the media of concern. Potential exposure routes for soil include incidental ingestion, dermal contact, and inhalation of air/dust particulates and vapors. The HHRA considered receptor exposure under non-residential land use (construction and occupational workers and recreational users) and hypothetical residential land use. Potential for vapor intrusion from contamination presumed to be in the subsurface beneath Building 62 Annex was also evaluated for occupational workers. Current and hypothetical future exposure pathways at OU9 are summarized in Table 2-2.

TABLE 2-2. RECEPTORS AND EXPOSURE ROUTES EVALUATED IN HHRA

RECEPTOR	EXPOSURE ROUTE
Construction Workers (current/future land use)	Soil ingestion and dermal contact (surface and subsurface) Soil inhalation of air/dust particulates and vapors (surface and subsurface)
Occupational Workers (current/future land use)	Soil ingestion and dermal contact (surface and subsurface)(1) Soil inhalation of air/dust particulates and vapors (surface and subsurface)(1) Vapor intrusion from ash presumed to be in subsurface beneath the floor of Building 62 Annex(2)
Recreational Users (current/future land use)	Soil ingestion and dermal contact (surface and subsurface)(1) Soil inhalation of air/dust particulates and vapors (surface and subsurface)(1)
Hypothetical Future Residents (future land use)	Soil ingestion and dermal contact (surface and subsurface)(1) Soil inhalation of air/dust particulates and vapors (surface and subsurface)(1)

1 - Although occupational workers and recreational users are current receptors at OU9, there is no current exposure route to surface or subsurface soil for these receptors. Quantitative evaluations of residents, recreational users, and occupational workers for exposure to subsurface soil (2 to 10 feet) were conducted for completeness.

2 - Ash presumed to be present under Building 62 Annex has not been investigated; however, specific PAHs that could be released as vapors from soil and move into the air inside Building 62 Annex were detected in samples of ash at OU9 and were used to evaluate vapor intrusion for this receptor.

Toxicity Assessment

Toxicity assessment involves identifying the types of adverse health effects caused by exposure to site COPCs and determining the relationship between the magnitude of exposure and the severity of adverse effects (i.e., dose-response relationship) for each COPC. Based on the quantitative dose-response relationships determined, toxicity values for both cancer (cancer slope factor [CSF]) and non-cancer (reference dose [RfD]) effects were derived and used to estimate the potential for adverse effects.

Tables 5.1 and 5.2 from Appendix C.1 of the OU9 RI Report (included in Appendix D of this ROD) provide the OU9 COPC non-carcinogenic RfDs and associated target organs for oral/dermal and inhalation routes of exposure, respectively. For non-carcinogenic hazards, the chronic toxicity data available for oral exposure to these COPCs were used to develop oral RfDs ranging from 3×10^{-4} to 6×10^{-2} mg/kg/day. Dermal RfDs range from 2.1×10^{-5} to 6×10^{-2} mg/kg/day. The available toxicity data indicate the primary target organ affected by each COPC. Dermal RfDs were extrapolated from oral RfDs by applying an adjustment factor as appropriate. Adjustment factors varied by chemical and ranged from 0.07 to 1.

Tables 6.1 and 6.2 from Appendix C.1 of the OU9 RI Report (included in Appendix D of this ROD) provide the OU9 COPC carcinogenic CSFs for oral/dermal and inhalation routes of exposure, respectively. For carcinogenic risks, CSFs are not available for the dermal route of exposure; therefore, dermal slope factors were extrapolated from oral values. Adjustment factors, if available, are applied to extrapolate dermal CSF values from oral CSF values depending on how well the chemical is absorbed via the oral route. No adjustment factors were required for the OU9 carcinogenic COPCs; the oral CSFs were used as the dermal CSFs.

Risk Characterization

During the risk characterization, the outputs of the exposure and toxicity assessments are combined to characterize the baseline risk (cancer risks and non-cancer hazards) at the site if no action was taken to address the contamination. Potential cancer risks and non-cancer hazards were calculated based on reasonable maximum exposure (RME) and central tendency exposure (CTE) assumptions. The RME scenario assumes the maximum level of human exposure that could reasonably be expected to occur, and the CTE scenario assumes a median or average level of human exposure.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where: risk = a unitless probability (e.g., 2×10^{-5}) of an individual developing cancer
CDI = chronic daily intake averaged over 70 years (in mg/kg/day)
SF = slope factor [in $(\text{mg/kg/day})^{-1}$]

These calculated risks are probabilities that are usually expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} under an RME scenario indicates that an individual experiencing the RME estimate has an “excess lifetime cancer risk” of 1 in 1,000,000 because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three. USEPA’s generally acceptable risk range for site-related exposures is 1×10^{-6} to 1×10^{-4}. The State of Maine cancer risk guideline is 1×10^{-5}.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., a lifetime) to an RfD derived for a similar exposure period. An RfD represents a level to which an individual may be exposed that is not expected to cause any deleterious effect. The ratio of exposure dose to the RfD is called a hazard quotient (HQ). An HQ less than 1 indicates that a receptor’s dose of a single contaminant is less than the RfD and that toxic non-carcinogenic effects from that chemical are unlikely. The hazard index (HI) is generated by adding the HQs for all chemicals that affect

the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may be reasonably exposed. An HI less than 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

$$\text{Non-cancer HQ} = \text{CDI} / \text{RfD}$$

where: CDI = chronic daily intake (in mg/kg/day)
RfD = reference dose (in mg/kg/day)

CDIs and RFDs are expressed in the same units and represent the same exposure period (i.e., chronic, sub-chronic, or short-term).

Tables 9.1 through 9.8 for RME from Appendix C.1 and Tables 9.1 through 9.8 from Appendix C.3 for the 5-percent ash/burnt material evaluation in the OU9 RI Report (included in Appendix D of this ROD) provide RME cancer risk estimates for surface and subsurface soil for the significant receptors and routes of exposure developed by taking into account various conservative assumptions about the frequency and duration of exposure for each receptor and also about the toxicity of the COPCs. These tables also provide RME non-carcinogenic HQs for each receptor and route of exposure and total HIs for all routes of exposure.

For construction worker exposure to surface and subsurface soil, the cancer risk estimate was 2×10^{-6}. Total risk estimates for exposure to surface soil for the other receptors range from 5×10^{-6} for occupational workers to 7×10^{-5} for hypothetical future lifetime residents, and total risk estimates for exposure to subsurface soil ranged from 3×10^{-5} for occupational workers to 5×10^{-4} for hypothetical future lifetime residents. These risk levels indicate that if no cleanup action was taken, the increased probabilities of developing cancer as a result of site-related exposure would range from approximately 2 in 1,000,000 to 5 in 10,000. PAHs were the main contributors to cancer risks. There were no non-carcinogenic COPCs for surface soil. Total HIs for exposure to subsurface soil ranged from 0.002 for recreational users to 0.1 for hypothetical future residents. No unacceptable non-cancer hazards were identified under the RME scenario for any receptors for soil under the defined exposure scenarios. Quantitative cancer risk estimates for exposure to subsurface material beneath the foundation of Building 62 Annex were not calculated. Based on the elevated levels of PAHs in samples containing primarily ash/burnt material outside the building, the presumed 2-foot-thick layer of PAH-contaminated ash/burnt material would pose an unacceptable risk to people if the foundation was removed and the material was exposed.

The vapor intrusion evaluation for occupational workers in Building 62 Annex from the OU9 RI Report is included in Appendix D of this ROD. The evaluation provides the concentrations, input parameters, risk calculation, results, and conclusions for naphthalene. The evaluation shows that risks would be less than acceptable levels; therefore, there are no unacceptable current or future risks for occupational workers in Building 62 Annex due to potential vapor intrusion.

No major sources of uncertainty, other than those typically associated with risk assessment estimates, were identified for the HHRA.

Based on the results of the HHRA, RME risks were identified that require a response action, including unacceptable carcinogenic risks for hypothetical future residents exposed to subsurface soil. Carcinogenic PAHs were the COCs contributing to the unacceptable risk estimate. Exposure to ash/burnt material contaminated with carcinogenic PAHs presumed to be present under the foundation of Building 62 Annex would also pose an unacceptable risk to people if the material was exposed.

2.7.2 Summary of Ecological Risk

The site is currently and has historically been located within an industrial area of PNS, and no sufficient ecological habitat has been identified at the site. Therefore, ecological exposure is not considered significant, and there are no onshore concerns for ecological risk. Offshore concerns for ecological receptors are being addressed as part of OU4. OU9 is no longer acting as a source of contaminants that may pose unacceptable risk to the offshore area. An ecological risk assessment was not conducted for OU9.

2.7.3 Basis for Action

As a result of past activities at OU9, carcinogenic PAHs are present in soil at concentrations that could result in unacceptable human health risks for hypothetical future residential exposure. Contamination is primarily in the subsurface in the area north of Building 62. In addition, ash/burnt material with elevated levels of carcinogenic PAHs is presumed to be present under the floor of Building 62 Annex, and if exposed could pose an unacceptable risk to current receptors at OU9. Because risks were identified under potential current and future land use scenarios, a response action is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment that may present an imminent and substantial endangerment to public health or welfare.

2.8 REMEDIAL ACTION OBJECTIVES

RAOs are medium-specific goals that define the objective of conducting remedial actions to protect human health and the environment. RAOs specify the COCs, potential exposure routes and receptors, and acceptable concentrations (i.e., cleanup levels) for a site and provide a general description of what the cleanup will accomplish. RAOs typically serve as the design basis for the remedial alternatives described in Section 2.9. The RAOs developed for OU9 considering current and future land uses at PNS are as follows:

- Prevent hypothetical future residential exposure through ingestion of, dust inhalation of, and dermal contact with subsurface soil containing carcinogenic PAH concentrations exceeding the residential cleanup level.
- Prevent potential future exposure to carcinogenic PAHs in ash that may be present under the floor of Building 62 Annex.

One site-specific risk-based OU9 cleanup level was developed in Appendix A.1 of the OU9 FS Report for carcinogenic PAHs, which were evaluated collectively in terms of BAP TEQ. The cleanup level is the chemical-specific goal for representative site concentrations (based on the exposure concentration) that, when achieved, will result in site concentrations that pose an acceptable risk for the targeted receptor. The site-specific risk-based cleanup level for carcinogenic PAHs based on BAP TEQ for residential exposure at OU9 is 1.5 mg/kg. The cleanup level was developed using site-specific exposure assumptions and based on a chemical-specific cancer risk of 1×10^{-4}.

For evaluation of remedial alternatives, the area north of Building 62 with PAH concentrations exceeding cleanup levels was delineated. Contamination was found in an approximate 175-square-foot area from approximately 2 to 8 feet bgs. By remediating soil within the identified remediation area, the resulting average soil exposure concentration, or EPC, would be less than the cleanup level and would pose no unacceptable risks for the targeted receptors. It was assumed that if ash is present, the entire area under Building 62 Annex would have PAH concentrations exceeding cleanup levels. Depths of remediation were based on the exposure depths evaluated in the HHRA, surface soil from 0 to 2 feet bgs and subsurface soil from 2 to 10 feet bgs or bedrock, whichever is shallower.

2.9 DESCRIPTION OF ALTERNATIVES

To address potential unacceptable human health risks associated with contamination at OU9, a preliminary technology screening evaluation was conducted in the FS. The general response actions are presented in Table 2-3.

TABLE 2-3. GENERAL RESPONSE ACTIONS

GENERAL RESPONSE ACTION	TECHNOLOGY	PROCESS OPTIONS
No Action	None	Not Applicable
Limited Action	LUCs	Passive Controls: Land Use Restrictions
Removal	Bulk Excavation	Excavation
In-Situ Treatment	Physical/Chemical	Chemical Oxidation
	Biological	Bioventing
Ex-Situ Treatment	Physical/Chemical	Soil Washing
Disposal	Landfill	Off-Yard Landfilling

The technologies and process options retained after detailed screening were assembled into remedial alternatives. Four alternatives were evaluated to address contamination at OU9. Consistent with the NCP, the no action alternative was evaluated as a baseline for comparison with other alternatives during the comparative analysis. Table 2-4 describes the major components and provides cost estimates for remedial alternatives developed for OU9. The Shipyard currently has no plans to demolish Building 62 Annex, and only LUCs were evaluated for contamination potential beneath the floor of Building 62 Annex. Therefore, a remedial alternative for complete excavation of contamination (including under Building 62 Annex) to meet residential cleanup levels for unlimited use and unrestricted exposure was not developed in the FS Report.

TABLE 2-4. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST
Alternative 1: **No Action** *No action to address contamination and no use restrictions*	No action would be conducted	Five-year reviews would not be included under the no action alternative.	**Cost**: $0
Alternative 2: **LUCs for Elevated PAH Area and Building 62 Annex** *Residential and industrial land use restrictions*	LUCs	Prohibition of future residential use and implementation of requirements for management of excavated soil during potential future construction activities within the residential LUC boundary (PAH-contaminated area north of Building 62 and Building 62 Annex).	**Capital**: $15,000 **30-Year NPW**: $197,000
		Implementation of restrictions to prevent unrestricted exposure to potential contaminants in the subsurface beneath the floor of Building 62 Annex	
		Annual inspections to verify the continued effectiveness of the LUCs.	

TABLE 2-4. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST
Alternative 3: **Excavation of Elevated PAH Area and Building 62 Annex LUCs** *Excavation and offsite disposal of contaminated subsurface soil causing unacceptable hypothetical residential risks north of Building 62, and residential and industrial land use restrictions for Building 62 Annex*	Excavation and Offsite Disposal	Excavation and offsite disposal of approximately 52 cubic yards of contaminated soil north of Building 62 associated with unacceptable hypothetical future residential risks. Excavation would extend to 8 feet bgs. Precautions would be taken for excavation near the shoreline and around utilities (main water line) in the area.	**Capital**: $423,000 **30-Year NPW**: $605,000
	Site restoration	Backfilling to establish pre-construction grades, elevations, and surface types using clean soil and grass.	
	LUCs	Prohibition of future residential use and implementation of requirements for management of excavated soil during potential future construction activities within the residential LUC boundary (Building 62 Annex).	
		Implementation of restrictions to prevent unrestricted exposure to potential contaminants in the subsurface beneath the floor of Building 62 Annex	
		Annual inspections to verify the continued effectiveness of the LUCs.	
Alternative 4 **In-Situ Chemical Oxidation (ISCO) Treatment of Elevated PAH Area and Building 62 Annex LUCs** *Treatment of PAH-contaminated subsurface soil causing unacceptable hypothetical residential risks north of Building 62, and residential and industrial land use restrictions for Building 62 Annex*	ISCO treatment	Treatment system to inject ozone gas into the subsurface to reduce PAH concentrations to acceptable levels. It was assumed that 10 injection points would be used to treat the contamination. Precautions would be taken to prevent damage to the main water line in the treatment area.	**Capital**: $356,000 **30-Year NPW**: $538,000
	LUCs	Same as for Alternative 3.	

2.10 COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 2-5 and subsequent text in this section summarize the comparison of the remedial alternatives with respect to the nine CERCLA evaluation criteria outlined in the NCP at 40 CFR 300.430 (e)(9)(iii) and categorized as threshold, primary balancing, and modifying. Further information on the detailed comparison of remedial alternatives is presented in the OU9 FS.

TABLE 2-5. COMPARISON OF REMEDIAL ALTERNATIVES

CRITERION	ALT 1 NO ACTION	ALT 2 LUCS ONLY	ALT 3 EXCAVATION AND LUCS	ALT 4 TREATMENT AND LUCS
Estimated Time Frame (months)				
Designing and Constructing the Alternative	NA	12	12	12 to 18
Achieving the Cleanup Objectives	NA	12	13	13 to 19
Criteria Analysis				
Threshold Criteria				
Protects Human Health and the Environment ➢ Will it protect you and plant and animal life on and near the site?	○	●	●	●
Meets federal and state regulations ➢ Does the alternative meet federal and state environmental statutes, regulations and requirements?	NA	●	●	●
Primary Balancing Criteria				
Provides long-term effectiveness and is permanent ➢ Will the effects of the cleanup last?	○	◉	◉	◉
Reduces mobility, toxicity, and volume of contaminants through treatment ➢ Are the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present reduced?	○	○	○	●
Provides short-term protection ➢ How soon will the site risks be reduced? ➢ Are there hazards to workers, residents, or the environment that could occur during cleanup?	NA	●	◉	◉
Can it be implemented ➢ Is the alternative technically feasible? ➢ Are the goods and services necessary to implement the alternative readily available?	NA	●	◉	◉
Cost ($) ➢ Upfront costs to design and construct the alternative (capital costs) ➢ Operating and maintaining any system associated with the alternative (O&M costs) ➢ Periodic costs associated with the alternative (periodic costs) ➢ Total cost in today's dollars (30-year NPW cost)	$0	$15,000 capital 30-year NPW: $197,000	$423,000 capital 30-year NPW: $605,000	$356,000 capital 30-year NPW: $538,000
Modifying Criteria				
State Agency Acceptance ➢ Does MEDEP agree with the Navy's recommendation?	MEDEP concurs with Alternative 2, and a letter of concurrence is included in Appendix A.			
Community Acceptance ➢ What objections, suggestions, or modifications does the public offer during the comment period?	Comments received during the public comment period support Alternative 2. Section 3.0 provides the Responsiveness Summary. Public comments received and responses are provided in Appendix C.			
Relative comparison of the nine balancing criteria and each alternative: ● – Good, ◉ – Average, ○ – Poor; NA – Not applicable				

Threshold Criteria

Overall Protection of Human Health and the Environment. The no action alternative would not achieve the RAOs and would not protect human health and the environment; therefore, it is not discussed further in this ROD. All of the other alternatives would be protective of human health and the environment. Alternatives 2, 3, and 4 would be equally protective because they would provide restrictions for exposure to, remove, or treat contaminated soil north of Building 62, eliminating the potential for hypothetical future residential contact with this material. LUCs would be required under Alternatives 2, 3, and 4 to prevent unacceptable exposure to potential contamination beneath the foundation of Building 62 Annex.

Compliance with ARARs. Applicable or Relevant and Appropriate Requirements (ARARs) include any federal or state standards, requirements, criteria, or limitations determined to be legally applicable or relevant and appropriate to the site or remedial action. Alternatives 3 and 4 would meet alternative-specific ARARs. There are no alternative-specific ARARs for Alternative 2.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Alternatives 3 and 4 would remove or treat contamination, respectively, from the area north of Building 62 to prevent unacceptable hypothetical future residential exposure to this material in the long-term as opposed to using LUCs as in Alternative 2. However, all three alternatives would require LUCs to prevent unacceptable current and future industrial and hypothetical future residential exposure to potential contamination beneath the floor of Building 62 Annex. Because residential land use of this area is not likely and LUCs are required for all three, Alternatives 2, 3, and 4 are considered equally effective in the long term.

Reduction in Toxicity, Mobility, or Volume Through Treatment. Alternative 4 is the only alternative that would include treatment to reduce the toxicity and volume of contamination.

Short-Term Effectiveness. Alternative 2 would have the least short-term effectiveness concerns. Implementation of LUCs would not adversely impact the surrounding community or the environment. Alternatives 3 and 4 would have the same general degree of short-term effectiveness concerns. Short-term effectiveness concerns for Alternative 3 would involve impacts to remediation construction workers and the environment during removal and processing of contaminated material, and concerns for Alternative 4 would involve impacts to remediation construction workers and the environment during installation of injection wells and operation of the treatment system. However, these concerns could be effectively controlled using personal protective equipment, compliance with proper site-specific health and safety procedures, and use of best management practices to prevent exposure to and migration of contamination during construction activities. Alternative 3 would have the greatest environmental impact due to estimated greenhouse gas (GHG) emissions, nitrous and sulfur oxide emissions, particulate matter emissions, energy consumption, and water usage related to soil removal construction activities (excavation, offsite transportation, disposal, grading, and backfilling). Alternative 2 would have the least environmental impacts, which would be primarily due to transportation of workers to and from the site for LUC inspections. Alternative 3 potential environmental impacts would be due to installation and operation of the treatment system. The estimated time for implementation of Alternatives 2 and 3 is 12 months, and for Alternative 4 is 12 to 18 months for preparation of remedial action documents. Alternative 2 would achieve RAOs upon implementation, and Alternatives 3 and 4 would achieve RAOs within 1 month of implementation.

Implementability. Alternative 2 would be the easiest to implement because it would only require development of a remedial action document for LUCs and conducting LUC inspections. Alternatives 3 and 4 have the same general amount of implementability concerns. Alternative 3 would involve the excavation and offsite transportation and disposal of contaminated materials, in addition to backfilling and regrading of the excavated area. The main implementability concern for Alternative 3 would be related to protection of the main water line within the excavation area. Alternative 4 would involve installation of

treatment wells and other system components and operation of an ozone treatment system, and it would also require protection of the main water line within the treatment area.

Cost. The estimated NPW cost is greatest for Alternative 3 at $605,000 and least for Alternative 2 at $197,000. The estimated NPW cost for Alternative 4 is $538,000.

Modifying Criteria

State Acceptance. State involvement has been solicited throughout the CERCLA process. MEDEP, as the designated support agency in Maine, concurs with the Selected Remedy.

Community Acceptance. No comments were received that changed the preferred remedial alternative.

2.11 PRINCIPAL THREAT WASTE

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or that would present a significant risk to human health or the environment should exposure occur. A source material is a material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. The NCP at 40 CFR 300.430(a)(1)(iii)(A) establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable. At OU9, contaminants are not highly toxic or highly mobile; therefore, principal threat wastes are not present at the site.

2.12 SELECTED REMEDY

2.12.1 Rationale for Selected Remedy

The Selected Remedy for OU9 is Alternative 2, which includes LUCs for contaminated soil north of Building 62 and for Building 62 Annex, which was selected because it provides the best balance of tradeoffs with respect to the nine evaluation criteria. Alternative 2 was selected over the other alternatives because LUCs provide the same protectiveness based on current industrial land use as Alternatives 3 and 4 with less short-term effectiveness and implementability concerns and at a lesser cost. The Selected Remedy will implement LUCs to prevent unrestricted exposure to potential contamination beneath the floor of Building 62 Annex for current industrial site users and to restrict residential use to prevent residential exposure to subsurface soil in the area north of Building 62.

The principal factors in the selection of this remedy for OU9 include the following:

- OU9 is historically an industrial site and there are no current plans to develop the site for residential use. Therefore, LUCs would be effective in preventing hypothetical future residential exposure to subsurface contamination north of Building 62. Excavation or treatment of this contamination would not provide significantly more long-term effectiveness based on current and anticipated future land use, and LUCs would still be required for Building 62 Annex.
- There are no current plans to remove Building 62 Annex; therefore, LUCs would be effective in preventing current and future potential exposure to contamination under the floor of the building.
- The remedy is consistent with the reasonably anticipated future industrial use of the site.
- The remedy achieves the same protection of current and likely future site users at a lower cost than active remediation ($197,000 compared with $605,000 for Alternative 3 and $538,000 for Alternative 4).

2.12.2 Description of Selected Remedy

The Selected Remedy for OU9 is implementing LUCs to prohibit future residential use, provide requirements for management of excavated soil, and prevent unrestricted industrial exposure to the subsurface beneath the foundation of Building 62 Annex.

LUCs will be implemented for OU9 through a LUC RD for the areas shown on Figure 2-3. Two areas for LUCs at OU9 were identified; the area north of Building 62 is where PAH-contaminated subsurface soil (2 to 8 feet bgs) based on potential residential risks was delineated, and Building 62 Annex is where ash contaminated with PAHs is presumed to be present beneath the floor of the building. LUCs to prevent residential land use and provide requirements for management of excavated soil will be implemented for the area north of Building 62 and Building 62 Annex. LUCs to restrict industrial exposure will be implemented for Building 62 Annex. As part of LUCs, regular inspections of LUCs will be conducted, in accordance with the requirements provided in the LUC RD. Consistent with the RAOs developed for the site, the specific performance objectives for the LUCs to be implemented at OU9 are as follows:

- To prohibit residential use unless additional action is undertaken to prevent residential exposure to contamination in subsurface soil in the area north of Building 62 and under Building 62 Annex. Prohibited residential uses shall include, but are not limited to, any form of housing, child-care facilities, pre-schools, elementary schools, secondary schools, playgrounds, convalescent, or nursing care facilities.
- Prohibit unrestricted contact with soil underneath Building 62 Annex to prevent exposure to contamination presumed to be under the building foundation.
- To provide requirements for proper management of excavated soil from the area north of Building 62 and under Building 62 Annex as part of any future construction or maintenance activities.

The LUCs will be implemented and maintained by the Navy until concentrations of hazardous substances are at levels that allow for unlimited use and unrestricted exposure. Within 90 days of ROD signature, the Navy as lead agency shall develop, prepare, and submit to USEPA for review and approval a LUC RD as a primary document per the FFA that shall contain LUC implementation actions, including maintenance, monitoring and enforcement requirements that are consistent with the requirements under this ROD. The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs described in this ROD. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for the remedy integrity.

2.12.3 Expected Outcomes of Selected Remedy

The current and reasonably anticipated future plan is to continue to use OU9 for industrial purposes. Under current conditions, exposure to contamination presumed to be present under the foundation of Building 62 Annex is unlikely. Ash contaminated with carcinogenic PAHs presumed to be beneath Building 62 Annex would pose an unacceptable risk to current and future site users if the material was exposed through construction or excavation. Subsurface soil contaminated with carcinogenic PAHs north of Building 62 only poses an unacceptable risk to hypothetical future residents. The Selected Remedy of LUCs eliminates potential risks to hypothetical future residential users for subsurface soil and risks for current and future anticipated industrial user exposure to the ash presumed to be beneath Building 62 Annex.

Groundwater at OU9 is not used and is not expected to be used in the future, and the Selected Remedy will have no impact on current or future groundwater uses available at the site. There are no socio-economic, community revitalization, or economic impacts or benefits associated with implementation of the Selected Remedy. It is estimated that the RAOs for OU9 will be achieved upon implementation of the remedy. Table 2-6 describes how the Selected Remedy mitigates risk and achieves RAOs.

FIGURE 2-3. OU9 SELECTED REMEDY

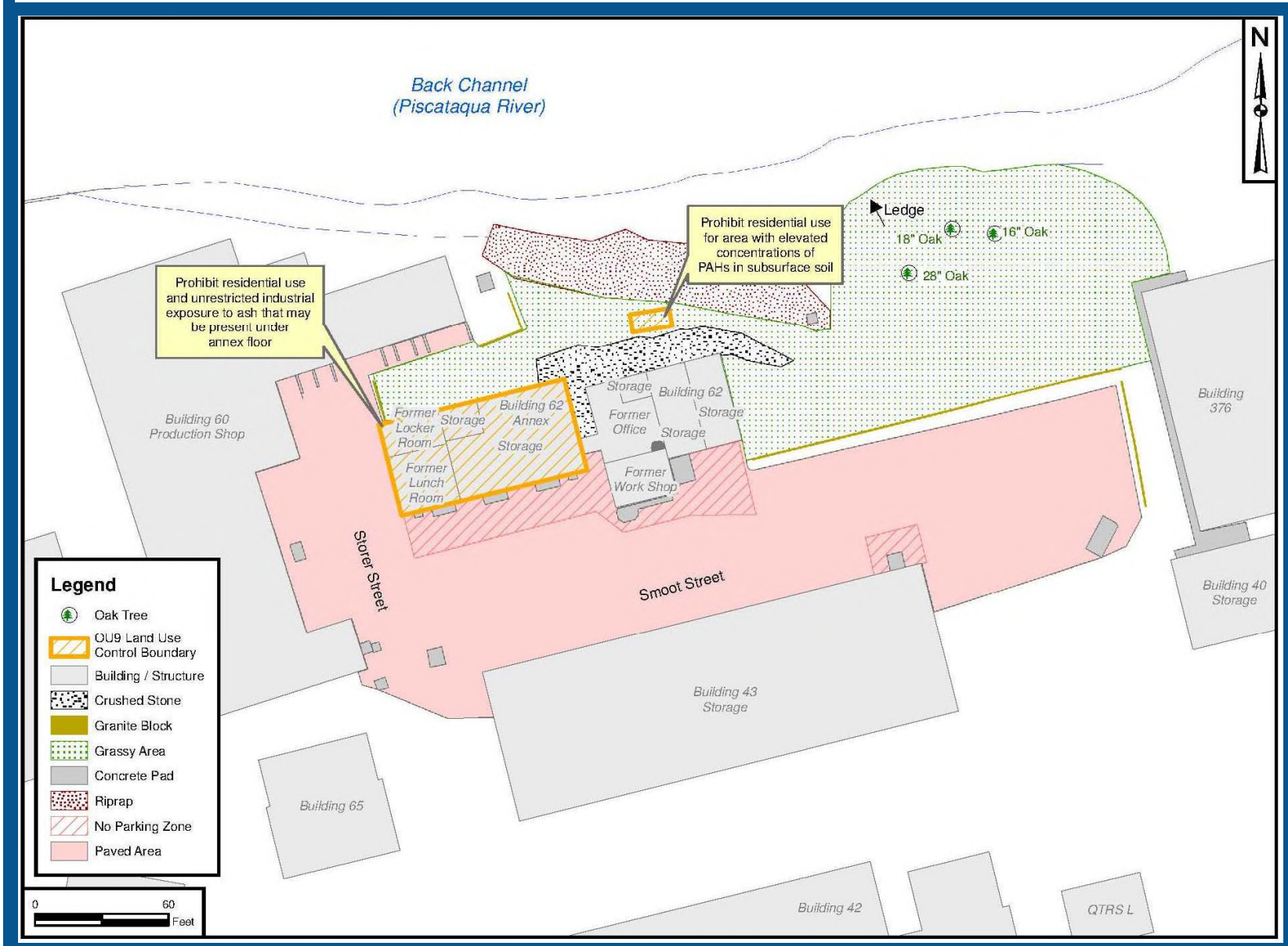


TABLE 2-6. HOW SELECTED REMEDY MITIGATES RISK AND ACHIEVES RAOS		
RISK	**RAO**	**COMMENTS**
Potential unacceptable risks to hypothetical future residents from exposure to contaminated subsurface soil in the area north of Building 62.	Prevent hypothetical future residential exposure through ingestion of, dust inhalation of, and dermal contact with subsurface soil containing carcinogenic PAH concentrations exceeding the residential cleanup level.	LUCs will restrict residential use of the area north of Building 62, where elevated PAH concentrations in subsurface soil are associated with potentially unacceptable risk based on residential exposure. LUCs will also specify requirements for management of excavated soil as part of any future construction activities within the LUC boundary.
Potential unacceptable risks to current and future industrial workers and hypothetical future residents from exposure to potential contamination beneath the foundation of Building 62 Annex.	Prevent potential future exposure to carcinogenic PAHs in ash that may be present under the floor of Building 62 Annex.	LUCs will restrict residential use, provide requirements for management of excavated material, and prevent unrestricted industrial exposure to the subsurface beneath the floor of Building 62 Annex. LUCs will prohibit unrestricted contact with soil beneath Building 62 Annex to prevent exposure to contamination presumed to be present under the building foundation. LUCs will also specify requirements for management of excavated soil as part of any future construction activities within the LUC boundary.

2.13 STATUTORY DETERMINATIONS

In accordance with the NCP, the Selected Remedy meets the following statutory determinations:

- **Protection of Human Health and the Environment** – The Selected Remedy for OU9 is needed to prevent potential unacceptable risks based on hypothetical future residential land use and unrestricted industrial uses. LUCs will prevent residential land use of the area north of Building 62, prevent residential use of Building 62 Annex, and prevent unrestricted industrial exposure to the subsurface beneath the floor of Building 62 Annex.
- **Compliance with ARARs** – No federal and state ARARs are associated with the Selected Remedy for OU9 as presented in Appendix E.
- **Cost-Effectiveness** – The Selected Remedy is the most cost-effective alternative that is expected to cause the least disruption of current facility operations and is protective of human health and the environment considering continued use of Building 62 and Building 62 Annex for industrial purposes. Detailed cost estimates for the Selected Remedy are presented in Appendix F.
- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** – The Selected Remedy represents the maximum extent to which permanent solutions and alternative treatment technologies can be used in a practical manner at OU9. Based on the small volume and depth of contamination north of Building 62 and unknown nature of the ash beneath Building 62 Annex, the Navy concluded that it was impracticable to treat the COCs in a cost-effective manner.
- **Preference for Treatment as a Principal Element** – Treatment is not a principal element of the Selected Remedy at OU9 because there are no principal threat wastes at the site.
- **Five-Year Review Requirement** – Five-year site reviews are required for OU9 because contamination will remain in excess of levels that allow for unlimited use and unrestricted exposure and will be conducted to confirm that the remedy remains protective of human health and the environment.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires an explanation of significant changes from the Selected Remedy presented in the Proposed Plan that was published for public comment. The Navy in consultation with USEPA determined that modifications to the Selected Remedy based on comments received during the public comment period were not required. Comments received during the public comment period are discussed in Section 3.0, Responsiveness Summary. There were no significant changes made to the Selected Remedy from what was presented in the Proposed Plan (provided in Appendix B).

3.0 RESPONSIVENESS SUMMARY

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

Based on the results of the public comment period, no changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate. Participants in the public meeting held July 23, 2013, included a RAB member, the Technical Assistance Grant consultant for the community organization, and representatives of the Navy, USEPA, and MEDEP. The RAB member is a representative of the community organization that provided oral and written comments during the public comment period. Comments received during the public comment period are included in Appendix C. The community organization indicated general support for the preferred alternative for OU9. One comment was specifically related to the proposed remedy and is summarized in Table 3-1. Other comments and questions related to information on site characteristics, risk assessment, and migration of contamination that were addressed in the RI and FS Reports for OU9 and comments and questions in regard to consideration of factors that relate to future conditions at PNS. The Navy will prepare a LUC RD and conduct five-year site reviews that will address any future conditions that could affect the long-term protectiveness of the remedy for OU9. The Navy's responses to these comments are provided in Appendix C.

TABLE 3-1. SUMMARY OF COMMENTS FROM PUBLIC HEARING AND PUBLIC COMMENT PERIOD

COMMENT	RESPONSE
The community organization indicated that periodic inspection was necessary to ensure that ash does not become exposed.	Inspection as part of LUCs and five-year reviews will be sufficient to determine whether site conditions have changed such that ash at OU9 could pose an unacceptable risk.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues associated with the OU9 ROD were identified.

Administrative Record Reference Table

DETAILED ADMINISTRATIVE RECORD REFERENCE TABLE

Item	Reference Phrase in ROD	Location in ROD	Location of Information in Administrative Record (N00102)	
			Record Number	Document Title
1	Soil and Sediment Sampling	Table 2-1	002700	Remedial Investigation for Operable Unit 9, Tetra Tech, June 2012
2	Limited Ash Excavation	Table 2-1	002700	Remedial Investigation for Operable Unit 9, Tetra Tech, June 2012
3	Site Screening Investigation	Table 2-1	002700	Remedial Investigation for Operable Unit 9, Tetra Tech, June 2012
4	Ash Extent Evaluation	Table 2-1	002700	Remedial Investigation for Operable Unit 9, Tetra Tech, June 2012
5	Removal Action	Table 2-1	002471	Construction Closeout Report for Site 34 Shoreline Stabilization and Removal Action, Shaw Environmental, Inc., July 2008
6	RI	Table 2-1	002700	Remedial Investigation for Operable Unit 9, Tetra Tech, June 2012
7	FS and cleanup alternatives	Table 2-1	002840	Feasibility Study Report for Operable Unit 9, Tetra Tech, May 2013
8	Site Characteristics	Section 2.5	002700	Remedial Investigation for Operable Unit 9, Tetra Tech, June 2012
9	Land uses and resources	Section 2.6	002700	Remedial Investigation for Operable Unit 9, Tetra Tech, June 2012
10	Human health risk	Section 2.7.1	002700	Remedial Investigation for Operable Unit 9, Tetra Tech, June 2012
11	Remedial action objectives and cleanup levels	Section 2.8	002840	Feasibility Study Report for Operable Unit 9, Tetra Tech, May 2013
12	Preliminary technology/screening	Section 2.9	002840	Feasibility Study Report for Operable Unit 9, Tetra Tech, May 2013
13	Remedial alternatives	Section 2.9	002840	Feasibility Study Report for Operable Unit 9, Tetra Tech, May 2013
14	Nine CERCLA evaluation criteria	Section 2.10	002840	Feasibility Study Report for Operable Unit 9, Tetra Tech, May 2013
15	Chemical-, location-, and action-specific ARARs	Section 2.10	002840	Feasibility Study Report for Operable Unit 9, Tetra Tech, May 2013
16	Public meeting	Section 3.1	Not Applicable	The public meeting for the Proposed Plan for OU9 was held on July 23, 2013. Transcripts are provided in Appendix C.

Appendix A
State of Maine Concurrence Letter

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

PATRICIA W. AHO
COMMISSIONER

September 18, 2013

James T. Owens, I11
Director, Office of Site Remediation & Restoration EPA New England, Region I
5 Post Office Sq. Suite 100
Mail Code OSRR07-5
Boston, MA 02109-3912

Re: Record of Decision for Operable Unit 9
Portsmouth Naval Shipyard, Kittery, Maine

Dear Mr. Owens:

The Maine Department of Environmental Protection (MEDEP) has reviewed the Record of Decision – Operable Unit 9 – Site 34 (Former Oil Gasification Plant, Building 62), Portsmouth Naval Shipyard, Kittery, Maine dated September 2013. The Record of Decision (ROD) summarizes the results from the 2007 Removal Action, the Remedial Investigation and the Feasibility Study, and documents Navy's rationale for selecting land use controls (LUCs) and annual inspections of LUCs as the remedy for OU9. MEDEP concurs with the selected decision of land use controls and annual inspections of LUCs.

The State's concurrence of the selected decision, as described above, should not be construed as the State's concurrence with any conclusion of law or finding of fact, which may be set forth in the ROD or supporting documents for the site listed above. The State reserves any and all rights to challenge any such finding of fact or conclusion of law in any other context.

This concurrence is based on the State's understanding that the Navy will continue to solicit MEDEP's review and concurrence with the Land Use Controls Remedial Design for OU9.

MEDEP looks forward to working with the Department of the Navy and Environmental Protection Agency to resolve the environmental issues remaining at the Portsmouth Naval Shipyard. If you have any questions or comments, please contact Iver McLeod at iver.j.mcleod@maine.gov or 207-287-8010.

Best regards,

Melanie Loyzim, Director
Bureau of Remediation and Waste Management

pc: Iver McLeod – MEDEP
Elizabeth Middleton – US Navy
Matt Audet - EPA

AUGUSTA
17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826

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PORTLAND, MAINE 04103
(207) 822-6300 FAX: (207) 822-6303

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PRESQUE ISLE, MAINE 04769
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web site: www.maine.gov/dep

Appendix B
Proposed Plan for Operable Unit 9

Proposed Plan

Operable Unit 9

Portsmouth Naval Shipyard, Kittery, Maine

The Cleanup Proposal

This Proposed Plan has been prepared, in accordance with federal law and the Federal Facility Agreement for Portsmouth Naval Shipyard (PNS), to present the Navy's preferred approach for addressing contamination at Operable Unit (OU) 9, PNS, Kittery, Maine. OU9 consists of Site 34 (the Former Oil Gasification Plant, Building 62). **Polycyclic aromatic hydrocarbon (PAH)**-contaminated subsurface soil is present in an area north of Building 62, and ash with PAH contamination may be present beneath the floor of Building 62 Annex.

After careful study, the Navy, with concurrence from the United States Environmental Protection Agency (EPA) and Maine Department of Environmental Protection (MEDEP), proposes:

- Implementation of **land use controls (LUCs)** for the area north of Building 62 and Building 62 Annex.
- Performance of five-year reviews to ensure continued protectiveness.

LUCs for Building 62 Annex would prevent unacceptable industrial exposure to contamination under Building 62 Annex. LUCs would prevent residential exposure to contamination under Building 62 Annex and in the subsurface soil in the area north of Building 62.

This plan provides information on the remedial alternatives evaluated for contamination at OU9, the public comment period, the informational open house and public hearing, and how the final remedy for OU9 will ultimately be selected.

Let us know what you think

Mark Your Calendar!

Public Comment Period

July 16, 2013, to August 14, 2013

The Navy will accept comments on this Proposed Plan for OU9 during this comment period. You do not have to be a technical expert to comment. To provide formal comments, you may offer oral comments during the public hearing or provide written comments either at the informational open house, at the public hearing, or by fax or mail. Send written comments postmarked no later than August 14, 2013, to:

Ms. Danna Eddy
Public Affairs Office (Code PAO100)
Portsmouth Naval Shipyard,
Portsmouth, New Hampshire 03804-5000
Fax: (207) 483-1266

Informational Open House and Public Hearing

July 23, 2013

The Navy invites you to attend an informational open house from*7:00 pm to 7:30 pm* to learn more about the proposed OU9 cleanup plan and how it compares with other cleanup options for the site. The informational session will include posters describing the Proposed Plan, and an informal question and answer session. A formal public hearing for OU9 will be held from 8:00 to 8:20 pm, following the public hearing for OU7. During the public hearing for OU9 the Navy will receive comments from the public on the Proposed Plan for OU9. It is at this formal hearing that an official transcript of the comments will be recorded. The above activities will be held at Kittery Town Hall in Kittery, Maine.

*Federal and state environmental laws govern cleanup activities at federal facilities. A federal law called the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, better known as Superfund, provides procedures for investigation and cleanup of environmental problems. Under this law, the Navy is pursuing cleanup of designated sites at PNS to return the property to a condition that protects the community, workers, and the environment.*

TECHNICAL TERMS USED THROUGHOUT THIS PROPOSED PLAN ARE EXPLAINED IN THE GLOSSARY OF TERMS ON PAGE 13

INTRODUCTION

This Proposed Plan provides information on the preferred approach for addressing contamination at OU9 at PNS and provides the rationale for this preference. In addition, this plan includes summaries of other cleanup alternatives evaluated for use at OU9. This document is issued by the Navy, as the lead agency for all investigations and cleanup programs ongoing at PNS, and EPA, with the concurrence of MEDEP. The Navy and EPA, in consultation with MEDEP, will select the final remedy for OU9 after reviewing and considering all information submitted during the 30-day public comment period and may modify the preferred alternative or select another response action presented in this plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives presented in this Proposed Plan.

The Navy is issuing this Proposed Plan as part of its public participation responsibilities under Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**. The Proposed Plan summarizes information that can be found in greater detail in the **Remedial Investigation (RI)**, **Feasibility Study (FS),** and other documents included in the PNS Information Repositories, located at the Rice Public Library in Kittery, Maine, and Portsmouth Public Library in Portsmouth, New Hampshire. The Navy and EPA encourage the public to review these documents to gain a more comprehensive understanding of the site and associated environmental activities. Please refer to the Next Steps section on Page 12 for contact information and hours of operation for these facilities.

The purposes of this Proposed Plan are to:

- Provide the public with basic background information about PNS and OU9. This information includes a description of the OU that was developed by reviewing past documents, investigating soil, and evaluating potential human and ecological impacts.
- Describe the cleanup options that were considered.
- Identify the Navy's preferred alternative for remedial action at OU9 and explain the reasons for that preference.
- Provide information on how the public can be involved in the remedy selection process.
- Solicit and encourage public review of the Proposed Plan.

After the public has had the opportunity to review and comment on this Proposed Plan, the Navy will summarize and respond to all significant comments received during the comment period in a Responsiveness Summary. The Navy and EPA, in consultation with MEDEP, will carefully consider all comments received and could even select a remedy different from that proposed in this plan, after appropriate additional opportunity for comment. Ultimately, the selected remedy for OU9 will be documented in a **Record of Decision (ROD)**. The Responsiveness Summary will be issued with the ROD.

History of Site Investigations and Interim Actions

1998 – Soil and Sediment Sampling: Identified Site 34 as a potentially contaminated site when ash was observed on the northern side of Building 62. Samples were collected to support further investigation.

1999 – Limited Ash Excavation: Ash was excavated from a pile on the northern side of Building 62; however, excavation was terminated when the volume of ash encountered exceeded the estimated two 55-gallon drums.

2003 – Site Screening Investigation (SSI): Conducted soil (including ash) and sediment sampling to determine whether site operations may have impacted soil or sediment. Temporary monitoring wells were installed at several borings; however, groundwater was not present in soil, and the wells were subsequently abandoned. The SSI concluded that PAHs, antimony, lead, and mercury were the potential contaminants associated with ash, and that by removing the ash, the majority of potential risks to human receptors would be addressed.

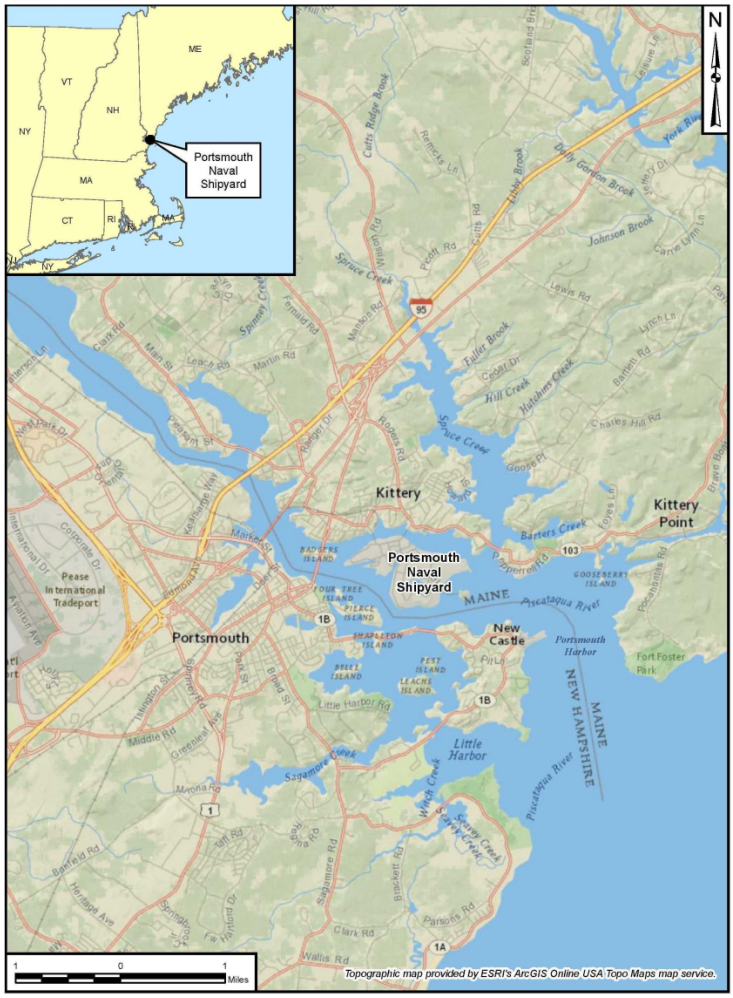
2004 – Ash Extent Evaluation: The visual presence of ash was used to determine the approximate extent of ash to support a removal action.

2007 – Removal Action: Included removal of ash across most of the site. Ash was excavated and the excavation backfilled with fill from an off-base borrow source. Although minor ash is present in the grassy area northeast of Building 62, no excavation was conducted to preserve large oak trees in this area.

2009 and 2010 – RI: Conducted to determine the nature and extent of contamination and to evaluate potential risks to human receptors after the 2007 removal action. An unexpected pocket of ash and burnt material was discovered north of Building 62, in the subsurface beneath the excavated area. Tar and ash suspected to be under Building 62 were not found. PAHs were the main contaminants associated with the ash. Antimony, lead, and mercury were detected at low concentrations. The RI concluded that with the removal of the majority of ash in 2007, there was no longer a risk for migration of contamination at OU9 to offshore sediment. Sediment contamination from past releases to the offshore area is being addressed as part of OU4 (offshore OU).

2012 – FS: Conducted to develop and evaluate potential cleanup alternatives for OU9.

Figure 1 - Site Vicinity Map



Site Background

PNS is a military facility with restricted access located on an island in the Piscataqua River. The Piscataqua River is a tidal estuary that forms the southern boundary between Maine and New Hampshire. PNS was established as a government facility in 1800 and it served as a repair and building facility for ships during the Civil War. The first government-built submarine was designed and constructed at PNS during World War I. A large number of submarines have been designed, constructed, and repaired at this facility since 1917. PNS continues to service submarines as its primary military focus. Figure 1 shows the location of PNS, and Figure 2 shows the layout of OU9.

Where is OU9 within the Shipyard?

OU9 is located in the northwestern portion of PNS, east of the access bridge from the mainland to PNS (at Gate 1).

For what was OU9 used?

The majority of the OU9 area has been used for industrial activities since the late 1800s. Industrial activities at OU9 included oil gasification plant operations, blacksmith operations, and storage. Coal was used to provide heat for oil gasification operations from the 1870s to the early 1900s. From 1915 to 1930, Building 62 was used as a blacksmith shop by the Shipyard Public Works Department, during which time the building was gutted by a fire (1919). The primary source of contamination at OU9 is ash from past oil gasification and blacksmithing operations. From 1930 to the present, Building 62 has been used for temporary storage of non-hazardous material. From the 1960s to 1985, pesticides, insecticides, and/or herbicides were stored in Building 62. Building 62 Annex was built in the 1940s for temporary storage of non-hazardous materials. Building 63, located within the OU9 boundary, was constructed in 1874 as a Cart and Wheel Shed and later used for Public Works storage. Building 63 was demolished in 2005, and the foundation was removed in 2007. A thin layer of ash was found under the foundation of Building 63, which was removed as part of the 2007 removal action.

What is the current and future land use at the site?

The current land use for OU9 is industrial. Building 62 and Building 62 Annex are used for temporary storage of non-hazardous materials. Outside of these buildings, OU9 is covered with pavement, crushed stones, and grass north and east of Building 62, with some trees and shrubs in the far northeastern portion. Adjacent to OU9 are other buildings in areas east, south, and west of Building 62 and Building 62 Annex. Future land use is anticipated to remain the same as current land use.

Site Characteristics

What does OU9 look like?

OU9 is an industrial area that includes Building 62 and Building 62 Annex. The majority of OU9 is relatively flat, with a gentle slope from the south of the site toward the area north of Building 62. Former Building 63 was located east of Building 62. Areas west and south of Building 62 are paved, and areas north and east of Building 62 are covered with crushed stones, grass, or other vegetation. There is a steep slope to the water's edge at the shoreline of the Piscataqua River Back Channel. Figure 3 shows the conceptual site model for OU9.

What is the size of OU9?

OU9 is approximately 1 acre in size. Excluding Building 62 (3,300 square feet), Building 62 Annex (3,500 square feet), and the grassy area with trees (4,100 square feet), most of the site was included in the 2007 removal action.

How much and what types of chemicals are present?

PAHs that may cause cancer (carcinogenic PAHs), including benzo(a)pyrene and related compounds, are the contaminants associated with ash from past operations at OU9. The majority of the ash and associated contaminated soil were removed during the 2007 removal action. During the RI conducted after

the removal action, small isolated pockets of ash/burnt material were found in subsurface soil beneath the excavated area. Minor amounts of ash/burnt material were also found in subsurface soil in the unexcavated grassy area with trees, and there are minor amounts of ash/burnt material under some utilities at the site. An estimated 5 percent of the overburden (subsurface material overlying bedrock) at OU9, excluding overburden under buildings, contains ash/burnt material. The majority of this material is in the subsurface in an approximate 175-square-foot area north of Building 62, by a main water line. No contamination was found beneath the floor of Building 62. The soil beneath Building 62 Annex has not be investigated; however, based on site use and the presence of ash beneath former Building 63, ash is presumed to be present beneath the floor of Building 62 Annex.

Scope and Role of the OU9 Response Action

OU9 is one of several OUs at PNS identified for assessment and cleanup under CERCLA. Each of these OUs is undergoing the CERCLA cleanup process independently of the others. The Proposed Plan for OU9 is not expected to have an impact on the strategy or progress of cleanup for the other OUs at PNS. Proposed Plans and signed RODs have been prepared for OU1, OU2, and OU3. A Proposed Plan for OU4 has been prepared, and a ROD will be signed. A Proposed Plan for OU7 is being prepared. One OU (OU8) is under investigation.

Figure 2 - Site Layout

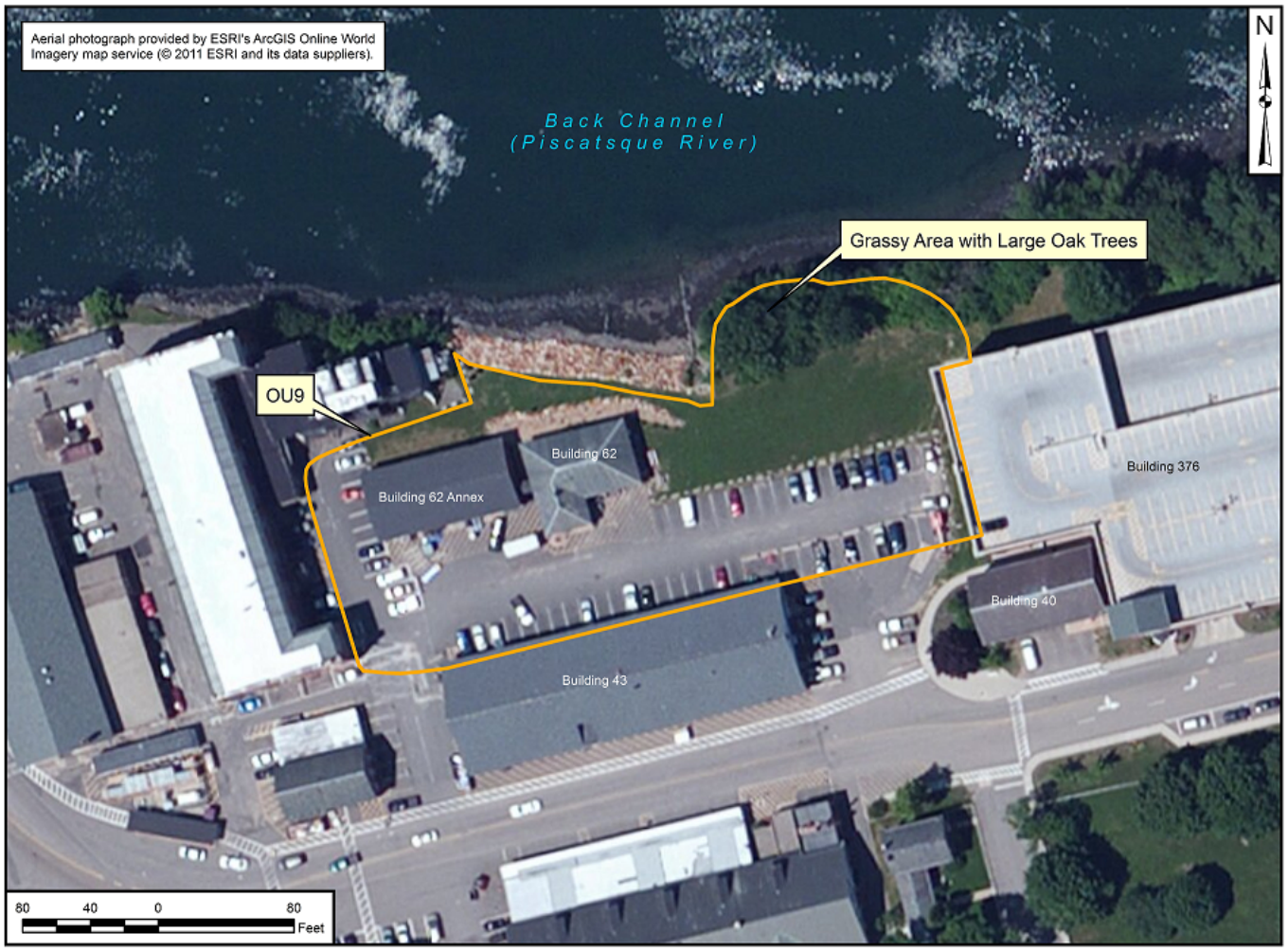
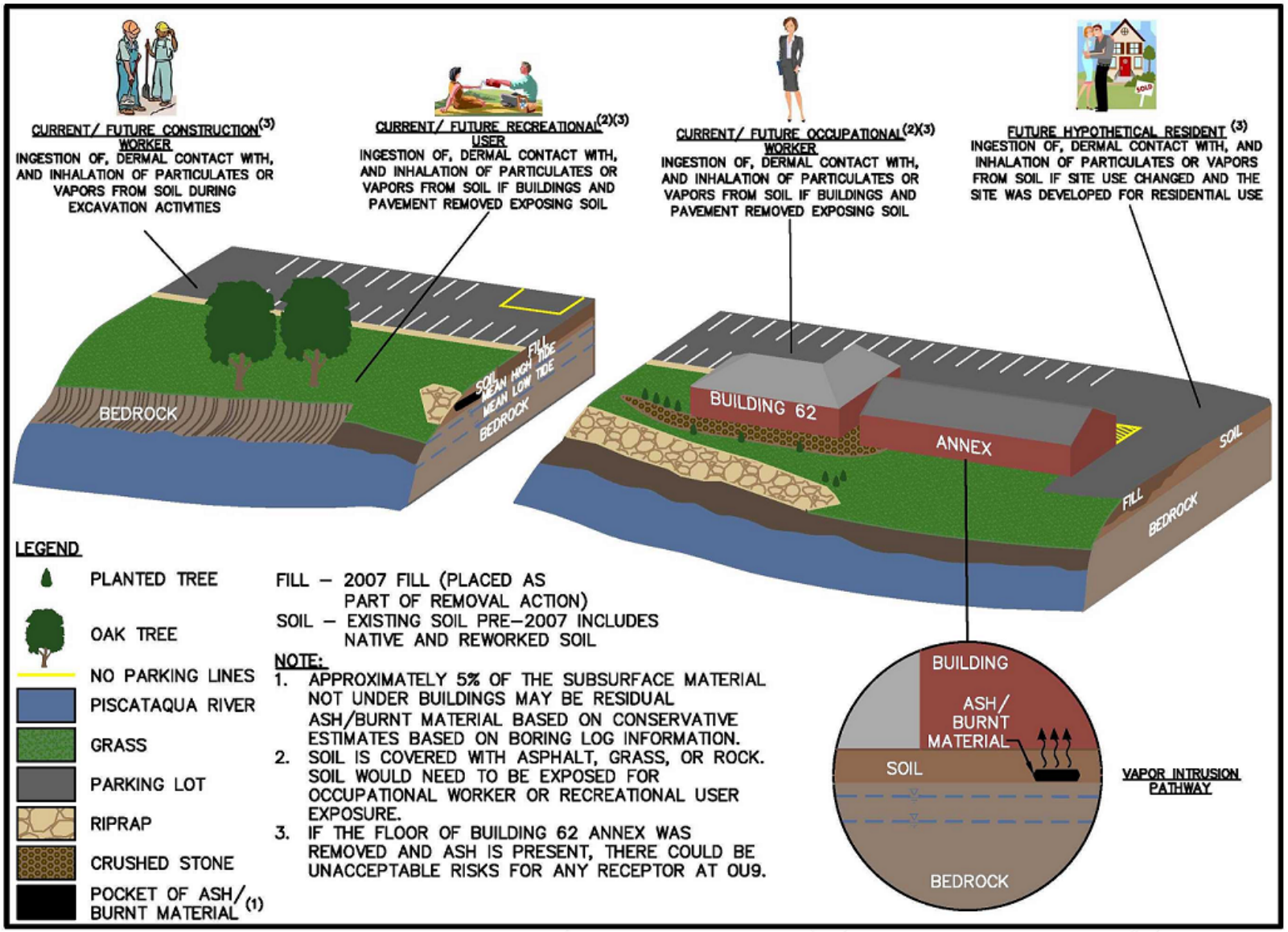


Figure 3 - Conceptual Site Model



Summary of Site Risks

As part of OU9 investigation activities, the Navy completed a risk assessment after the 2007 removal action to evaluate current and future potential for adverse human health effects caused by exposure to site contaminants. The results of the risk assessment are described below. Potential for adverse ecological effects from exposure to site contaminants was not evaluated as part of a risk assessment because OU9 is currently and has historically been an industrial area with no significant habitats for ecological exposure.

Human Health Risks

The **Human Health Risk Assessment (HHRA)** estimates the baseline risk, which is the likelihood of health problems occurring if cleanup actions were not taken at the site. The HHRA evaluated current and future potential for adverse human health effects from exposure to site contaminants in soil not covered by buildings at OU9. Ash material presumed to be present under the floor of Building 62 Annex was considered separately. To estimate the baseline risk to humans using the EPA HHRA methodology, a four-step process was used.

Step 1 – Identify Chemicals of Potential Concern (COPCs)

COPCs are chemicals found at the site at concentrations greater than risk-based screening criteria (and for select organic compounds and **metals**, greater than facility **background** levels). The COPCs were further evaluated in Steps 2 through 4 of the risk assessment.

Step 2 – Conduct an Exposure Assessment

In this step, the many ways that people could come into contact with soil at OU9 were considered. Both current and future exposure scenarios were identified based on site conditions and uses. Commercial/industrial (construction and occupation workers), recreational, and hypothetical residential exposure scenarios were considered.

There is potential construction worker exposure to surface and subsurface soil during excavation activities. Although there are current commercial/industrial activities at the site (i.e., storage of materials), there are no current occupational exposures to soil because the site is covered by pavement and vegetation. Based on site conditions, there are also no current recreational activities (e.g., picnicking) that would result in exposures to soil. Occupational workers and recreational users might be exposed to surface and subsurface soil in the future if soil was exposed or brought to the surface during construction activities. Hypothetical future residential exposure to surface and subsurface soil at the site was considered if the site use changed and the site was developed for residential use. Exposure to soil for the HHRA was evaluated based on the assumption that people may come in contact with soil through touching (dermal contact), ingesting, and breathing in soil particles (as dust) or breathing vapors emanating from soil (inhalation).

Step 3 – Complete a Toxicity Assessment

At this step, possible harmful effects from exposure to the individual COPCs were evaluated. Generally, these chemicals are separated into two groups, carcinogens (chemicals that may cause cancer) and non-carcinogens (chemicals that may cause adverse effects other than cancer). COPCs identified for OU9 were carcinogenic PAHs and mercury (non-carcinogenic).

Step 4 – Characterize the Risk

The results of Steps 2 and 3 were combined to estimate the overall risk from exposure to chemicals at OU9. The terms used to define the estimated risk are explained in the text box, ***What is the Potential Risk to Me?***, below. **Chemicals of concern (COCs)** are identified based on the risk characterization.

What is the Potential Risk to Me?

In evaluating risks to people, risk estimates for carcinogens (chemicals that may cause cancer) and non-carcinogens (chemicals that may cause adverse effects other than cancer) are expressed differently.

For carcinogens, risk estimates are expressed in terms of probability. For example, exposure to a particular carcinogenic chemical may present a 1 in 10,000 increased chance of getting cancer over an estimated lifetime of 70 years. This can also be expressed as $1x10^{-4}$. The EPA acceptable risk range for carcinogens is within $1x10^{-6}$ to $1x10^{-4}$ or a one in a million to a 1 in 10,000 increased chance of getting cancer. Cleanup would be considered for calculated risks greater than the acceptable risk range.

For non-carcinogens, exposures are first estimated and then compared to a reference dose (RfD). The RfD is developed by EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse (non-cancer) health effects. This measure is known as a hazard index and is the ratio of daily intake of a chemical from onsite exposure divided by the RfD. A hazard index greater than 1 suggests that adverse effects are possible.

The results of the OU9 HHRA for people potentially exposed to soil and ash not under buildings at OU9 indicated that non-carcinogenic hazard indices were less than the target goal of 1 for all exposures evaluated. Cancer risk estimates exceeded the target risk range for hypothetical future residential exposure to subsurface soil, and the risks were attributed to carcinogenic PAHs in an area north of Building 62. Cancer risk estimates for surface soil were less than the target risk range.

Exposure to ash material contaminated with carcinogenic PAHs presumed to be present under the floor of Building 62 Annex would pose an unacceptable risk to people if the material was exposed. Specific PAHs that could be released as vapors from soil and move into the air inside buildings (referred to as vapor intrusion) have not been detected in ash at OU9 at concentrations that would pose unacceptable risk due to vapor intrusion. Therefore, if ash is present under the floor of Building 62 Annex, it is not expected to pose unacceptable risks to people working in the building due to vapor intrusion. .

Why is action needed at the site?

PAH-contaminated subsurface soil in an area north of Building 62 and ash presumed to be under Building 62 Annex remain that could result in unacceptable human health risks if action is not taken to prevent future exposure to the contamination.

It is the current judgment of the Navy and EPA, in consultation with MEDEP, that a response action is necessary to protect public health and welfare from actual or threatened releases of these hazardous substances into the environment, and that the preferred alternative is the appropriate remedial alternative for this purpose.

Remedial Action Objectives

Remedial action objectives (RAOs) are the goals that a cleanup plan should achieve. They are established to protect human health and the environment and to comply with all pertinent federal and state regulations. The following RAOs were developed for OU9 based on its current and reasonably anticipated future use:

- Prevent hypothetical future residential exposure through ingestion of, dust inhalation of, and dermal contact with subsurface soil containing carcinogenic PAH concentrations exceeding the residential **cleanup level**.
- Prevent potential future exposure to carcinogenic PAHs in ash that may be present under the floor of Building 62 Annex.

One site-specific risk-based OU9 cleanup level was developed in the FS for carcinogenic PAHs, which were evaluated collectively in terms of a **benzo(a)pyrene toxicity equivalency quotient (BAP TEQ)**. The proposed site-specific risk-based cleanup level for carcinogenic PAHs based on the BAP TEQ for residential exposure at OU9 is 1.5 parts per million (ppm), and it is based on average exposure.

Summary of Remedial Alternatives

Remedial alternatives, or cleanup options, were identified in the OU9 FS. These alternatives are different combinations of plans to restrict access and to contain, remove, or treat contamination to protect human health. With the exception of Alternative 1 (No Action), all alternatives would attain the RAOs. The alternatives evaluated in the OU9 FS included:

- Alternative 1 - No Action
- Alternative 2 – LUCs
- Alternative 3 – Excavation and LUCs
- Alternative 4 – Treatment and LUCs

No Action

A "no action" alternative, where no cleanup remedies would be applied at the site, was evaluated for OU9 as required under CERCLA, and it serves as a baseline for comparison with other alternatives. OU9 would be left as it is today under the no action alternative.

LUCs

Alternative 2 would consist of implementing LUCs (institutional or administrative controls and/or engineering or physical controls) to prevent residential land use of the area north of Building 62, where elevated PAH concentrations in subsurface soil are associated with potentially unacceptable risk based on residential exposure. LUCs would also be implemented to prevent residential use of Building 62 Annex and to prevent unrestricted industrial exposure to the subsurface beneath the floor of Building 62 Annex. LUCs would specify requirements for management of excavated soil as part of any future construction activities within the LUC boundary. Five-year reviews would be required to evaluate the continued adequacy of the remedy.

Excavation and LUCs

Alternative 3 would consist of excavation and offsite disposal of PAH-contaminated subsurface soil in the area north of Building 62. Excavation would extend to a depth of 8 feet below ground surface where ash/burnt material exceedances of the proposed cleanup level were found. Precautions would be taken for excavation near the shoreline and around utilities (main water line) in the area. Following excavation, the excavation area would be backfilled to established preconstruction grades, elevations, and surface types. Contamination under Building 62 Annex would not be removed. LUCs would be implemented to prevent residential use of Building 62 Annex and to prevent unrestricted industrial exposure to the subsurface beneath the floor of Building 62 Annex. LUCs would specify requirements for management of excavated soil as part of any future construction activities within the LUC boundary. Five-year reviews would be required to evaluate the continued adequacy of the remedy.

Treatment with LUCs

Alternative 4 would consist of treatment of PAH-contaminated subsurface soil in the area north of Building 62 using **in-situ chemical oxidation (ISCO)**. The treatment system would inject ozone gas into the subsurface in the area with elevated PAH concentrations to reduce concentrations to acceptable levels. Precautions would be taken around utilities (main water line) in the treatment area. Contamination under Building 62 Annex would not be removed. LUCs would be implemented to prevent residential use of Building 62 Annex and to prevent unrestricted industrial exposure to the subsurface beneath the floor of Building 62 Annex. LUCs would specify requirements for management of excavated soil as part of any future construction activities within the LUCs boundary. Five-year reviews would be required to evaluate the continued adequacy of the remedy.

Evaluation of Alternatives

EPA has established nine criteria for use in comparing the advantages/disadvantages of cleanup alternatives. These criteria fall into three groups, threshold criteria, primary balancing criteria, and modifying criteria. These nine criteria are explained in the text box, ***What are the Nine Evaluation Criteria?***, below. A detailed analysis of alternatives can be found in the FS. The evaluated alternatives are compared based on seven of the nine criteria in Table 1. The two modifying criteria, State Agency and Community Acceptance, are evaluated following the public comment period.

What are the Nine Evaluation Criteria?

The following is a summary of the nine criteria used to evaluate the remedial alternatives. The first two criteria are considered threshold criteria, and any alternative selected must meet them. The next five criteria are the balancing criteria. The last two criteria, state (MEDEP) and community acceptance, will be addressed after the public comment period on this Proposed Plan.

1. ***Overall Protection of Human Health and the Environment*** determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
2. ***Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)*** evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
3. ***Long-Term Effectiveness and Permanence*** considers the ability of an alternative to maintain protection of human health and the environment.
4. ***Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment*** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
5. ***Short-Term Effectiveness*** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
6. ***Implementability*** considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
7. ***Cost*** includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over the time in terms of today's dollar value. The alternative should provide the necessary protection for a reasonable cost. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
8. ***State/Support Agency Acceptance*** considers whether the state agrees with EPA's analyses and recommendations, as described in the FS and Proposed Plan.
9. ***Community Acceptance*** considers whether the local community agrees with the Navy and EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

TABLE 1: COMPARISON OF OU9 REMEDIAL ALTERNATIVES				
CRITERION	**ALTERNATIVE 1**	**ALTERNATIVE 2**	**ALTERNATIVE 3**	**ALTERNATIVE 4**
Estimated Time Frame (months)				
Designing and Constructing the Alternative	NA	12	12	12 to 18
Achieving the Cleanup Objectives	NA	12	13	13 to 19
Criteria Analysis				
Threshold Criteria				
Protects Human Health and the Environment ➢ Will it protect you and plant and animal life on and near the site?	○	●	●	●
Meets federal and state regulations ➢ Does the alternative meet federal and state environmental statutes, regulations and requirements?	NA	●	●	●
Primary Balancing Criteria				
Provides long-term effectiveness and is permanent ➢ Will the effects of the cleanup last?	○	◉	◉	◉
Reduces mobility, toxicity, and volume of contaminants through treatment ➢ Are the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present reduced?	○	○	○	●
Provides short-term protection ➢ How soon will the site risks be reduced? ➢ Are there hazards to workers, residents, or the environment that could occur during cleanup?	NA	●	◉	◉
Can it be implemented ➢ Is the alternative technically feasible? ➢ Are the goods and services necessary to implement the alternative readily available?	NA	●	◉	◉
Cost ($) ➢ Upfront costs to design and construct the alternative (capital costs) ➢ Operating and maintaining any system associated with the alternative (O&M costs) ➢ Periodic costs associated with the alternative (periodic costs) ➢ Total cost in today's dollars [30-year **Net Present Worth** (NPW) cost]	$0	$15,000 capital 30-year NPW: $197,000	$423,000 capital 30-year NPW: $605,000	$336,000 capital 30-year NPW: $538,000
Modifying Criteria				
State Agency Acceptance ➢ Does MEDEP agree with the Navy's recommendation?	To be determined after the public comment period on the Proposed Plan.			
Community Acceptance ➢ What objections, suggestions, or modifications does the public offer during the comment period?	To be determined after the public comment period on the Proposed Plan.			
Relative comparison of the nine balancing criteria and each alternative: ● – Good , ◉ – Average, ○ – Poor; NA – Not applicable				

Preferred Alternative

Based on information available at this time, the Navy recommends Alternative 2 as the preferred alternative to address contamination at OU9 and to provide long-term risk reduction. The Navy believes that Alternative 2 meets the threshold criteria and provides the best balance of tradeoffs among the balancing criteria (see Table 1). The Navy proposes that this be the final remedy for OU9.

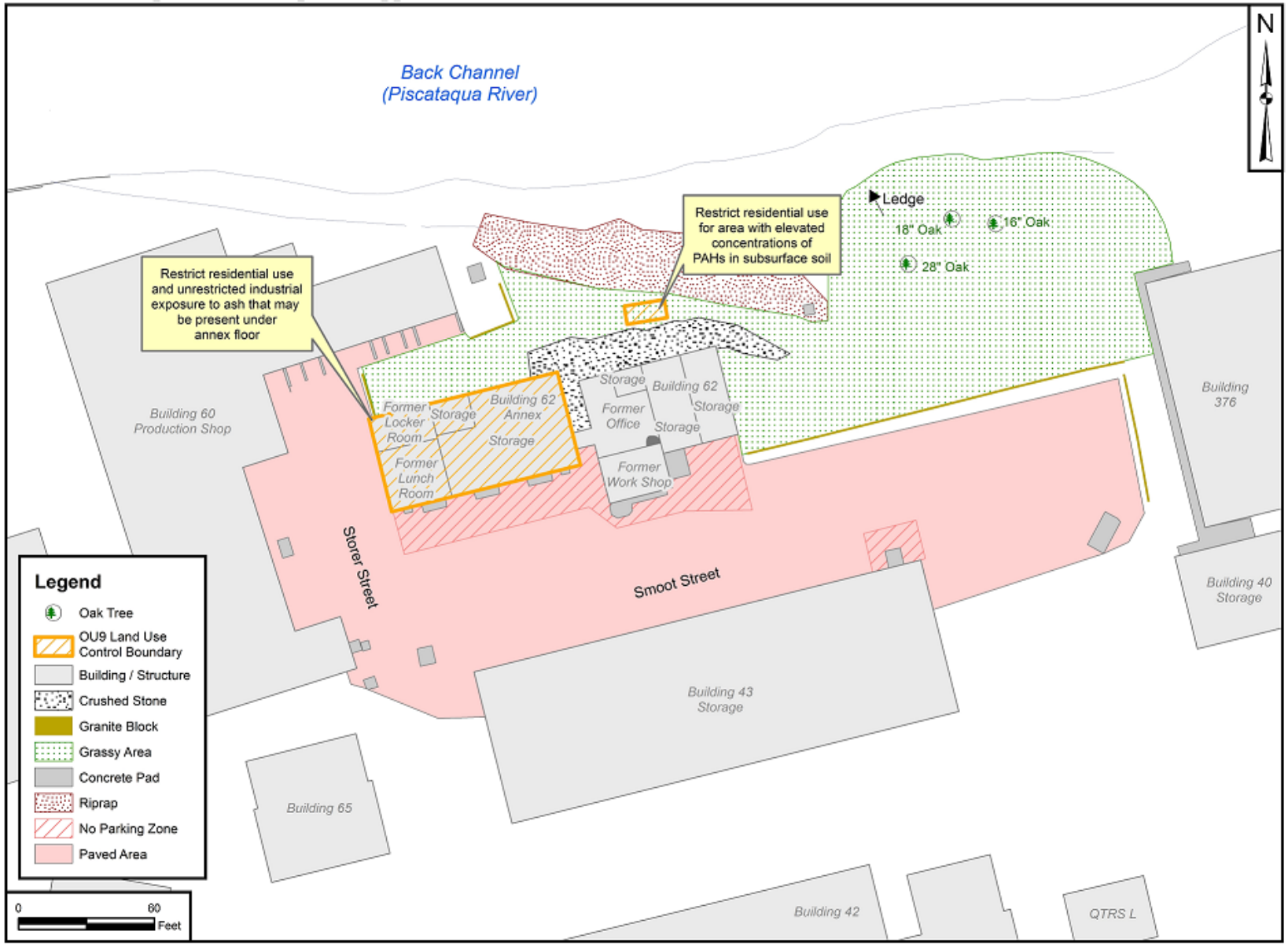
The Navy expects the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) utilize permanent solutions to the maximum extent practicable. The Navy may decide to change its preferred alternative in response to public comment or new information. After the end of the public comment period on this Proposed Plan, the Navy, with the concurrence of EPA and after consultation with MEDEP, will document its selected remedy in a ROD.

The proposed alternative would include LUCs and five-year reviews. LUCs would be implemented within the LUC boundary, as shown on Figure 4, and would prevent residential land use of the area north of Building 62, where elevated PAH concentrations in subsurface soil are associated with potentially unacceptable risk based on residential exposure. LUCs would also be implemented to prevent residential use of Building 62 Annex and to prevent unrestricted industrial exposure to the subsurface beneath the floor of Building 62 Annex. LUCs would also specify requirements for management of excavated soil as part of any future construction activities within the LUC boundary. LUCs would be implemented via a LUC Remedial Design (RD) to document the LUCs, identify inspection requirements, and document responsible parties. LUCs would be required as long as COC concentrations exceed levels that allow for unlimited use and unrestricted exposure. Reviews would be conducted every 5 years to ensure that the remedy remains protective.

Alternative 2 is preferred over the other alternatives because it provides the Navy's preferred balance between long-term effectiveness for current and planned industrial use of the site, implementability, and cost. OU9 is in an industrial area that has no current or planned future residential use; therefore, LUCs would be effective to prevent residential exposure. There are no current plans to remove Building 62 Annex; therefore, LUCs would be effective to prevent exposure to contamination under the floor of the building. Potential risks from exposure to subsurface soil not beneath Building 62 Annex for current site users are acceptable; therefore, LUCs are not required to restrict current access to this portion of OU9.

Alternative 2 is more implementable than Alternatives 3 and 4. For the increased short-term effectiveness concerns, implementability concerns, and costs associated with excavation or in-situ treatment, Alternatives 3 and 4 do not provide significantly more long-term effectiveness than Alternative 2. All three alternatives would require LUCs and five-year reviews to meet the RAOs. Therefore, the additional concerns and costs associated with excavation or treatment of subsurface contamination to reduce risks to acceptable levels for residential land use of the area north of Building 62 are not warranted for OU9.

Figure 4 - Alternative 4 LUC Boundaries



Five-Year Review Requirements

Because contamination would remain at OU9 in excess of levels that allow for unlimited use and unrestricted exposure, reviews of the continued protectiveness of the remedy would be needed every 5 years as part of the preferred remedy. Five-year reviews would confirm that the remedy remains protective of human health and the environment. Five-year reviews would be conducted as long as COC concentrations at the site exceed levels that allow for unlimited use and unrestricted exposure.

COMMUNITY PARTICIPATION

The public is encouraged to participate in the decision-making process for the cleanup of OU9 by reviewing and commenting on this Proposed Plan during the public comment period, which is from July 16 to August 14, 2013.

What Do You Think?

You do not have to be a technical expert to comment. If you have a comment, the Navy wants to hear it before beginning the cleanup.

What is a Formal Comment?

Federal regulations make a distinction between "formal" comments received during the 30-day comment period and "informal" comments received outside this comment period. Although the Navy uses comments throughout the cleanup process to help make cleanup decisions, it is required to respond to formal comments.

Your formal comments will become part of the official record for OU9. This is a crucial element in the decision-making process for the site. The Navy will consider all significant comments received during the comment period prior to making the final cleanup decision for the site. Written comments will be included in the Responsiveness Summary contained in the ROD.

Formal comments can be made in writing or made orally. To make a formal comment on the Proposed Plan, you may:

- Offer oral comments during the public hearing on July 23, 2013.
- Provide written comments at the informational open house, at the public hearing, or by fax or mail. Comments must be postmarked no later than August 14, 2013.

A tear-off mailer is provided as part of this document for your convenience.

NEXT STEPS

The Navy will consider and address all significant public comments received during the comment period. The responses to written comments will be included in the Responsiveness Summary in the ROD, which will document the final CERCLA remedy selected by the Navy and EPA, in consultation with MEDEP, for OU9. After the ROD is signed, it will be made available to the public at the Information Repositories.

To Comment Formally:

Send Written Comments postmarked no later than August 14, 2013, to:

Ms. Danna Eddy
Public Affairs Office (Code 100PAO)
Portsmouth Naval Shipyard
Portsmouth, NH 03804-5000

Fax Comments by August 14, 2013, to the attention of:

Ms. Danna Eddy
Public Affairs Office (Code 100PAO)
Portsmouth Naval Shipyard
Fax: (207) 438-1266

For More Detailed Information, You May Go to the Public Information Repositories or Public Website

The Proposed Plan was prepared to help the public understand and comment on the preferred cleanup alternative for this site and provides a summary of a number of reports and studies.

Information Repositories

Rice Public Library
8 Wentworth Street
Kittery, Maine 03904
Telephone: (207) 439-1553

Portsmouth Public Library
175 Parrott Avenue
Portsmouth, New Hampshire 03801
Telephone: (603) 427-1540

Public Website
http://go.usa.gov/vvb

Glossary of Terms

This glossary defines the bolded terms used in this Proposed Plan. The definitions in this glossary apply specifically to this Proposed Plan and may have other meanings when used in different circumstances

Applicable or Relevant and Appropriate Requirements (ARARs): The federal, state, and local environmental rules, regulations, and criteria that must be met by the selected cleanup action under CERCLA.

Background: Concentrations of chemicals that would be found in the environment even if there had been no man-made sources or releases of chemicals at the site.

Benzo(a)pyrene toxicity equivalency quotient (BAP TEQ): The calculated concentration of carcinogenic PAHs relative to the toxicity associated with an equivalent concentration of benzo(a)pyrene.

Chemical of Concern (COC): Chemicals of potential concern (COPCs) that through further evaluation in human health risk assessments are determined to present a potential adverse effect on human health and the environment.

Cleanup Level: A numerical concentration agreed upon by the Navy and EPA, in consultation with MEDEP, as having to be reached for a certain COC to meet one or more of the RAOs. A cleanup level may be regulatory-based criterion, a risk-based concentration, or even a background value.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law also known as "Superfund." This law was passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. This law created a tax on the chemical and petroleum industries and provided broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

Feasibility Study (FS): A report that presents the description and analysis or evaluation of potential cleanup alternatives for a site. The report also provides other remedial options screened out in the FS because they were not considered to be applicable for the site conditions.

Human Health Risk Assessment (HHRA): An evaluation of current and future potential for adverse human health effects from exposure to site contaminants.

In-situ chemical oxidation (ISCO): Treatment conducted in place, without having to excavate soil, using specific chemicals (oxidants) to help change harmful contaminants into less toxic ones. ISCO can be used to treat many types of contaminants, including PAHs. The four major oxidants that may be used for ISCO are permanganate, persulfate, hydrogen peroxide, and ozone. During treatment, testing of soil may be conducted to ensure that ISCO is working to treat site contaminants.

Land use controls (LUCs): Engineered and non-engineered measures formulated and enforced to regulate current and future land use options. Engineered measures include fencing and posting. Non-engineered measures typically consist of administrative restrictions that prohibit residential land use and/or groundwater use.

Metals: Metals are naturally occurring elements. Some metals, such as lead and mercury, can have toxic effects. Other metals, such as iron, are essential to the metabolism of humans. Metals are classified as inorganic because they are of a mineral origin.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): More commonly called the National Contingency Plan, it is the federal government's blueprint for responding to both oil spills and hazardous substance releases. Following the passage of Superfund (CERCLA) legislation in 1980, the NCP was broadened to cover releases at hazardous waste sites requiring emergency removal actions. A key provision involves authorizing the lead agency to initiate appropriate removal action in the event of a hazardous substance release.

Net Present Worth (NPW): A costing technique that expresses the total of initial capital expenditure and long-term operation and maintenance costs in terms of present-day dollars.

Polycyclic aromatic hydrocarbons (PAHs): High molecular weight, relatively immobile, and moderately toxic solid organic chemicals that include multiple benzenic (aromatic) rings in their chemical formula. PAHs are normally formed during the incomplete combustion of coal, oil, gas, garbage, or other organic substances. Typical PAHs include anthracene, phenanthrene, and benzo(a)pyrene.

Record of Decision (ROD): An official document that describes the selected cleanup action for a specific site. The ROD documents the cleanup selection process and is issued by the Navy following the public comment period.

Remedial action objective (RAO): A cleanup objective agreed upon by the Navy and EPA, in consultation with MEDEP. One or more RAOs are typically formulated for each environmental site.

Remedial Investigation (RI): An in-depth study designed to gather data needed to determine the nature and extent of contamination and risks at a Superfund site. Information supports establishing site cleanup criteria, identifying preliminary alternatives for remedial action, and technical and cost analyses of alternatives.

Use This Space to Write Your Comments

Your input on the Proposed Plan for contamination at OU9 at Portsmouth Naval Shipyard is important to the Navy, EPA, and MEDEP. Comments provided by the public are valuable in helping to select the remedy for this site.

You may use the space below to write your comments, then fold and mail. Comments must be postmarked by August 14, 2013. Comments can be submitted via mail or fax and should be sent to the following address:

Ms. Danna Eddy
Public Affairs Office (Code 100PAO)
Portsmouth Naval Shipyard
Portsmouth, NH 03804-5000

Fax: (207) 438-1266

Name:	
Address:	
City:	
State:	Zip Code:
Telephone:	

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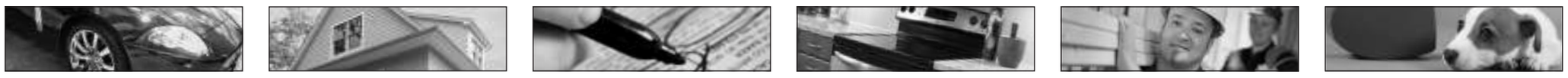

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Announcements

13 Mortgage Foreclosure

POSTPONEMENT OF MORTGAGEE'S SALE

The Mortgagee's Sale public auction concerning the mortgage given by Charles H. Smith, to Jay M. Smith, dated August 6, 1999, said mortgage now being held by the Estate of Jay M. Smith, and said mortgage being recorded at the Carroll County Registry of Deeds at Book 1833, Page 410, for premises located at 140 Ryefield Road, Effingham, Carroll County, State of New Hampshire, scheduled for July 8, 2013 at 11:00 A.M., has been postponed until August 7, 2013 at 11:00 A.M..

Dated this 8th day of July, 2013.

The Estate of Jay M. Smith
By Its Attorney:
James H. Schulte, Esquire
(603) 743-6300

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17 Public Notice

PUBLIC NOTICE

The Department of the Navy announces the availability for public comment of the Proposed Plan for cleanup of contamination at Operable Unit (OU) 9 at Portsmouth Naval Shipyard (PNS). This plan was prepared under the Comprehensive Environmental Response, Compensation and Liability Act (also known as Superfund). The public comment period for this Proposed Plan begins July 16, 2013 and ends August 14, 2013.

OU9 consists of Site 34 (the Former Oil Gasification Plant, Building 62), located in the northwestern portion of PNS, east of the access bridge from the mainland to PNS. Buildings 62 and 62 Annex are located on the site. Polycyclic aromatic hydrocarbon (PAH) contamination is present in the subsurface at the site from past industrial operations in Building 62. The contamination resulted from disposal of ash and burnt materials from use of coal as part of oil gasification plant and blacksmith operations conducted in Building 62. Coal was used to provide heat for oil gasification operations from the 1870s to the early 1900s and for the blacksmith shop from 1915 to 1930. Ash and burnt material from these operations were deposited in the area surrounding Building 62. The majority of the ash and burnt material surrounding Building 62 was removed as part of a cleanup action in 2007. However, some ash and burnt material remains in the subsurface north of Building 62. In addition, PAH-contaminated ash and burnt material may be present beneath the foundation of Building 62 Annex, built after coal-burning operations ended in Building 62.

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Kittery, ME 03904
207-439-1633

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Ms. Danna Eddy, Public Affairs Office (Code PA0100)
Portsmouth Naval Shipyard,
Portsmouth, NH 03804-5000
Telephone: 207-438-1140 • Fax: 207-438-1266

Announcements

17 Public Notice

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The primary contaminant sources at OU7 are associated with the fill material and past industrial uses of the site. Concentrations of dioxin/furans and polychlorinated biphenyls (PCBs) in subsurface soil in a portion of the site pose a potential unacceptable risk to workers at the site if the material was brought to the surface. Concentrations of lead in surface soil and lead and other metals, dioxins/furans, PCBs, and polycyclic aromatic hydrocarbons (PAHs) in subsurface soil pose a potential unacceptable risk to hypothetical future residents, if the site was redeveloped for residential use and the contaminated soil uncovered or brought to the surface.

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NOTICE OF PUBLIC HEARING

The Newmarket Housing Authority proposed Agency Plan in compliance with the QHWR Act of 1998 is available for review at the NHA office, 34 Gordon Avenue, Newmarket, NH. In addition, a public hearing will be held at 6:00 pm on Tuesday, August 20, 2013 at the NHA office.

Town of Berwick

is interested in selecting a qualified engineering firm to Complete a holistic assessment of building systems including HVAC, lighting, and envelope. For full details, please refer to the Town's official website at www.berwickmaine.org, or contact Town Manager Patrick Venne at 11 Sullivan Street, Berwick, ME 03901, or 207-698-1101 ext. 111.

NOTICE

SAU 56 (Somersworth/Rollinsford) had limited openings for the Pre-School Program. Applications for the Program will be scheduled on July 22, 2013.

To schedule an appointment please call Judy Barry at 603-692-4450.

LEGAL NOTICE
ZONING BOARD OF ADJUSTMENT
NEWMARKET, NH

AUGUST 5, 2013
7:00 P.M.
TOWN COUNCIL CHAMBERS

You are hereby notified of a Zoning Board of Adjustment public hearing concerning a request by F J Durell Corp/Perkins Agency Inc/David Loiselle for a Special Exception reference Section 2.03(B)(2), of the Newmarket Zoning Ordinance.

The applicants request a Special Exception to permit changing the existing single-family dwelling to a professional office, with a residential unit on the second floor. The lot is located at 195 South Main Street, Tax Map U4, Lot 27, M3 Zone.

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Hampshire State Police have identified a Connecticut man who drowned in the Saco River in North Conway.

Police say three people had jumped more than 30 feet from a railroad trestle into the river to swim Saturday afternoon, and one of them did not resurface.

Police say that about 15 minutes later, Edward Foster, 30, of Gales Ferry, Conn., was recovered from the water, about 600 feet from the trestle. Police say CPR was performed on him and he was taken from the Saco River Campground

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#21344 1tP7/17

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#21344 1tP7/16

Appendix C
Comments Received During the Public Comment Period and Navy Responses

Public Hearing for the Proposed Plan for Operable Unit 9

Meeting

Taken on: July 23, 2013

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PUBLIC HEARING FOR
ENVIRONMENTAL RESTORATION
WORK AT PORTSMOUTH NAVAL SHIPYARD

at
Kittery Municipal Building
200 Rogers Road
Kittery, Maine

on
Tuesday, July 23, 2013
at 8:00 p.m.

Court Reporter:
Karen D. Pomeroy, RDR, CRR

MS. MIDDLETON: Good evening. My name is Liz Middleton. I'm a remedial project manager for NAVFAC Mid-Atlantic.

Welcome to the public hearing for the Proposed Remedial Action Plan for OU9 at the Portsmouth Naval Shipyard.

During this meeting we will accept oral and written comments on this plan. We will also accept written comments until August 13th, and details for that can be found in the proposed plan.

A responsiveness summary will address any significant comments we receive and will be included in the record of decision for OU9.

At this time, we will accept oral comments. Please state your name and organization prior to providing any comments.

Are there any comments?

MS. LEPAGE: Yes. There's a question.

MS. MIDDLETON: Okay.

MS. LEPAGE: I thought I heard you say August 13th, and the proposed plan says send written comments postmarked no later than August 14th.

MS. MIDDLETON: That's fine. They will be accepted until August 14th.

MS. LEPAGE: Thank you.

MS. MIDDLETON: Thank you for that clarification. My apologies.

MS. LEPAGE: Okay. My name is Carolyn Lepage. I'm a Maine certified geologist from Auburn, Maine; and I serve under contract as the technical advisor to Seacoast Anti-Pollution League, also known by the acronym SAPL, which is spelled S-A-P-L.

The following comments regarding the July 2013 proposed plan for Operable Unit 9 are presented on behalf of SAPL.

One, support for the preferred remedy.

In general, SAPL supports the implementation of land use controls at the site to prevent exposure to contaminants remaining on site and five years -- five-year reviews to assess the protectiveness of the remedy.

However, SAPL still has questions and concerns about the Navy's preferred remedy as well as one suggestion as follows:

Two, lack of response to SAPL's previous comments.

SAPL submitted comments on the May 2013 draft proposed plan for Operable Unit 9 with the hope that revisions would be incorporated into the final proposed

plan to enhance the public's understanding and participation during the public comment period.

Many of the suggestions were intended to clarify the proposed plan and make it easier for the public to understand, especially those who are not knowledgeable about the ongoing CERCLA-related investigations and cleanup actions at the shipyard.

Therefore, SAPL is disappointed that most of the comments submitted in its July 2nd, 2013, letter to the Navy have not been addressed in the final proposed plan that is the subject of tonight's public hearing.

Three, multiple site names.

The public website listed on page 12 of the proposed plan is a useful resource for those interested in or needing to check supporting documentation contained in the administrative record, particularly those who are unable to easily visit the information repositories at the two public libraries also identified on page 12.

As an aside, this website should have been specifically mentioned on page 2 of the proposed plan along with the two libraries as a source of information.

However, a quick search of the administrative

record on the website reveals an inconsistency in the naming or identification of the site when it comes to tracking down relevant documents.

A search for OU9 brings up a list of 18 documents dating from only April 2011 to the present, but a search for Site 34 brings up 71 records dating back to 1997.

To the uninitiated, searching for OU9 documents would have eliminated a significant amount of information from consideration.

Therefore, SAPL suggests that the cross-referencing on the public website be improved so that -- so that a search for OU9 or Site 34 would bring up the same extensive listing for documents.

Furthermore, while it is too late to revise the proposed plan, SAPL recommends that the title of the record of decision as well as relevant sections of the text, such as the Introduction, Site History, and Background sections, also clearly state the multiple names for the site.

Four, site elevation.

SAPL had asked the Navy to add information regarding the elevation of the site to the, quote, What Does OU9 Look Like, end quote, section of the proposed

plan. However, that information was not added to the final proposed plan.

This is very important information given the site's proximity to water and the knowledge that sea level is rising.

Recent projections by University of New Hampshire researchers of future storm surges in the estuary show significant potential impacts along the entire shoreline of the shipyard. Therefore, elevation information must be included in the site description in the record of decision.

Five, vapor inhalation risk.

The risk of vapor inhalation is mentioned in the Site Conceptual Model shown on Figure 3 but not in the text of the proposed plan.

In its comment letter on the draft proposed plan, SAPL asked what the current risk of vapor intrusion in buildings at or near the site is and how they were evaluated and about future risks.

Information about this potential exposure pathway must be added to the record of decision as part of the conceptual model and human health risk assessment discussions.

Six, relationship between OU9 and OU4.

This is a reiteration of SAPL's comment on the draft proposed plan.

The scope and role of the OU9 response action section on page 4 states the following, quote, The proposed plan for OU9 is not expected to have an impact on the strategy or progress of cleanup for the other sites at PNS, end quote.

SAPL agrees with this statement except for OU4 which is addresses offshore areas adversely impacted by shipyard activities.

The Navy's preferred alternative for OU4 requires remediation of four out of 12 offshore areas of concern; and one of these four areas is adjacent to OU9.

According to the proposed plan for Operable Unit 4 released earlier this year, the likely source of contamination at offshore area MS-01 is past disposal of ash at Site 34 and the removal of ash during the 2007 remedial action conducted at OU9 eliminated the source of contamination.

SAPL requests that the Navy clearly explain the past, current, and likely future relationship between OU9 and OU4 in the record of decision and how that affects the selection and implementation of the remedy

1 for OU9.
2 Furthermore, SAPL believes that periodic
3 inspections of OU9 should be added to the remedy to
4 ensure that ash that remains on site does not become
5 exposed to possible erosion and mobilization to
6 offshore areas.
7 Given the expectation of sea level rise and
8 increasing storm and wave intensity in the future,
9 inspections should also include the stability and
10 integrity of the shoreline adjacent to OU9.
11 Seven, potential ecological risks.
12 The Summary of Site Risks section on page 6 states
13 the following:
14 Quote, Potential for adverse ecological effects
15 from exposure to site contaminants was not evaluated as
16 part of a risk assessment because OU9 is currently and
17 historically has been an industrial area with no
18 significant habitats for ecological exposure.
19 In the July 2nd comment letter, SAPL had asked how
20 potential risks for ecological receptors would be
21 evaluated in the future should land use changes result
22 in the creation of habitats of potential significance.
23 For example, the area is currently paved.
24 However, closure or downsizing of shipyard operations

might encourage the removal of the pavement and creation of green space which could result in an environment much more favorable to ecological receptors. This question should now be answered in the record of decision.

Eight, consideration of sea level rise in risk assessment.

SAPL had asked the following with regard to the draft proposed plan:

Please clarify in the text if/how the exposure assessment scenarios or any other steps in the human health risk assessment take into consideration rising sea level and resulting changes in groundwater levels, erosion and deposition patterns, and increasing storm and wave action impact on protective coastal structures and site contaminants.

SAPL requests that the answers be provided in the summary of site risks discussed in the record of decision.

Nine, contingency for additional removal to allow unlimited use.

The description of the preferred alternative on page 10 states, quote, There are no current plans to remove Building 62 Annex. Therefore, LUCs would be

effective to prevent exposure to contamination under the floor of the building, end quote.

SAPL suggests that the Navy include a contingency in the record of decision for OU9 that the Navy will evaluate removal of the ash currently beneath the Building 62 Annex and the area containing ash north of Building 62 should the Building 62 Annex ever be removed.

Removal of the ash from both areas could allow unrestricted use of the site and eliminate the need for LUCs and five-year reviews at OU9.

The September 1999 final record of decision for Site 9 at the former Brunswick Naval Air Station contained such a contingency on page 2-27 should the building foundation covering an ash layer ever be disturbed.

Ten, sea level rise.

SAPL has raised the following question during the public comment period during the proposed plan for Operable Unit 4 earlier this year and has not seen the Navy's response. Therefore, SAPL is repeating the comment as it applies to OU9.

SAPL again expresses its concern with the effect of rising sea level on the contamination located at

various sites around the shipyard, as well as on the remedial measures taken to clean up the sites.

A recent report from Carbon Solutions New England at the University of New Hampshire entitled, quote, Climate Change in the Piscataqua/Great Bay Region: Past, Present, Future, end quote, concludes that, quote, We can expect the 100-year flood height to increase several feet over the next 90 years, end quote, which will result in more severe flooding in coastal New Hampshire in the future.

Recent work by UNH and regional researchers is illustrated in a map showing hundred-year flooding and storm surge levels that by the year 2050 will inundate significant areas along the shipyard's shoreline.

The effect of such an increase on the Great Bay Area can be observed at a website developed by Princeton University climate scientists sealevel.climatecentral.org\surgingseas.

The remedy for OU9 allows ash, which is the source of contamination found in the adjacent offshore monitoring location MS-01, to remain on site.

Groundwater contamination is not a component of the selected remedy because wells installed previously at the site were dry. However, rising sea level will

alter the current groundwater/surface water system and affect the stability of the shoreline and adjacent areas.

How was rising sea level considered in the development of potential remedies for OU9 and in the selection of the Navy's preferred alternative?

What are the effects of rising sea level and increasing frequency and/or severity of storm events on the proposed remedy and how have they been evaluated?

What range of sea level change was considered?

What are the potential future impacts to the Navy's preferred alternative as sea level rises?

How has the Navy planned to deal with the potential future impacts?

Eleven, impact of shipyard closure.

What will happen if the shipyard closes and the Navy is no longer on the property to keep an eye on various sites?

Recent experience at another Navy facility in Maine that recently closed has shown that security measures for even the most dangerous sites will no longer be maintained at a high level once a base closes.

In the event of closure, how will the Navy ensure

that there are no adverse impacts at OU9 or at adjacent OU4 offshore areas as a result of activities or actions on the former shipyard property?

Twelve, new or emerging contaminants.

SAPL has also raised the question of emerging contaminants during the public comment period for the proposed plan for Operable Unit 4 earlier this year and again has not yet seen the Navy's response.

What contingencies or plans does the Navy have to address emerging contaminants or other new contaminants at shipyard sites?

MS. MIDDLETON: Thank you. Are there any other comments?

(No response.)

MS. MIDDLETON: The public meeting for OU9 at Portsmouth Naval Shipyard is now closed.

Thank you.

(Conclusion of proceedings at 8:18 p.m. this date.)

CERTIFICATE

I, Karen D. Pomeroy, a Registered Diplomate Reporter, do hereby certify that the within transcription is a true and accurate record, to the best of my knowledge, skills and ability, of the proceedings.

I further certify that I am not related to any of the parties in this matter by blood or marriage and that I am in no way interested in the outcome of this matter.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal of office this 30th day of July, 2013.

Karen D. Pomeroy, RDR, CRR

My Certifications Expire:
September 30, 2014

SUBSCRIBED AND SWORN TO
before me this 2nd day of
August, A.D., 2013.

OFFICIAL SEAL
LAURA DAVIS
NOTARY PUBLIC - STATE OF ILLINOIS
MY COMMISSION EXPIRES:10/19/16

Lepage Environmental Services, Inc.

P. O. Box 1195 • Auburn, Maine • 04211-1195 • 207-777-1049

August 14, 2013

Ms. Danna Eddy
Public Affairs Office (Code 100PAO)
Portsmouth Naval Shipyard
Portsmouth, NH 03804-5000

FAX Number: 207-438-1266

Subject: July 2013 *Proposed Plan for Operable Unit 9*

Dear Ms. Eddy:

This letter is submitted as requested by and on behalf of the Seacoast Anti-Pollution League (SAPL) regarding the July 2013 *Proposed Plan for Operable Unit 9, Portsmouth Naval Shipyard, Kittery, Maine* (the Proposed Plan). Most of the comments below reflect the oral comments presented on behalf of, and with input from, SAPL members at the July 23, 2013, Public Hearing held at the Kittery Town Hall.

1. Support for the Preferred Remedy.

In general, SAPL supports the Navy's Preferred Remedy, which includes implementation of Land Use Controls at the site to prevent exposure to contaminants remaining on-site and five-year reviews to assess the protectiveness of the remedy. However, SAPL also believes that periodic inspections of OU9 should be added to the remedy to ensure that the ash that remains on-site does not become exposed to possible erosion and mobilization to offshore areas. Given the expectation of sea level rise and increasing storm and wave intensity in the future, inspections should also include the stability and integrity of the shoreline adjacent to OU9. Furthermore, SAPL suggests that the Navy include a contingency in the Record of Decision for OU9 that the Navy will evaluate removal of the ash currently beneath the Building 62 Annex and the area containing ash north of Building 62 should the Building 62 Annex ever be disturbed or removed, or the area to the north containing ash ever be disturbed. Removal of the ash in both areas could allow unrestricted use of the site and possibly reduce or eliminate the need for LUCs and Five-Year Reviews at OU9. SAPL's questions and concerns about the Navy's preferred remedy are as follows:

2. Lack of Response to SAPL's Previous Comments

SAPL submitted comments on the May 2013 Draft *Proposed Plan for Operable Unit 9,* with the hope that revisions would be incorporated in the final Proposed Plan to enhance the public's understanding and participation during the public comment period. Many of the suggestions were intended to clarify the Proposed Plan and make it easier for the public to understand, especially those who are not knowledgeable about the ongoing CERCLA-related investigations and cleanup actions at the Shipyard. Therefore, SAPL is disappointed that most of the comments submitted in its July 2, 2013, letter to the Navy have not been addressed the final Proposed Plan.

3. Multiple Site Names

The public website listed on page 12 of the Proposed Plan is a useful resource for those interested in or needing to check supporting documentation contained in the Administrative Record, particularly those who are unable to easily visit the information repositories at the two public libraries also identified on page 12. [As an aside, this website should have been specifically mentioned on page 2 of the Proposed Plan along with the two libraries as a source of information.] However, a quick search of the Administrative Record on the website reveals an inconsistency in the naming or identification of the site when it comes to tracking down relevant documents. A search for "OU9" brings up a list of eighteen (18) documents dating from only April 2011 to the present. But a search for "Site 34" brings up 71 records dating back to 1997. To the uninitiated, searching for OU9 documents would have eliminated a significant amount of information from consideration. Therefore, SAPL suggests that the cross-referencing of the public website be improved so that a search for OU9 or Site 34 would bring up the same extensive listing for documents. Furthermore, while it is too late to revise the Proposed Plan, SAPL recommends that the title of the Record of Decision, as well as relevant sections of the text, such as the Introduction, Site History, and Background sections, also clearly state the multiple names for the site.

4. Site Elevation

SAPL had asked that the Navy add information regarding the elevation (average, range) of the site to the "What does OU9 look like?" section of the Proposed Plan. However, that information was not added to the final Proposed Plan. This is very important information given the site's proximity to water, and the knowledge that sea level is rising. Recent projections by University of New Hampshire researchers of future storm surges in the estuary show significant potential impacts along the entire shoreline of the Shipyard. [Please refer to the following link for maps and details: http://www.granit.unh.edu/Projects/Details?project_id=264] Therefore, elevation information must be included in the site description in the Record of Decision.

5. Vapor Inhalation Risk

The risk of vapor inhalation is mentioned in the Site Conceptual Model shown as Figure 3, but not in the text of the Proposed Plan. In its comment letter on the draft Proposed Plan, SAPL asked what the current risk of vapor intrusion in buildings at or near the site is and how were they evaluated and about future risks. Information about this potential exposure pathway must be added to the Record of Decision as part of the conceptual model and human health risk assessment discussions.

6. Relationship Between OU9 and OU4

This is a reiteration of SAPL's comment on the draft Proposed Plan. The Scope and Role of the OU9 Response Action section on page 4 states the following: "*... The Proposed Plan for OU9 is not expected to have an impact on the strategy or progress of cleanup for the other sites at PNS. ...*" SAPL agrees with this statement except for OU4, which addresses offshore areas adversely impacted by Shipyard activities. The Navy's Preferred Alternative for OU4 requires remediation of four out of twelve offshore areas of concern, and one of these four areas are adjacent to OU9. According to the *Proposed Plan for Operable Unit 4* released earlier this year, the likely source of contamination at offshore area MS-01 is past disposal of ash at Site 34, and the removal of ash during the 2007 remedial action conducted at OU9 eliminated the source of contamination. SAPL requests that the Navy clearly explain the past, current, and likely future relationship between OU9 and OU4 in the Record of Decision and how that affects the selection and implementation of the remedy for OU9

Furthermore, SAPL believes that periodic inspections of OU9 should be added to the remedy to ensure that the ash that remains on-site does not become exposed to possible erosion and mobilization to offshore areas. Given the expectation of sea level rise and increasing storm and wave intensity in the future, inspections should also include the stability and integrity of the shoreline adjacent to OU9.

7. Potential Ecological Risks

The Summary of Site Risks section on page 6 states the following: *"Potential for adverse ecological effects from exposure to site contaminants was not evaluated as part of a risk assessment because OU9 is currently and historically has been an industrial area with no significant habitats for ecological exposure."* In the July 2nd comment letter, SAPL had asked how potential risks for ecological receptors would be evaluated in the future, should land use changes result in the creation of habitats of potential significance. For example, the area is currently paved. However, closure or down-sizing of shipyard operations might encourage the removal of the pavement and creation of green space which could result in an environment much more favorable to ecological receptors. This question should now be answered in the Record of Decision.

8. Consideration of Sea Level Rise in Risk Assessment

SAPL had asked the following with regard to the draft Proposed Plan: Please clarify in the text if/how the exposure assessment scenarios or any other steps in the human health risk assessment take into consideration rising sea level and resulting changes in groundwater levels, erosion and deposition patterns, and increasing storm and wave action impacts on protective coastal structures and site contaminants. SAPL requests that the answers be provided in the summary of site risks discussion in the Record of Decision.

9. Contingency for Additional Removal to Allow Unlimited Use

The Description of the Preferred Alternative on page 10 states "*There are no current plans to remove Building 62 Annex; therefore, LUCs would be effective to prevent exposure to contamination under the floor of the building.*" SAPL suggests that the Navy include a contingency in the Record of Decision for OU9 that the Navy will evaluate removal of the ash currently beneath the Building 62 Annex and the area containing ash north of Building 62 should the Building 62 Annex ever be disturbed or removed, or the area to the north containing ash ever be disturbed. Removal of the ash in both areas could allow unrestricted use of the site and reduce or eliminate the need for LUCs and Five-Year Reviews at OU9.

The September 1999 Final *Record of Decision for Site 9* at the Former Brunswick Naval Air Station contains such a contingency that could provide a template for the OU9 Record of Decision. The barracks at Site 9 were considered protective with regard to risk to human receptors because the buildings prevented exposure to landfilled incinerator ash that remained buried under the building foundations. The Selected Remedy description in the Site 9 ROD contains the following language on page 2-40:

- *If the buildings' exterior walls are disturbed in the future, the remedy of the ash landfill will be reassessed.*
- *Should the barracks be removed, modified, or excavated, the Operations Instruction will restrict excavation in the inactive landfill area without prior written approval from EPA and MEDEP. This use restriction will be included in all documents evidencing any transfer or lease of any real property affected by Site 9.*

In fact, the barracks were removed several years after the 1999 Site 9 ROD was signed, and much of the landfilled ash has been excavated and disposed at an off-site facility.

10. Sea Level Rise

SAPL had raised the following question during the public comment period for the "Proposed Plan for Operable Unit 4" earlier this year, and has not yet seen the Navy's response. Therefore, SAPL is repeating the comment as it applies to OU9:

SAPL again expresses its concern with the effect of rising sea level on the contamination located at various sites around the Shipyard, as well as on the remedial measures taken to clean up the sites. A recent report from Carbon Solutions New England at the University of New Hampshire, entitled "*Climate Change in the Piscataqua/Great Bay Region: Past, Present, and Future*" concludes that "we can expect the 100-year flood height to increase several feet over the next 90 years", which will result in more severe flooding in coastal New Hampshire in the future. Recent work by UNH and regional researchers is illustrated in a map showing 100-year flooding and storm surge levels that by 2050 will inundate significant areas along the Shipyard shoreline.
[More details, other maps, and contact information is at:
http://www.granit.unh.edu/Projects/Details?project id=264]

The effect of such an increase on the Great Bay area can be observed at a website developed by Princeton University climate scientists, sealevel.climatecentral.org/surgingseas.
[http://sealevel.climatecentral.org/surgingseas/place/states/NH#center=14/43.0761/-70.7407&surge=3&show=cities]

The remedy for OU9 allows ash, which is the source of contamination found in the adjacent offshore monitoring location MS-01, to remain on-site. Groundwater contamination is not a component of the selected remedy because wells installed previously at the site were dry. However, rising sea level will alter the current groundwater/surface water system and affect the stability of the shoreline and adjacent areas.

How was rising sea level considered in the development of potential remedies for OU9, and in the selection of the Navy's preferred alternative? What are the effects of rising sea level and increasing frequency and/or severity of storm events on the proposed remedy and how have they been evaluated? What range of sea-level change was considered? What are the potential future impacts to the Navy's preferred alternative as sea level rises? How has the Navy planned to deal with the potential future impacts? These questions should now be addressed in the Record of Decision.

11. Impact of Shipyard Closure

What will happen if the Shipyard closes and the Navy is no longer on the property to keep an eye on various sites? Recent experience at another Navy facility in Maine that recently closed has shown that security measures for even the most dangerous sites will no longer be maintained at a high level once a base closes. In the event of closure, how will the Navy ensure that there are no adverse impacts at OU9 or on OU4 offshore areas as a result of activities or actions on the former Shipyard property?

12. "New" or Emerging Contaminants.

SAPL had also raised the question of "emerging contaminants" during the public comment period for the "Proposed Plan for Operable Unit 4" earlier this year, and again, has not yet seen the Navy's response. What contingencies or plans does the Navy have to address "emerging contaminants" or other "new" contaminants at Shipyard sites?

Please do not hesitate to contact me if you have any questions.

Sincerely,

Carolyn A. Lepage

Carolyn A. Lepage, C.G. & P.G.
President
State of Maine Certified Geologist No. GE202

cc: Doug Bogen, SAPL
Iver McLeod, MEDEP
Matthew Audet, EPA
Lisa Joy, PNS
Deborah Cohen, TetraTech
Elizabeth Middleton, Navy

105OU9PRAP FinalComments14.AG3

TABLE C-1
RESPONSES TO COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD ON THE PROPOSED PLAN FOR OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Oral comments during the July 23, 2013 public hearing and written comments dated August 14, 2013, were received from one community organization, Seacoast Anti-Pollution League (SAPL), on the July 2013 Proposed Plan for Operable Unit (OU) 9. The SAPL representative, who is also a Restoration Advisory Board (RAB) member, and SAPL's Technical Assistance Grant (TAG) Consultant attended the public hearing. No changes to the remedy, as originally identified in the Proposed Plan, were necessary based on comments received during the public comment period. A summary of the comments received and the Navy's responses to these comments are provided in the table herein.

Summary of Comments Received during the Public Comment Period and Navy Responses	
Question/Comment	**Navy Response**
1. Although SAPL indicated support for the preferred remedy, SAPL indicated that periodic inspections of OU9 should be added to the remedy to ensure that ash does not become exposed and to check the stability and integrity of the shoreline adjacent to OU9. SAPL also suggested that the Navy include a contingency for removal of ash at OU9 in the future.	No change to the remedy is necessary. Inspection as part of land use controls (LUCs) and five-year reviews will be sufficient to determine whether site conditions have changed such that ash at OU9 could pose an unacceptable risk. The LUC Remedial Design (RD) will provide the requirements of notification of changes to site uses and requirements for management of excavated material within the LUC boundary; therefore, a contingency is not needed for the OU9 remedy.
2. SAPL commented on the Navy lack of response to their comments on a draft version of the Proposed Plan for OU9.	The Navy provided a presentation on the draft Proposed Plan at the June 4, 2013 RAB meeting, during which the Navy explained the contents of the Proposed Plan and the Navy's preferred remedy. The Navy responded to SAPL questions during this meeting. The referenced May 2013 draft version of the Proposed Plan was only provided for regulatory review and comment. The final July 2013 Proposed Plan that was provided for public comment reflects revisions made based on regulatory review and comment. As provided in the Navy's email dated July 11, 2013 in response to SAPL's comments on the draft Proposed Plan, the Navy indicated that the comments would be taken into consideration, and to submit the comments during the public comment period to ensure that they are included in the administrative record. SAPL provided comments during the public comment period, which are included in Appendix C of the Record of Decision (ROD) for OU9. Navy responses to comments provided during the public comment period are provided herein.

Summary of Comments Received during the Public Comment Period and Navy Responses	
Question/Comment	**Navy Response**
3. SAPL commented that the public website does not provide cross-referencing for the various documents prepared for OU9. Cross-referencing of the multiple names for the site should be included in the ROD.	The multiple names for OU9 (Site 34, Former Oil Gasification Plant, Building 62) are indicated on Page 1 of the Proposed Plan and are provided on the title page and first pages of Sections 1 and 2 of the ROD. In addition, the ROD provides an Administrative Record Reference Table that shows the document title and Administrative Record number for easy search for the document on the public website. The public website has a tab entitled "Site Description" that provides a table with cross-referencing of the multiple site names. The search tool in the Administrative Record provides a simple search function and does not allow for multiple search criteria in a single search.
Several of SAPL's comments are on format and content of the Proposed Plan and information to include in the ROD. These are: 4. Adding information on site elevation. 5. Discuss risks for vapor intrusion. 6. Discuss the relationship between OU9 and OU4. 7. Discuss future potential ecological risks. 8. Discuss consideration of sea level rise in risk assessment.	4. Technical information on site characteristics, such as elevation of the site, are detailed in the Remedial Investigation (RI) Report for OU9 and summarized in the Feasibility Study (FS) Report for OU9. A high level of technical detail is not included in the Proposed Plan, which is intended to be a concise explanation of the site and proposed plan for cleanup of the site. Information on site elevations and other characteristics of the site is provided in Section 2.5 (Site Characteristics) in the ROD. 5. Vapor inhalation and vapor intrusion are included as a potential exposure pathway in the Conceptual Site Model and summary of site risks (Figure 3 and Pages 6 and 7 of the Proposed Plan, respectively). These are also both discussed in the Section 2.7 (Summary of Site Risks) in the ROD. 6. As part of investigation at PNS, potential offshore impacts from past releases to the offshore was separated from the onshore areas. OU4 was designated as the offshore OU and it addresses offshore impacts from past releases from onshore Installation Restoration (IR) Program sites. The remedy for OU4 includes removing contamination associated with unacceptable risks from past releases from OU9 (MS-01 portion of OU4). Evaluation of OU9 shows that remaining contamination at the site is not a current source to the offshore. In addition, because of the small amount of contamination in the subsurface, site conditions, and that PAHs are relatively immobile, future transport to the offshore is not a concern for OU9. OU9 is not a current or future potential source to the offshore; therefore, the remedy for OU9 will not impact the remedy for OU4. Text in the Proposed Plan explains what is being addressed as part of OU4 and that OU9 is no longer a source to the offshore (see the text box on Page 2). Section 2.4 (Scope and Role of Operable Unit) of the ROD also provides information on the relationship between OU9 and OU4. 7. There is no potential for ecological exposure based on current and future anticipated land use. More than just pavement removal and creation of green space would be necessary to result in ecological exposure to subsurface material based on site conditions; therefore, this was not considered a future potential exposure. However, if there was a change in land use or site conditions that could result in ecological exposure, then this would be addressed as part of five-year reviews.

Summary of Comments Received during the Public Comment Period and Navy Responses	
Question/Comment	**Navy Response**
	8. The various predictions of future sea levels were not considered in the site risk assessment and no discussion of potential sea level change is required in the ROD. However, based on the small amount of remaining contamination and the elevation of the site well above mean high tide and the 100-year flood elevation, sea level rise would not change the risk conclusions for OU9.
9. SAPL suggested that the Navy include a contingency in the ROD to evaluate removal of ash from the site in the future.	No change to the remedy is necessary. Please see the Navy's response to SAPL's Comment No. 1 regarding a contingency.
10. SAPL expressed concern with the effect of rising sea level on contamination and the stability of the shoreline adjacent to OU9. SAPL asked how sea level was considered in the development and selection of remedies for OU9, what the potential future impacts may be to the Navy's preferred remedy as sea level rises and/or increasing frequency and/or severity of storm events, and how the Navy will address potential future impacts from sea level rise at OU7.	Predictions of sea level rise and changes in storm events were not considered in the development or selection of the remedy. However common reference datum such as National Oceanic and Atmospheric Administration (NOAA)'s mean high and mean low water levels and Federal Emergency Management Agency (FEMA)'s 100-year and 500-year flood elevations are used in understanding site characteristics, development of the conceptual site model, and development and selection of remedies as appropriate. Changes in these parameters would be considered as necessary as part of changes in site conditions as part of the five-year review process. However, rising sea level changes in storm events would not likely have any impact on the remedy for OU9. The 2007 removal action at OU9 sufficiently removed contamination such that it is no longer a current or future potential source of contamination to the offshore.
11. SAPL asked what happens if the Shipyard closes and the Navy is no longer on the property to inspect various onshore sites and how the Navy will ensure no adverse impacts at OU9 or OU4.	For the various sites that required continued controls, as provided in previous responses to similar questions from SAPL regarding hypothetical Shipyard closure, the LUC RD indicates procedures pertaining to changes in land use, including property transfer. The deed associated with any future transfer of property would require continued implementation of the LUCs. The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy will retain ultimate responsibility for remedy integrity. As part of the OU4 remedy, contaminated sediment in the offshore area will be removed such that LUCs or other activities, including five-year reviews, will not be required for OU4.

Summary of Comments Received during the Public Comment Period and Navy Responses	
Question/Comment	**Navy Response**
12. SAPL asked what contingencies or plans does the Navy have to address emerging or other new contaminants at Shipyard sites.	As discussed in answer to a similar question from SAPL during the December 2012 RAB meeting, the Navy makes decisions on investigating emerging contaminants based on site-specific conditions. There needs to be a reason to investigate a specific emerging contaminant. At the Shipyard, historical filling and contamination of metals and PAHs are the primary issues for the IR Program sites at PNS. Investigation of OU9 included a large number of potential contaminants and based on historical site use, emerging or new contaminants are not anticipated to be a concern for OU9. However, if in the future information becomes available such that new contaminants need to be considered for OU9, the Navy in consultation with U. S. Environmental Protection Agency would conduct the necessary actions.

Appendix D
Human Health Risk Tables

Excerpts from Appendix C of the Remedial Investigation Report for OU9

C.1 RAGs-Part D Tables

TABLE 3.5.RME
EPCs WEIGHTED 95 PERCENT FOR SOILS WITH NO ASH/BURNT MATERIAL AND 5 PERCENT FOR SOILS WITH ASH/BURNT MATERIAL EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Benzo(a)anthracene	mg/kg	0.77	0.89 (N)	7.5 (J)	0.89	mg/kg	T-statistic	(1)
	Benzo(a)pyrene	mg/kg	0.68	0.79 (N)	7.4 (J)	0.79	mg/kg	T-statistic	(1)
	Benzo(k)fluoranthene	mg/kg	0.51	0.60 (N)	4.8 (J)	0.60	mg/kg	T-statistic	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.11	0.13 (N)	1.6 (J)	0.13	mg/kg	T-statistic	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	0.32	0.37 (N)	3.5 (J)	0.37	mg/kg	T-statistic	(1)

For non-detects, one half the sample quantitation limit was used as a proxy concentration.
N = Normal

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.6.RME
EPCs WEIGHTED 95 PERCENT FOR SOILS WITH NO ASH/BURNT MATERIAL AND 5 PERCENT FOR SOILS WITH ASH/BURNT MATERIAL EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Mercury	mg/kg	0.23	0.25 (N)	8.2	0.25	mg/kg	T-statistic	(1)
	2-Methylnaphthalene	mg/kg	14	17 (N)	560 (J)	17	mg/kg	T-statistic	(1)
	Acenaphthylene	mg/kg	2.7	3.3 (N)	370	3.3	mg/kg	T-statistic	(1)
	Benzo(a)anthracene	mg/kg	4.0	4.7 (N)	410 (J)	4.7	mg/kg	T-statistic	(1)
	Benzo(a)pyrene	mg/kg	4.3	5.0 (N)	450	5.0	mg/kg	T-statistic	(1)
	Benzo(b)fluoranthene	mg/kg	3.5	4.1 (N)	360	4.1	mg/kg	T-statistic	(1)
	Benzo(g,h,i)perylene	mg/kg	2.5	2.9 (N)	230	2.9	mg/kg	T-statistic	(1)
	Benzo(k)fluoranthene	mg/kg	1.5	1.7 (N)	130 (J)	1.7	mg/kg	T-statistic	(1)
	Chrysene	mg/kg	4.0	4.6 (N)	420	4.6	mg/kg	T-statistic	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.77	0.87 (N)	66	0.87	mg/kg	T-statistic	(1)
	Fluoranthene	mg/kg	5.5	6.4 (N)	550	6.4	mg/kg	T-statistic	(1)
	Fluorene	mg/kg	2.5	2.9 (N)	320	2.9	mg/kg	T-statistic	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	1.7	2.0 (N)	160	2.0	mg/kg	T-statistic	(1)
	Naphthalene	mg/kg	4.0	5.0 (N)	640	5.0	mg/kg	T-statistic	(1)
	Phenanthrene	mg/kg	10	12 (N)	1300	12	mg/kg	T-statistic	(1)
	Pyrene	mg/kg	8.5	9.9 (N)	910 (J)	9.9	mg/kg	T-statistic	(1)

For non-detects, one half the sample quantitation limit was used as a proxy concentration.
N = Normal

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
PAHs										
2-Methylnaphthalene	Chronic	4.0E-03	mg/kg/day	1	4.0E-03	mg/kg/day	Lungs	1000/1	IRIS	12/10/2010
Acenaphthene	Chronic	6.0E-02	0.06	1	6.0E-02	mg/kg/day	Blood	3000/1	IRIS	2/15/2011
Acenaphthylene[3]	Chronic	6.0E-02	0.06	1	6.0E-02	mg/kg/day	Blood	3000/1	IRIS	2/15/2011
Benzo(a)anthracene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(g,h,I)perylene[4]	Chronic	3.0E-02	mg/kg/day	1	3.0E-02	mg/kg/day	Liver	3000/1	IRIS	2/15/2011
Benzo(k)fluoranthene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Fluoranthene	Chronic	4.0E-02	mg/kg/day	1	4.0E-02	mg/kg/day	Liver	3000/1	IRIS	2/15/2011
Fluorene	Chronic	4.0E-02	mg/kg/day	1	4.0E-02	mg/kg/day	Blood	3000/1	IRIS	2/15/2011
Indeno(1,2,3-cd)pyrene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	2.0E-02	mg/kg/day	1	2.0E-02	mg/kg/day	Body Weight	3000/1	IRIS	12/10/2010
Phenanthrene[4]	Chronic	3.0E-02	mg/kg/day	1	3.0E-02	mg/kg/day	Kidney	3000/1	IRIS	2/15/2011
Pyrene	Chronic	3.0E-02	mg/kg/day	1	3.0E-02	mg/kg/day	Kidney	3000/1	IRIS	2/15/2011
Inorganics										
Antimony	Chronic	4.0E-04	mg/kg/day	0.15	6.0E-05	mg/kg/day	Blood	1000/1	IRIS	9/09/2009
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury[5]	Chronic	3.0E-04	mg/kg/day	0.07	2.1E-05	mg/kg/day	Autoimmune	1000/1	IRIS	9/09/2009

Notes:
1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.
3 - Acenaphthene used as surrogate.
4 - Pyrene used as surrogate.
5 - Values are for mercury inorganic salts.

Definitions:
IRIS = Integrated Risk Information System
NA = Not Available.

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[1]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
PAHs									
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	3.0E-03	mg/m3	8.6E-04	mg/m3	Nasal	3000/1	IRIS	2/15/2011
Phenanthrene									
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics									
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury[2]	Chronic	3.00E-05	mg/m3	8.6E-06	mg/m3	CNS	NA	Cal EPA	09/2009

Notes:
1 - Extrapolated RfD = RfC *20m^3/day / 70 kg
2 - Values are for mercuric chloride and other inorganic salts.

Definitions:
Cal EPA = California Environmental Protection Agency
CNS = Central Nervous System
IRIS = Integrated Risk Information System
NA = Not Applicable

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
PAHs								
2-Methylnaphthalene	NA	NA	1	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	1	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	1	NA	NA	NA	NA	NA
Benzo(a)anthracene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Benzo(a)pyrene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	12/10/2010
Benzo(b)fluoranthene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Benzo(g,h,i)perylene	NA	NA	1	NA	NA	NA	NA	NA
Benzo(k)fluoranthene[3]	7.3E-02	$(mg/kg/day)^{-1}$	1	7.3E-02	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Chrysene[3]	7.3E-03	$(mg/kg/day)^{-1}$	1	7.3E-03	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Dibenzo(a,h)anthracene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Fluoranthene	NA	NA	1	NA	NA	NA	NA	NA
Fluorene	NA	NA	1	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Naphthalene	NA	NA	1	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	1	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics								
Antimony	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	B2 / Probable human carcinogen	IRIS	9/09/2009
Mercury	NA	NA	NA	NA	NA	C/ Possible Human Carcinogen	IRIS	9/09/2009

Notes:

1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral Absorption Efficiency for Dermal.

3 - The carcinogenic PAHs are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:

USEPA(1) = United States Environmental Protection Agency. EPA/600/R 93 089.

IRIS = Integrated Risk Information System.

NA = Not Available.

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
PAHs							
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(a)pyrene[2]	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(b)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(g,h,i)perylene			0.0E+00				
Benzo(k)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Chrysene[2]	1.1E-05	$(ug/m^3)^{-1}$	3.9E-02	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Dibenzo(a,h)anthracene[2]	1.2E-03	$(ug/m^3)^{-1}$	4.2E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Fluoranthene	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Naphthalene	3.4E-05	$(ug/m^3)^{-1}$	1.2E-01	$(mg/kg/day)^{-1}$	C/ Possible Human Carcinogen	Cal EPA	8/2004
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA
Inorganics							
Antimony	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	B2 / Probable human carcinogen	IRIS	9/09/2009
Mercury	NA	NA	NA	NA	C/ Possible Human Carcinogen	IRIS	9/09/2009

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - The carcinogenic PAHs are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Cal EPA = California Environmental Protection Agency.

IRIS = Integrated Risk Information System.

NA = Not Available.

RAGS TABLES 7 and 9

EPCS Weighted 95% for samples without ash/burnt material

and

5% for samples with ash/burnt material

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.RME	Occupational Workers - Entire Site Surface Soil
9.3.RME	Child Recreational Users - Entire Site Surface Soil
9.4.RME	Adult Recreational Users - Entire Site Surface Soil
9.5.RME	Lifetime Recreational Users - Entire Site Surface Soil
9.6.RME	Child Residents - Entire Site Surface Soil
9.7.RME	Adult Residents - Entire Site Surface Soil
9.8.RME	Lifetime Residents - Entire Site Surface Soil
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.CTE	Occupational Workers - Entire Site Surface Soil
9.3.CTE	Child Recreational Users - Entire Site Surface Soil
9.4.CTE	Adult Recreational Users - Entire Site Surface Soil
9.5.CTE	Child Residents - Entire Site Surface Soil
9.6.CTE	Adult Residents - Entire Site Surface Soil

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	2E-08	--	7E-09	--	2E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	6E-08	--	2E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	5E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-09	--	3E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	2E-07	--	8E-08	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Air	OU9	Benzo(a)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	9E-11	--	--	9E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	--	- -	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Medium Total								3E-07					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.002	- -	--	0.002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.008	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00004	0.0001
			Benzo(a)anthracene	9E-08	--	4E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	8E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.00007	0.0003
			Benzo(k)fluoranthene	3E-09	--	1E-09	--	5E-09	NA	--	- -	--	--
			Chrysene	9E-10	--	4E-10	--	1E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	7E-08	--	2E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0003	- -	0.0001	0.0004
			Fluorene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0005	- -	0.0002	0.0007
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0008	- -	0.0003	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0006	- -	0.0002	0.0009
			Chemical Total	1E-06	--	5E-07	--	2E-06		0.01	--	0.004	0.02
		Exposure Point Total						2E-06					0.02
	Exposure Medium Total							2E-06					0.02

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Chrysene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Naphthalene	--	3E-08	--	--	3E-08	Nasal	- -	0.02	- -	0.02
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	4E-08	--	--	4E-08		- -	0.02	- -	0.02
		Exposure Point Total						4E-08					0.02
	Exposure Medium Total							4E-08					0.02
Medium Total								2E-06					0.04
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.002
Total Blood HI	0.0003
Total Body Weight HI	0.0007
Total Kidney HI	0.002
Total Liver HI	0.0007
Total Lungs HI	0.01
Total Nasal HI	0.02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-08	--	1E-08	--	3E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-07	--	3E-07	--	6E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-08	--	8E-08	--	2E-07	NA	--	- -	--	--
			Chemical Total	3E-06	--	2E-06	--	5E-06		--	--	--	--
		Exposure Point Total						5E-06					--
	Exposure Medium Total							5E-06					--
	Air	OU9	Benzo(a)anthracene	--	9E-13	--	--	9E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								5E-06					--
Receptor Total							Receptor Risk Total	5E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	4E-06	--	8E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	6E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	6E-06	--	5E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								1E-05					--
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	4E-08	--	4E-08	--	8E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	4E-07	--	8E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	3E-09	--	6E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	6E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	2E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	5E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-14	--	--	6E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								1E-06					--
Receptor Total							Receptor Risk Total	1E-06				Receptor HI Total	--

Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	6E-07	--	4E-07	--	1E-06
			Benzo(a)pyrene	5E-06	--	4E-06	--	9E-06
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	7E-08
			Dibenzo(a,h)anthracene	9E-07	--	6E-07	--	1E-06
			Indeno(1,2,3-cd)pyrene	2E-07	--	2E-07	--	4E-07
			Chemical Total	7E-06	--	5E-06	--	1E-05
		Exposure Point Total						1E-05
	Exposure Medium Total							1E-05
	Air	OU9	Benzo(a)anthracene	--	4E-13	--	--	4E-13
			Benzo(a)pyrene	--	3E-12	--	--	3E-12
			Benzo(k)fluoranthene	--	3E-13	--	--	3E-13
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13
			Indeno(1,2,3-cd)pyrene	--	2E-13	--	--	2E-13
			Chemical Total	--	5E-12	--	--	5E-12
		Exposure Point Total						5E-12
	Exposure Medium Total							5E-12
Medium Total								1E-05
Receptor Total							Receptor Risk Total	1E-05

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	4E-06	--	1E-06	--	5E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-07	--	9E-08	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-06	--	2E-06	--	8E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-06	--	6E-07	--	2E-06	NA	--	- -	--	--
			Chemical Total	4E-05	--	2E-05	--	6E-05		--	--	--	--
		Exposure Point Total						6E-05					--
	Exposure Medium Total							6E-05					--
	Air	OU9	Benzo(a)anthracene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-12	--	--	7E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	6E-11	--	--	6E-11		- -	--	- -	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Medium Total								6E-05					--
Receptor Total							Receptor Risk Total	6E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	6E-07	--	3E-07	--	8E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	3E-06	--	8E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	4E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	1E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	7E-06	--	3E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Chemical Total	--	8E-11	--	--	8E-11		- -	--	- -	--
		Exposure Point Total						8E-11					--
	Exposure Medium Total							8E-11					--
Medium Total								1E-05					--
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	4E-06	--	2E-06	--	6E-06
			Benzo(a)pyrene	4E-05	--	1E-05	--	5E-05
			Benzo(k)fluoranthene	3E-07	--	1E-07	--	4E-07
			Dibenzo(a,h)anthracene	6E-06	--	2E-06	--	9E-06
			Indeno(1,2,3-cd)pyrene	2E-06	--	7E-07	--	3E-06
			Chemical Total	5E-05	--	2E-05	--	7E-05
		Exposure Point Total						7E-05
	Exposure Medium Total							7E-05
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11
			Benzo(a)pyrene	--	1E-10	--	--	1E-10
			Benzo(k)fluoranthene	--	7E-12	--	--	7E-12
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11
			Indeno(1,2,3-cd)pyrene	--	5E-12	--	--	5E-12
			Chemical Total	--	1E-10	--	--	1E-10
		Exposure Point Total						1E-10
	Exposure Medium Total							1E-10
Medium Total								7E-05
Receptor Total							Receptor Risk Total	7E-05

C.3 Additional Risk Estimates

Appendix C.3 Contents

The contents of Appendix C.3 are separated into three parts as follows:

Risks Including Background. This sub-appendix presents total risks (i.e., including chemicals within background levels) using unweighted EPCs for both surface and subsurface soil for all receptors. RAGS Part D Tables 3.1B and 3.2B present unweighted EPCs for surface and subsurface soil, respectively for all COPCs and chemicals eliminated from COPC selection due to the background screen. RAGS Part D Tables 7 and 9 using these unweighted EPCs are included for both the RME and CTE evaluations. Lead model output files are also presented, as lead was eliminated from COPC selection due to the background screen.

Subsurface Soil Risks. This sub-appendix presents site-specific risks (i.e., excluding chemicals within background levels) for subsurface soil as well as surface soil. The site-specific subsurface soil risks are presented using the three different sets of EPCs. Table 3.1A presents unweighted EPCs for subsurface soil COPCs. Table 3.2A presents EPCs weighted 90% for the excavated area and 10% for the unexcavated area. Table 3.3A presents EPCs weighted 95% for samples without ash/burnt material and 5% for samples with ash/burnt material. RAGS Part D Tables 7 and 9 for all receptors and for both the RME and CTE evaluations are presented for each of the three sets of EPCs.

Vapor Intrusion Analysis. Information used to provide an estimate of potential vapor intrusion risks for Building 62 Annex as described in Section 6.6.2 are provided. The excavation cross-section figures were used to estimate the amount of ash potentially present underneath Building 62 Annex based on the depth of visible ash excavated from the former location of Building 62. A table presenting naphthalene concentrations in ash is provided as well as the Johnson and Ettinger model files.

SUBSURFACE SOIL RISKS

TABLE 3.3A.RME
EPCs WEIGHTED 95 PERCENT FOR SOILS WITH NO ASH/BURNT MATERIAL AND 5 PERCENT FOR SOILS WITH ASH/BURNT MATERIAL EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Mercury	mg/kg	0.23	0.25 (N)	8.2	0.25	mg/kg	T-statistic	(1)
	2-Methylnaphthalene	mg/kg	14	17 (N)	560 (J)	17	mg/kg	T-statistic	(1)
	Acenaphthylene	mg/kg	2.7	3.3 (N)	370	3.3	mg/kg	T-statistic	(1)
	Benzo(a)anthracene	mg/kg	4.0	4.7 (N)	410 (J)	4.7	mg/kg	T-statistic	(1)
	Benzo(a)pyrene	mg/kg	4.3	5.0 (N)	450	5.0	mg/kg	T-statistic	(1)
	Benzo(b)fluoranthene	mg/kg	3.5	4.1 (N)	360	4.1	mg/kg	T-statistic	(1)
	Benzo(g,h,i)perylene	mg/kg	2.5	2.9 (N)	230	2.9	mg/kg	T-statistic	(1)
	Benzo(k)fluoranthene	mg/kg	1.5	1.7 (N)	130 (J)	1.7	mg/kg	T-statistic	(1)
	Chrysene	mg/kg	4.0	4.6 (N)	420	4.6	mg/kg	T-statistic	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.77	0.87 (N)	66	0.87	mg/kg	T-statistic	(1)
	Fluoranthene	mg/kg	5.5	6.4 (N)	550	6.4	mg/kg	T-statistic	(1)
	Fluorene	mg/kg	2.5	2.9 (N)	320	2.9	mg/kg	T-statistic	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	1.7	2.0 (N)	160	2.0	mg/kg	T-statistic	(1)
	Naphthalene	mg/kg	4.0	5.0 (N)	640	5.0	mg/kg	T-statistic	(1)
	Phenanthrene	mg/kg	10	12 (N)	1300	12	mg/kg	T-statistic	(1)
	Pyrene	mg/kg	8.5	9.9 (N)	910 (J)	9.9	mg/kg	T-statistic	(1)

For non-detects, one half the sample quantitation limit was used as a proxy concentration.
N = Normal

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

RAGS TABLES 7 and 9

EPCS Weighted 95% for samples without ash/burnt material

and

5% for samples with ash/burnt material

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.RME	Occupational Workers - Entire Site Surface/Subsurface Soil
9.3.RME	Child Recreational Users - Entire Site Surface/Subsurface Soil
9.4.RME	Adult Recreational Users - Entire Site Surface/Subsurface Soil
9.5.RME	Lifetime Recreational Users - Entire Site Surface/Subsurface Soil
9.6.RME	Child Residents - Entire Site Surface/Subsurface Soil
9.7.RME	Adult Residents - Entire Site Surface/Subsurface Soil
9.8.RME	Lifetime Residents - Entire Site Surface/Subsurface Soil
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.CTE	Occupational Workers - Entire Site Surface/Subsurface Soil
9.3.CTE	Child Recreational Users - Entire Site Surface/Subsurface Soil
9.4.CTE	Adult Recreational Users - Entire Site Surface/Subsurface Soil
9.5.CTE	Child Residents - Entire Site Surface/Subsurface Soil
9.6.CTE	Adult Residents - Entire Site Surface/Subsurface Soil

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	2E-08	--	7E-09	--	2E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	6E-08	--	2E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	5E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-09	--	3E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	2E-07	--	8E-08	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Air	OU9	Benzo(a)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	9E-11	--	--	9E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	--	- -	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Medium Total								3E-07					--

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.002	- -	--	0.002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.008	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00004	0.0001
			Benzo(a)anthracene	9E-08	--	4E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	8E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.00007	0.0003
			Benzo(k)fluoranthene	3E-09	--	1E-09	--	5E-09	NA	--	- -	--	--
			Chrysene	9E-10	--	4E-10	--	1E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	7E-08	--	2E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0003	- -	0.0001	0.0004
			Fluorene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0005	- -	0.0002	0.0007
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0008	- -	0.0003	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0006	- -	0.0002	0.0009
			Chemical Total	1E-06	--	5E-07	--	2E-06		0.01	--	0.004	0.02
		Exposure Point Total						2E-06					0.02
Exposure Medium Total								2E-06					0.02

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Chrysene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Naphthalene	--	3E-08	--	--	3E-08	Nasal	- -	0.02	- -	0.02
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	4E-08	--	--	4E-08		- -	0.02	- -	0.02
		Exposure Point Total						4E-08					0.02
	Exposure Medium Total							4E-08					0.02
Medium Total								2E-06					0.04
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.002
Total Blood HI	0.0003
Total Body Weight HI	0.0007
Total Kidney HI	0.002
Total Liver HI	0.0007
Total Lungs HI	0.01
Total Nasal HI	0.02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-08	--	1E-08	--	3E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-07	--	3E-07	--	6E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-08	--	8E-08	--	2E-07	NA	--	- -	--	--
			Chemical Total	3E-06	--	2E-06	--	5E-06		--	--	--	--
		Exposure Point Total						5E-06					--
	Exposure Medium Total							5E-06					--
	Air	OU9	Benzo(a)anthracene	--	9E-13	--	--	9E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								5E-06					--

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0008	- -	--	0.0008
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.004	- -	0.003	0.007
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00005	- -	0.00005	0.00010
			Benzo(a)anthracene	1E-06	--	1E-06	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	1E-05	--	1E-05	--	2E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-06	--	9E-07	--	2E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00009	- -	0.00008	0.0002
			Benzo(k)fluoranthene	4E-08	--	4E-08	--	8E-08	NA	--	- -	--	--
			Chrysene	1E-08	--	1E-08	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0002	- -	0.0001	0.0003
			Fluorene	- -	--	- -	--	- -	Blood	0.00007	- -	0.00006	0.0001
			Indeno(1,2,3-cd)pyrene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0002	- -	0.0002	0.0005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0004	- -	0.0003	0.0007
			Pyrene	- -	--	- -	--	- -	Kidney	0.0003	- -	0.0003	0.0006
			Chemical Total	2E-05	--	2E-05	--	3E-05		0.006	--	0.004	0.01
		Exposure Point Total						3E-05					0.01
Exposure Medium Total								3E-05					0.01

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chrysene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Naphthalene	--	3E-07	--	--	3E-07	Nasal	- -	0.007	- -	0.007
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.007	- -	0.007
		Exposure Point Total						3E-07					0.007
	Exposure Medium Total							3E-07					0.007
Medium Total								3E-05					0.02
Receptor Total							Receptor Risk Total	4E-05				Receptor HI Total	0.02

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.0008
Total Blood HI	0.0002
Total Body Weight HI	0.0005
Total Kidney HI	0.001
Total Liver HI	0.0005
Total Lungs HI	0.007
Total Nasal HI	0.007

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	4E-06	--	8E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	6E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	6E-06	--	5E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								1E-05					--

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.002	- -	--	0.002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.008	- -	0.004	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00007	0.0002
			Benzo(a)anthracene	3E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.0001	0.0003
			Benzo(k)fluoranthene	1E-07	--	8E-08	--	2E-07	NA	--	- -	--	--
			Chrysene	3E-08	--	2E-08	--	5E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-06	--	4E-06	--	9E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0003	- -	0.0002	0.0005
			Fluorene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00010	0.0002
			Indeno(1,2,3-cd)pyrene	1E-06	--	9E-07	--	2E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0005	- -	0.0003	0.0008
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0007	- -	0.0005	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0006	- -	0.0004	0.001
			Chemical Total	4E-05	--	3E-05	--	7E-05		0.01	--	0.006	0.02
		Exposure Point Total						7E-05					0.02
Exposure Medium Total								7E-05					0.02

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chrysene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Naphthalene	--	1E-08	--	--	1E-08	Nasal	- -	0.001	- -	0.001
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.001	- -	0.001
		Exposure Point Total						1E-08					0.001
	Exposure Medium Total							1E-08					0.001
Medium Total								7E-05					0.02
Receptor Total							Receptor Risk Total	8E-05				Receptor HI Total	0.02

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.002
Total Blood HI	0.0004
Total Body Weight HI	0.0008
Total Kidney HI	0.002
Total Liver HI	0.0008
Total Lungs HI	0.01
Total Nasal HI	0.001

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	4E-08	--	4E-08	--	8E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	4E-07	--	8E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	3E-09	--	6E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	6E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	2E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	5E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-14	--	--	6E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								1E-06					--

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.00008	- -	--	0.00008
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.0004	- -	0.0003	0.0008
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.000006	- -	0.000006	0.00001
			Benzo(a)anthracene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.000010	- -	0.00001	0.00002
			Benzo(k)fluoranthene	8E-09	--	8E-09	--	2E-08	NA	--	- -	--	--
			Chrysene	2E-09	--	2E-09	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-07	--	4E-07	--	8E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00002	- -	0.00002	0.00003
			Fluorene	- -	--	- -	--	- -	Blood	0.000007	- -	0.000008	0.00002
			Indeno(1,2,3-cd)pyrene	9E-08	--	1E-07	--	2E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.00003	- -	0.00003	0.00005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.00004	- -	0.00004	0.00008
			Pyrene	- -	--	- -	--	- -	Kidney	0.00003	- -	0.00003	0.00007
			Chemical Total	3E-06	--	3E-06	--	7E-06		0.0007	--	0.0005	0.001
		Exposure Point Total						7E-06					0.001
Exposure Medium Total								7E-06					0.001

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	7E-13	--	--	7E-13	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Chrysene	--	8E-14	--	--	8E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Naphthalene	--	3E-08	--	--	3E-08	Nasal	- -	0.0007	- -	0.0007
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-08	--	--	3E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						3E-08					0.0007
	Exposure Medium Total							3E-08					0.0007
Medium Total								7E-06					0.002
Receptor Total							Receptor Risk Total	8E-06				Receptor HI Total	0.002

Total Blood HI	0.00003
Total Body Weight HI	0.00005
Total Kidney HI	0.0002
Total Liver HI	0.00005
Total Lungs HI	0.0008
Total Nasal HI	0.0007

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	6E-07	--	4E-07	--	1E-06
			Benzo(a)pyrene	5E-06	--	4E-06	--	9E-06
			Benzo(b)fluoranthene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	7E-08
			Dibenzo(a,h)anthracene	9E-07	--	6E-07	--	1E-06
			Indeno(1,2,3-cd)pyrene	2E-07	--	2E-07	--	4E-07
			Chemical Total	7E-06	--	5E-06	--	1E-05
		Exposure Point Total						1E-05
	Exposure Medium Total							1E-05
	Air	OU9	Benzo(a)anthracene	--	4E-13	--	--	4E-13
			Benzo(a)pyrene	--	3E-12	--	--	3E-12
			Benzo(b)fluoranthene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	3E-13	--	--	3E-13
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13
			Indeno(1,2,3-cd)pyrene	--	2E-13	--	--	2E-13
			Chemical Total	--	5E-12	--	--	5E-12
		Exposure Point Total						5E-12
	Exposure Medium Total							5E-12
Medium Total								1E-05

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	3E-06	--	2E-06	--	5E-06
			Benzo(a)pyrene	3E-05	--	2E-05	--	6E-05
			Benzo(b)fluoranthene	3E-06	--	2E-06	--	5E-06
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	1E-07	--	8E-08	--	2E-07
			Chrysene	3E-08	--	2E-08	--	5E-08
			Dibenzo(a,h)anthracene	6E-06	--	4E-06	--	1E-05
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	1E-06	--	1E-06	--	2E-06
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	5E-05	--	3E-05	--	8E-05
		Exposure Point Total						8E-05
	Exposure Medium Total							8E-05

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	2E-12	--	--	2E-12
			Benzo(a)pyrene	--	2E-11	--	--	2E-11
			Benzo(b)fluoranthene	--	2E-12	--	--	2E-12
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	7E-13	--	--	7E-13
			Chrysene	--	2E-13	--	--	2E-13
			Dibenzo(a,h)anthracene	--	4E-12	--	--	4E-12
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	8E-13	--	--	8E-13
			Naphthalene	--	4E-08	--	--	4E-08
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	4E-08	--	--	4E-08
		Exposure Point Total						4E-08
	Exposure Medium Total							4E-08
Medium Total								8E-05
Receptor Total							Receptor Risk Total	9E-05

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	4E-06	--	1E-06	--	5E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-07	--	9E-08	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-06	--	2E-06	--	8E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-06	--	6E-07	--	2E-06	NA	--	- -	--	--
			Chemical Total	4E-05	--	2E-05	--	6E-05		--	--	--	--
		Exposure Point Total						6E-05					--
	Exposure Medium Total							6E-05					--
	Air	OU9	Benzo(a)anthracene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-12	--	--	7E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	6E-11	--	--	6E-11		- -	--	- -	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Medium Total								6E-05					--

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	- -	--	0.01
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.05	- -	0.02	0.07
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0007	- -	0.0003	0.0010
			Benzo(a)anthracene	2E-05	--	7E-06	--	3E-05	NA	--	- -	--	--
			Benzo(a)pyrene	2E-04	--	8E-05	--	3E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-05	--	6E-06	--	2E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0004	0.002
			Benzo(k)fluoranthene	7E-07	--	3E-07	--	1E-06	NA	--	- -	--	--
			Chrysene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0007	0.003
			Fluorene	- -	--	- -	--	- -	Blood	0.0009	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	9E-06	--	3E-06	--	1E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.003	- -	0.001	0.004
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.005	- -	0.002	0.007
			Pyrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.002	0.006
			Chemical Total	3E-04	--	1E-04	--	4E-04		0.08	--	0.02	0.1
		Exposure Point Total						4E-04					0.1
Exposure Medium Total								4E-04					0.1

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Chrysene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Naphthalene	--	3E-07	--	--	3E-07	Nasal	- -	0.03	- -	0.03
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.03	- -	0.03
		Exposure Point Total						3E-07					0.03
	Exposure Medium Total							3E-07					0.03
Medium Total								4E-04					0.1
Receptor Total							Receptor Risk Total	5E-04				Receptor HI Total	0.1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	0.002
Total Body Weight HI	0.004
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.07
Total Nasal HI	0.03

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	6E-07	--	3E-07	--	8E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	3E-06	--	8E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	4E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	1E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	7E-06	--	3E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Chemical Total	--	8E-11	--	--	8E-11		- -	--	- -	--
		Exposure Point Total						8E-11					--
	Exposure Medium Total							8E-11					--
Medium Total								1E-05					--

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.001	- -	--	0.001
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.006	- -	0.002	0.008
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00008	- -	0.00004	0.0001
			Benzo(a)anthracene	3E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	3E-06	--	1E-06	--	4E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0001	- -	0.00007	0.0002
			Benzo(k)fluoranthene	1E-07	--	6E-08	--	2E-07	NA	--	- -	--	--
			Chrysene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-06	--	3E-06	--	8E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0002	- -	0.0001	0.0003
			Fluorene	- -	--	- -	--	- -	Blood	0.00010	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	1E-06	--	7E-07	--	2E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0003	- -	0.0002	0.0005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0005	- -	0.0003	0.0008
			Pyrene	- -	--	- -	--	- -	Kidney	0.0005	- -	0.0002	0.0007
			Chemical Total	4E-05	--	2E-05	--	7E-05		0.009	--	0.003	0.01
		Exposure Point Total						7E-05					0.01
Exposure Medium Total								7E-05					0.01

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chrysene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.03	- -	0.03
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.03	- -	0.03
		Exposure Point Total						1E-06					0.03
	Exposure Medium Total							1E-06					0.03
Medium Total								7E-05					0.04
Receptor Total							Receptor Risk Total	8E-05				Receptor HI Total	0.04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.001
Total Blood HI	0.0003
Total Body Weight HI	0.0005
Total Kidney HI	0.002
Total Liver HI	0.0005
Total Lungs HI	0.008
Total Nasal HI	0.03

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	4E-06	--	2E-06	--	6E-06
			Benzo(a)pyrene	4E-05	--	1E-05	--	5E-05
			Benzo(b)fluoranthene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	3E-07	--	1E-07	--	4E-07
			Dibenzo(a,h)anthracene	6E-06	--	2E-06	--	9E-06
			Indeno(1,2,3-cd)pyrene	2E-06	--	7E-07	--	3E-06
			Chemical Total	5E-05	--	2E-05	--	7E-05
		Exposure Point Total						7E-05
	Exposure Medium Total							7E-05
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11
			Benzo(a)pyrene	--	1E-10	--	--	1E-10
			Benzo(b)fluoranthene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	7E-12	--	--	7E-12
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11
			Indeno(1,2,3-cd)pyrene	--	5E-12	--	--	5E-12
			Chemical Total	--	1E-10	--	--	1E-10
		Exposure Point Total						1E-10
	Exposure Medium Total							1E-10
Medium Total								7E-05

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	2E-05	--	9E-06	--	3E-05
			Benzo(a)pyrene	2E-04	--	9E-05	--	3E-04
			Benzo(b)fluoranthene	2E-05	--	8E-06	--	3E-05
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	8E-07	--	3E-07	--	1E-06
			Chrysene	2E-07	--	9E-08	--	3E-07
			Dibenzo(a,h)anthracene	4E-05	--	2E-05	--	6E-05
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	1E-05	--	4E-06	--	1E-05
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	3E-04	--	1E-04	--	5E-04
		Exposure Point Total						5E-04
	Exposure Medium Total							5E-04

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	6E-11	--	--	6E-11
			Benzo(a)pyrene	--	6E-10	--	--	6E-10
			Benzo(b)fluoranthene	--	5E-11	--	--	5E-11
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	2E-11	--	--	2E-11
			Chrysene	--	6E-12	--	--	6E-12
			Dibenzo(a,h)anthracene	--	1E-10	--	--	1E-10
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Naphthalene	--	1E-06	--	--	1E-06
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	1E-06	--	--	1E-06
		Exposure Point Total						1E-06
	Exposure Medium Total							1E-06
Medium Total								5E-04
Receptor Total							Receptor Risk Total	5E-04

VAPOR INSTRUSION ANALYSIS

Concentrations of Naphthalene in Surface Soil Samples Containing Ash/Burnt Material

OU9-SS-04-0002	NAPHTHALENE	5.8		UG/KG
34SS020002-AVG	NAPHTHALENE	40	U	UG/KG
34SS040001-AVG	NAPHTHALENE	27500	J	UG/KG
34SS050002	NAPHTHALENE	1200	J	UG/KG
34SS120002	NAPHTHALENE	2300		UG/KG
34SS130002	NAPHTHALENE	42	U	UG/KG

J = Estimated Result
U = Not Detected

SL-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED SOIL CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial soil conc., C_R (µg/kg)	Chemical
91203	1.49E+04	Naphthalene

MORE ↓

ENTER Average soil temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to top of contamination, L_t (cm)	ENTER Depth below grade to bottom of contamination, (enter value of 0 if value is unknown) L_b (cm)	ENTER Totals must add up to value of L_t (cell G28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
7.2	15.24	15.24	46	15.24	0	0	LS		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum A soil organic carbon fraction, f_{oc}^A (unitless)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum B soil organic carbon fraction, f_{oc}^B (unitless)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)	ENTER Stratum C soil organic carbon fraction, f_{oc}^C (unitless)
Lookup Soil					Lookup Soil					Lookup Soil				
S	1.66	0.375	0.054	0.002	S	1.66	0.375	0.054	0.002					

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	2515	1140	300	0.1	1.5	5

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	25	250	1.0E-06	1
				Used to calculate risk-based soil concentration.	

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Physical state at soil temperature, (S,L,G)
5.90E-02	7.50E-06	4.82E-04	25	10,373	491.14	748.40	2.00E+03	3.10E+01	3.4E-05	3.0E-03	S

END

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Initial soil concentration used, C_R (μg/kg)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
7.88E+08	1	0.321	0.321	ERROR	0.015	1.62E-08	0.992	1.60E-08	7,310	1.49E+04	3.58E+05

Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)
2.98E+06	2.45E-04	15.24	12,941	1.20E-04	5.23E-03	1.75E-04	9.54E-03	0.00E+00	0.00E+00	9.54E-03	1	15.24

Soil-water partition coefficient, K_d (cm^3/g)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Finite source β term (unitless)	Finite source ψ term $(sec)^{-1}$	Time for source depletion, τ_D (sec)	Exposure duration > time for source depletion (YES/NO)
4.00E+00	1.93E+04	0.10	8.33E+01	9.54E-03	7.31E+02	8.03E+51	NA	NA	3.42E+02	7.45E-06	1.47E+09	NO

Finite source indoor attenuation coefficient, $<\alpha>$ (unitless)	Mass limit bldg. conc., $C_{building}$ ($\mu g/m^3$)	Finite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Final finite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.26E-04	NA	4.37E+00	4.37E+00	3.4E-05	3.0E-03

END

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	NA	NA	1.25E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.6E-05	8.3E-01

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

FROM RI TEXT

hypothetical future residential use was evaluated as a risk scenario that could occur if the Shipyard closed or if the site was developed for other uses.

Exposure Point Concentrations

Uncertainty is associated with use of 95-percent UCLs on the mean concentrations as EPCs. As a result of using 95-percent UCLs, the estimations of potential risk for the RME scenario are most likely to be overstated because the 95-percent UCL is a representation of the upper limit to which potential receptors would be exposed over the entire exposure period. Uncertainty is introduced when non-detects are incorporated into the UCL calculation by using detection limits as input values for non-detects when using ProUCL software. This may overstate the risks to the receptors if detection limits are elevated. However, this methodology is in accordance with USEPA guidance (May 2010a).

Exposure Routes and Receptor Identification

An attempt was made to simplify the various receptor groups and exposure routes of potential concern in this report. The uncertainty associated with this approach is minimal because exposure routes and potential receptors are considered to be well defined based on the land use observed at the site. The conservative exposure assumptions used in the risk assessment should be protective of receptor use at the site.

Risks and hazard indices were estimated for child recreational users. However, it should be noted that child recreational users are not current receptors but are only potential future receptors. The adult recreational user is considered both a current and potential future receptor.

As stated previously, vapor intrusion of contaminants from ash is not expected to be a significant exposure pathway for Building 62 because no ash or tar was found under Building 62. However, it is unknown if ash exists under Building 62 Annex. Therefore an evaluation was performed to determine if there may be a potentially unacceptable vapor intrusion risk to Building 62 Annex.

Chemicals detected in RI soil samples were first evaluated to determine if they are sufficiently volatile and toxic via the inhalation pathway to pose a potential vapor intrusion risk. Vapor intrusion guidance from USEPA (2002) and DoD (2009) presents methodology for determining if chemicals should be evaluated for vapor intrusion. Both guidances define a chemical as being sufficiently volatile if its Henry's Law Constant is greater than $1x10^{-5}$ atm-m^3/mole. Strictly following the guidance indicates naphthalene and benzo(a)anthracene are the only PAHs which should be evaluated for vapor intrusion. However, the Henry's Law Constant for benzo(a)anthracene is $1.2x10^{-5}$, which only slightly exceeds $1x10^{-5}$, and

benzo(a)anthracene is not considered to be a volatile (USEPA, 2011). Therefore, only naphthalene was evaluated for vapor intrusion risks.

To evaluate the potential for vapor intrusion for Building 62 Annex, the Johnson and Ettinger (JEE) Vapor Intrusion Model (USEPA, 2004) was used to estimate potential vapor intrusion risks from soil concentrations. Several key assumptions were made so that inputs into the JEE model are representative of site conditions. The first key assumption is that there is a layer of ash/burnt material approximately one foot thick directly underneath the slab of Building 62 Annex. This assumption was made based on the excavation cross-section figures (shown in Appendix C.3) from the Site 34 Closeout Report (Shaw, July 2008) which show that on average approximately one foot of ash material was excavated underneath the former slab for Building 63. Next, a potential naphthalene soil concentration in potential ash underneath of Building 62 Annex was calculated by determining the 95-percent UCL of naphthalene concentrations in surface soil samples that contained ash/burnt material (ProUCL Version 4.1.00 output in Appendix C.3). In addition, the following input parameters were used: 45°F as the soil temperature; a soil type of sand (the most conservative); an enclosed space height of 300 cm and indoor air exchange rate of 1.5 1/h (based on industrial use); an exposure duration of 25 years and an exposure frequency of 250 days per year based on typical industrial workers exposure assumptions. Inputs for Building 62 Annex floor width and length were estimated from the Site 34 Shoreline Stabilization and Removal Action Excavation figure (Shaw, July 2008) shown in Appendix C.3.

The JEE model output files for naphthalene are included in Appendix C.3. Using the above input parameters results in an ILCR of 3.6×10^{-5} and an HQ of 0.8. The estimated ILCR is within the USEPA target cancer risk range of 1×10^{-6} to 1×10^{-4} and slightly greater than the State of Maine risk guideline of 1×10^{-5}. The estimated HQ is less than 1, indicating that adverse noncarcinogenic effects are not anticipated.

The JEE model outputs are conservative estimates based on conservative assumptions. For example, the JEE model assumes that contaminants do not undergo chemical or biological transformations and that all contaminant vapors originating below the building will enter the building (i.e. the model does not allow vapors to flow around the building and not enter the structure). Those assumptions over predict vapor intrusion into a structure and therefore overestimate potential risks. Therefore, unacceptable risks are not expected for Building 62 Annex due to vapor intrusion for the occupational worker.

Occupational, Recreational, and Residential Exposures to Subsurface Soil

The risk assessment assumed that occupational workers, recreational users, and future hypothetical residents would only be exposed to surface soil. The possibility that subsurface soils would be excavated and spread across the land surfaces and that the future land use would be residential is very remote.

Appendix E
Applicable or Relevant and Appropriate Requirements

TABLE E-1

ALTERNATIVE 2: LUCs FOR ELEVATED PAH AREA AND BUILDING 62 ANNEX
CHEMICAL-, LOCATION-, AND ACTION-SPECIFIC ARARs
OPERABLE UNIT 9 RECORD OF DECISION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

REQUIREMENT	CITATION	STATUS	SYNOPSIS	EVALUATION/ACTION TO BE TAKEN
FEDERAL CHEMICAL-SPECIFIC ARARS AND TBCS				
Soil/Risk Assessment	USEPA Human Health Assessment Group Cancer Slope Factors (CSFs) from Intetrated Risk Information System (IRIS)	TBC	CSFs present the most up-to-date information on cancer risk potency for known and suspected carcinogens.	CSFs were used to develop risk-based soil cleanup goals for carcinogenic polycyclic aromatic hydrocarbons (PAHs).
	Guidelines for Carcinogen Risk Assessment EPA/630/P-03/001F (2005a)	TBC	These guidelines are used to perform the Human Health Risk Assessment (HHRA). They provide a framework for assessing possible cancer risks from exposures to pollutants or other agents in the environment.	These guidelines were used to develop risk-based soil cleanup goals for carcinogenic PAHs.
	Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens EPA/630/R-03/003F (2005b)	TBC	These guidelines are used to perform the HHRA and address a number of issues pertaining to cancer risks associated with early-life exposures in general and provide specific guidance on potency adjustment for carcinogens acting through a mutagenic mode of action.	This guidance was used to develop risk-based soil cleanup goals for carcinogenic PAHs.
STATE CHEMICAL-SPECIFIC ARARS AND TBCS: NO ARARS OR TBCS				
FEDERAL LOCATION-SPECIFIC ARARS AND TBCS: NO ARARS OR TBCS				
STATE LOCATION-SPECIFIC ARARS AND TBCS: NO ARARS OR TBCS				
FEDERAL ACTION-SPECIFIC ARARS AND TBCS: NO ARARS OR TBCS				
STATE ACTION-SPECIFIC ARARS AND TBCS: NO ARARS OR TBCS				

Appendix F
Alternative Calculations and Cost Estimates

CLIENT: PORTSMOUTH NAVAL SHIPYARD			JOB NUMBER: 112G02214 - FS.DR
SUBJECT: OU9 FS - QUANTITY CALCULATIONS			
BASED ON:			DRAWING NUMBER:
BY: Matt Kaus Date: 10/12/2012	CHECKED BY: Fer Padlila Date: 10/22/2012		APPROVED BY: DATE:

PURPOSE:

The purpose of this calculation is to determine the volumes, areas, and quantities of materials associated with the remedial action alternatives presented in the OU9 FS. These material and volume quantities are presented within the FS text and are used to support the cost estimates provided in Appendix C.

DISCUSSION:

The volume, area, and quantity calculations presented below are based on the descriptions of the alternatives presented in Section 4.0 of the text and FS Figures 4-1 through 4-3.

CALCULATIONS:

Alternative 2 - Land Use Controls (LUCs) for Elevated PAH Area and Building 62 Annex

Alternative 2 includes the implementation of LUCs over the areas identified in Figure 4-1.

Land use control area

Area of the LUC limits on Fig. 4-1 = 3,500 sf

Inspections would be required for the LUCs at the site.

Five year reviews would also be required under this alternative.

Alternative 3 - Excavation of Elevated PAH Area and Building 62 Annex LUCs

Alternative 3 includes excavation in the elevated PAH area north of Building 62 and LUCs for the Building 62 Annex area. All excavated soil would be characterized and disposed off-site. The excavation area would be backfilled to existing grade and surface conditions would be returned to pre-excavation conditions.

Excavation of Elevated PAH Area

There is a water line in the elevated PAH area. Therefore, it is assumed that a slide rail system would be used for the excavation

Area =	175	sf
Depth =	8	ft
Volume =	1400	cf
=	52	cy

PORTSMOUTH NAVAL SHIPYARD
Kittery, Maine
OU9 FS
Alternative 2 - Land Use Controls For Elevated PAH Area and Building 62 Annex
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING & DOCUMENTS											
1.1 Prepare LUC Documents	200	hr			$39.00		$0	$0	$7,800	$0	$7,800
Subtotal							$0	$0	$7,800	$0	$7,800
Overhead on Labor Cost @ 30%									$2,340		$2,340
G & A on Labor, Material, Equipment, & Subs Cost @ 10%							$0	$0	$780	$0	$780
Tax on Materials and Equipment Cost @ 6%								$0		$0	$0
Total Direct Cost							$0	$0	$10,920	$0	$10,920
Indirects on Total Direct Cost @ 0%											$0
Profit on Total Direct Cost @ 10%											$1,092
Subtotal											$12,012
Health & Safety Monitoring @ 0%											$0
Total Field Cost											$12,012
Contingency on Total Field Costs @ 25%											$3,003
Engineering on Total Field Cost @ 0%											$0
TOTAL CAPITAL COST											**$15,015**

PORTSMOUTH NAVAL SHIPYARD
Kittery, Maine
OU9 FS
Alternative 2 - Land Use Controls For Elevated PAH Area and Building 62 Annex
Annual Cost

Item	Item Cost years 1 - 30	Item Cost every 5 years	Notes
Annual Site Inspection & Report	$2,950		Labor and supplies once a year to inspect Land Use Controls with Report.
Five Year Site Review		$23,000	Labor and supplies to evaluate site every five years for 5-year review
SUBTOTAL	$2,950	$23,000	
Contingency @ 10%	$295	$2,300	
TOTAL	**$3,245**	**$25,300**	

PORTSMOUTH NAVAL SHIPYARD
Kittery, Maine
OU9 FS
Alternative 2 - Land Use Controls For Elevated PAH Area and Building 62 Annex
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate 2.0%	Present Worth
0	$15,015		$15,015	1.000	$15,015
1		$3,245	$3,245	0.980	$3,181
2		$3,245	$3,245	0.961	$3,119
3		$3,245	$3,245	0.942	$3,058
4		$3,245	$3,245	0.924	$2,998
5		$28,545	$28,545	0.906	$25,854
6		$3,245	$3,245	0.888	$2,881
7		$3,245	$3,245	0.871	$2,825
8		$3,245	$3,245	0.853	$2,770
9		$3,245	$3,245	0.837	$2,715
10		$28,545	$28,545	0.820	$23,417
11		$3,245	$3,245	0.804	$2,610
12		$3,245	$3,245	0.788	$2,559
13		$3,245	$3,245	0.773	$2,508
14		$3,245	$3,245	0.758	$2,459
15		$28,545	$28,545	0.743	$21,209
16		$3,245	$3,245	0.728	$2,364
17		$3,245	$3,245	0.714	$2,317
18		$3,245	$3,245	0.700	$2,272
19		$3,245	$3,245	0.686	$2,227
20		$28,545	$28,545	0.673	$19,210
21		$3,245	$3,245	0.660	$2,141
22		$3,245	$3,245	0.647	$2,099
23		$3,245	$3,245	0.634	$2,058
24		$3,245	$3,245	0.622	$2,017
25		$28,545	$28,545	0.610	$17,399
26		$3,245	$3,245	0.598	$1,939
27		$3,245	$3,245	0.586	$1,901
28		$3,245	$3,245	0.574	$1,864
29		$3,245	$3,245	0.563	$1,827
30		$28,545	$28,545	0.552	$15,759
				TOTAL PRESENT WORTH	**$196,574**