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NAS SOUTH WEYMOUTH
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FINAL RECORD OF DECISION INDUSTRIAL OPERATIONS AREA (AREA OF CONCERN 14 (AOC 14) OPERABLE UNIT 23 (OU23), AREA OF CONCERN 83 (AOC 83) OPERABLE UNIT 24 (OU24), REVIEW AREA ITEM 33 (RIA 33), AND REVIEW AREA ITEM 82 (RIA 82)

FORMER NAS SOUTH WEYMOUTH MA

09/01/2015

RESOLUTION CONSULTANTS

FINAL
RECORD OF DECISION

INDUSTRIAL OPERATIONS AREA
(AOC 14 (OU23), AOC 83 (OU24),
RIA 33, and RIA 82)

FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

BRAC PMO EAST
U.S. NAVY

SEPTEMBER 2015

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List of Acronyms

AFFF	Aqueous film forming foam
AIMD	Aircraft Intermediate Maintenance Division
AOC	Area of concern
ARAR	Applicable or relevant and appropriate requirements
AUL	Activity and use limitation
BCT	Base Closure Team
BRAC	Base Realignment and Closure
bgs	Below ground surface
CDI	Chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of concern
COPC	Contaminants of potential concern
cPAH	Carcinogenic polycyclic aromatic hydrocarbon
CSF	Cancer slope factor
EBS	Environmental baseline survey
EPC	Exposure point concentrations
EPH	Extractable petroleum hydrocarbons
EU	Exposure unit
FFS	Focused Feasibility Study
HHRA	Human Health Risk Assessment
HI	Hazard Index
HPCDD	Heptachlorodibenzo-p-dioxins
HQ	Hazard Quotient
ID	Identification
IOA	Industrial Operations Area
IR	Installation Restoration
LOD	Limit of detection
LUC	Land use control
MassDEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
mg/kg	Milligram per kilogram
MUVD	Mixed-Use Village District
NAS	Naval Air Station
Navy	U.S. Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPW	Net present worth
O&M	Operations and maintenance

PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PECDF	Pentachlorodibenzofuran
PFCs	Perfluorinated compounds
PRG	Preliminary remediation goals
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RIA	Review area items
RME	Reasonable maximum exposure
ROD	Record of Decision
RSL	Regional Screening Level
RTN	Release Tracking Number
SARA	Superfund Amendments and Reauthorization Act
SAP	Sampling and Analysis Plan
SF	Slope factor
SMP	Site Management Plan
SRA	Southfield Redevelopment Authority
SSL	Soil screening levels
SSTTDC	South Shore Tri-Town Development Corporation
TBC	To Be Considered
TEQ	Toxic Equivalents
Tetra Tech	Tetra Tech NUS, Inc.
U.S. EPA	United States Environmental Protection Agency
UST	Underground storage tank
VCD	Village Center District
VPH	Volatile Petroleum Hydrocarbons
VOC	Volatile organic compound

1.0 DECLARATION

1.1 Site Name and Location

The Industrial Operations Area (IOA) is located at the former Naval Air Station (NAS) South Weymouth, Weymouth, Massachusetts. The former NAS South Weymouth has been assigned United States Environmental Protection Area (U.S. EPA) Identification (ID) Number MA2170022022. The location of the IOA within the former NAS South Weymouth is depicted in Figure 1-1.

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the Selected Remedy for the IOA (Site), which also includes Area of Concern (AOC) 14 (OU23) Drum Storage Area and AOC 83 (OU24) Hazardous Waste Storage Area. The Selected Remedy was chosen by the Navy and U.S. EPA in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 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). This decision is based on information contained in the Administrative Record for the Site. The Massachusetts Department of Environmental Protection (MassDEP) concurs with the Selected Remedy, as shown in Appendix A.

Review Item Area (RIA) 33 - aircraft intermediate maintenance division (AIMD) Building Shop (Building 117) and RIA 82 - Power House, Building 8, are also within the IOA and incorporated into this ROD. Following the 2013 human health risk assessment (HHRA), a decision of no further action was identified for these two RIAs.

This ROD does not incorporate the two areas of land within the IOA that have Activity and Use Limitation (AUL) covenants established to limit certain land uses. The AULs are related to environmental sites addressed by the Navy through the Massachusetts Contingency Plan (MCP) program.

1.3 Assessment of Site

The Selected Remedy presented in this ROD is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment. A CERCLA action is required because concentrations of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCB) Aroclor-1260, heptachlor epoxide (pesticide), 2,3,7,8-TCDD (dioxin), arsenic, and chromium in Site surface soil would pose unacceptable risks to human health under future residential land use scenarios.

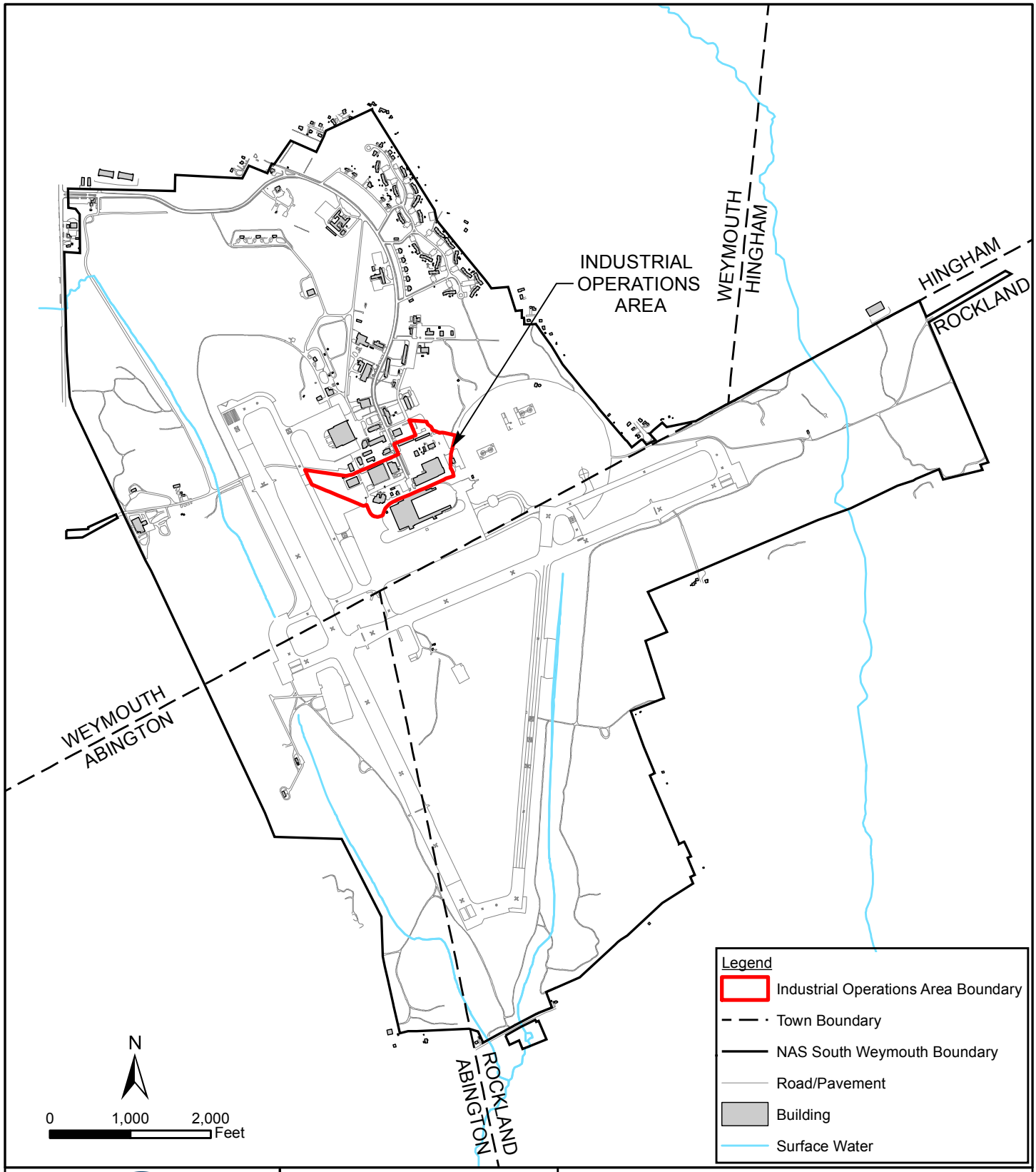

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FIGURE 1-1
LOCATION MAP
INDUSTRIAL OPERATIONS AREA

FORMER NAVAL AIR STATION
SOUTH WEYMOUTH, MASSACHUSETTS

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1.4 Description of Selected Remedy

The Selected Remedy, consisting of soil excavation and offsite disposal, addresses potential unacceptable human health risks associated with exposure through direct contact, incidental ingestion, or inhalation of fugitive dust of contaminated soil at the Site. The Selected Remedy will reduce site-wide contaminant concentrations in soil to risk-based cleanup levels. Implementation of the Selected Remedy is expected to achieve long-term risk reduction and will allow for future recreational, residential, commercial, and institutional site uses as consistent with the established zoning in place at the time this ROD is executed. The Selected Remedy does not address the two areas where AULs have been established within the IOA.

No unacceptable risks associated with exposure to site groundwater were identified at the Site. No unacceptable risks associated with exposure to ambient air are anticipated. The western portion of the site is listed as a Priority Habitat of Rare Species; however, there is no exposure pathway for Site contaminants to create an ecological risk as the site is mainly covered with buildings, and pavement.

The major components of the Selected Remedy for the IOA include the following:

- Pre-excavation soil sampling to further define areas to be excavated.
- Soil excavation and offsite disposal of soils with contaminants of concern (COC) concentrations exceeding cleanup goals.
- Post-excavation soil sampling to confirm achievement of the Remedial Action Objective (RAO).

The remediation at the IOA will not adversely impact the current use or reasonably anticipated future uses of the Site. This ROD documents the final remedial action for the IOA, including AOC 14 and AOC 83, which are located within the IOA boundary, and does not include or adversely impact any other sites at former NAS South Weymouth. A decision of no further action was achieved for RIA 33 and RIA 82 following the 2013 HHRA. Although there are 13 other environmental sites identified within the IOA, those locations have been previously addressed and are not considered suspected on-going sources of contamination within the IOA. As noted previously, the two existing AULs within the IOA are excluded from this ROD.

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, satisfies the statutory requirements of CERCLA §121 and the regulatory requirements of the NCP, is cost-effective, and utilizes permanent solutions to the maximum extent practicable.

1.6 ROD Data Certification Checklist

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

Table 1-1
ROD Check List

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	Sections 2.7 and 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, operation and maintenance (O&M), and total net present worth (NPW) costs; discount rate; and number of years over which the remedy costs are projected	Appendix C
Key factors that led to the selection of the remedy	Section 2.12.1

1.7 Authorizing Signatures

_____ _____

David A. Barney Date

BRAC Environmental Coordinator

BRAC PMO East

U.S. Navy

_____ _____

Nancy Barmakian Date

Acting Director, Office of Site Remediation and Restoration

Region 1 — New England

U. S. Environmental Protection Agency

2.0 DECISION SUMMARY

2.1 Site Name, Location, and Brief Description

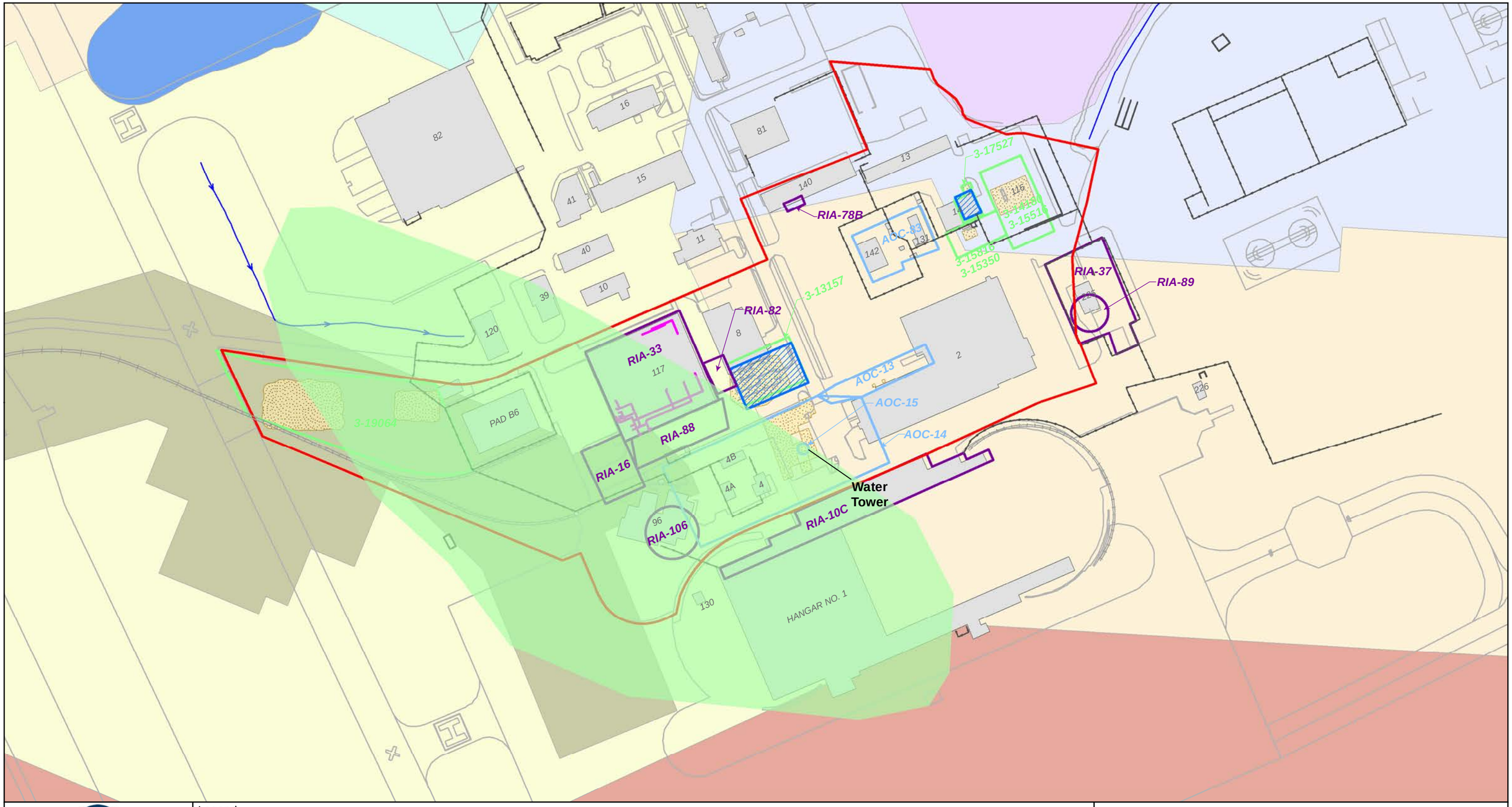
The former NAS South Weymouth (Base), U.S. EPA ID MA2170022022, is comprised of approximately 1,444-acres and encompasses portions of the Towns of Weymouth, Abington, and Rockland, Massachusetts (Figure 2-1). The IOA is located in the town of Weymouth portion of the Base.

The Base was commissioned by the United States Department of Navy (Navy) in 1942 to support dirigible aircraft used to patrol the North Atlantic during World War II. The Base was closed in 1949 and reopened in 1953 as a Naval Air Station for aviation training. In 1995, NAS South Weymouth was placed on the Defense Base Realignment and Closure (BRAC) Commission's Base Closure List. The Base remained in continuous operation from 1953 time until it was operationally closed on 30 September 1996, and administratively closed on 30 September 1997. Since closure of NAS South Weymouth, portions of the Base property have been transferred to the local redevelopment authority and are undergoing redevelopment.

The IOA covers approximately 20 acres and is located in the central part of the Base (Figure 2-1). The IOA was an area where predominantly industrial operations occurred, including, but not limited to: storage of industrial materials, equipment and coal for the power plant, movement of materials by truck and railroad spur, and power plant operations. In 2009, the boundary for the IOA was established to investigate the concern for the potential of low-level dispersed contamination in surface soil across the Site. Four active environmental sites are also located within the boundary of the IOA. In 2011, a Site-wide soil sampling program was completed at the IOA and contaminants were identified at multiple locations that were attributed to the historical industrial operations.

The IOA contains 13 inactive buildings including: the former power plant (Building 8), the former AIMD facility (Building 117), and supply warehouse (Building 2). The IOA also contains the location of a former water tower, remnants of a railroad spur, and a former hazardous waste accumulation area (Figure 2-1). The Site is generally flat and mostly covered by asphalt or buildings; there are a few small grassy areas located around buildings and sidewalks. Shea Memorial Drive bisects the approximate center of the IOA. The current wetland delineation for former NAS South Weymouth does not identify wetlands within the IOA Site.

The former NAS South Weymouth is a closed facility, and environmental investigations and remediation at the Base are funded under the Department of Defense BRAC program. The Navy is the lead agency and the U.S. EPA is the lead regulatory agency for CERCLA activities at the former NAS South Weymouth.



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Legend

- Previous Trench Excavation Area
- CERCLA AOC Boundary
- Industrial Operations Area Boundary
- RIA Boundary
- RTN Site Boundary
- Previously Excavated Area
- Building Footprint

Zoning

- Main Street Overlay District
- Mixed-Use Village District (MUVD)
- Open Space-Corporation District (OS-C)
- Open Space-Weymouth District (OS-W)
- Recreation District (RecD)
- Residential District (RD)
- Shea Village Overlay District
- Village Center District (VCD)

Aquifers

- High Yield
- Medium Yield

- Activity And Use Limitation Area Boundary

N

0 100 200

Scale in Feet

FIGURE 2-1
SITE BOUNDARIES
INDUSTRIAL OPERATIONS AREA

FORMER NAVAL AIR STATION
SOUTH WEYMOUTH, MASSACHUSETTS

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2.2 Site History and Enforcement Activities

As part of the Base closure, an environmental baseline survey (EBS) was conducted to support the Navy's compliance with CERCLA Section 120, as amended by Public Law 102-426, Community Environmental Response Facilitation Act, and state and local real property transfer disclosure notification regulations. The Phase I EBS investigation was conducted for those areas of the Base property not already addressed by the Installation Restoration (IR) program or the MCP. The information collected during the Phase I EBS was used to identify specific areas of environmental concern and to recommend the level of further investigation required for each of these areas. Areas identified for additional investigation were designated as Phase II EBS RIAs in the Phase I EBS Report. Phase II EBS investigations were conducted at these RIAs. The investigations included collecting environmental samples (soil, groundwater, sediment, surface water) from each RIA and analyzing these samples for target contaminants. Results of environmental sample analyses were evaluated and those RIAs with laboratory results exceeding U.S. EPA residential Regional Screening Levels (RSLs) (U.S. EPA 2014a) became AOCs. AOCs were then investigated in accordance with CERCLA requirements, under the IR program.

The Navy has investigated 17 environmental sites within the IOA boundary including: eight RIA sites under the EBS program, four AOC sites under CERCLA, and five sites under the MCP. The previous investigations and their subsequent response actions have resulted in the closure of six of the RIAs (between 2003 and 2004), signed RODs for two of the AOCs in April 2006, and closure of the five MCP sites (between 1998 and 2001). The four remaining active sites within the IOA include: AOC 14 Drum Storage Area, AOC 83 Hazardous Waste Storage Area, RIA 33 AIMD Building Shops (Building 117), and RIA 82 Power House (Building 8). Locations of the environmental sites within the IOA are identified on Figure 2-1. (Note seven MCP Release Tracking Numbers (RTNs) are shown on the figure because two of the MCP sites have two RTNs, each.) The environmental sites within the IOA and their regulatory status are listed in Table 2-1.

In 2009, the U.S. EPA and MassDEP raised concerns about the potential presence of low-level dispersed contamination in soil across the IOA due to historical site use for industrial operations. The IOA boundary was established at that time and was defined as the outer perimeter of the area where industrial operations took place, based on information from aerial photographs and previous investigations. The 2009 establishment of the IOA boundary also incorporated the four active environmental sites, and the decision was made to consolidate future investigation activities at those sites with investigation of the potential low-level dispersed contamination in soil across the IOA.

Table 2-1
Sites Located Within the Industrial Operations Area

Site Name	Program / Site ID	Activity	Site Status
Building 2 (Supply Warehouse Railroad Spur)	AOC 13	Two removal actions (2001 and 2004), total of 45 tons of PAH and hydrocarbon contaminated soil removed	ROD 2006
Drum Storage Area (Supply Warehouse Drum Storage)	AOC 14	N/A	Active
Water Tower — Lead Chips	AOC 15	Two removal actions (1999 and 2002), total of 380 tons of lead contaminated soil removed	ROD 2006
Hazardous Waste Storage Area	AOC 83	N/A	Active
Sewage Lift Station (Equalization Tank)	RIA 16	N/A	Closed 2003, NFADD
AIMD Building Shops (Building 117)	RIA 33	Removal action conducted at floor drain locations (2000 - 2001 timeframe)	Active
Courier Station (Drum Storage Area)	RIA 37	N/A	Closed 2003, NFADD
UST 44 (Building 140)	RIA 78B	N/A	Closed 2003, NFADD
Power House (Storage of coal and coal ash)	RIA 82	Removal action conducted in 2000 to the west of RIA 82 (see Building 8 MCP 3-13157)	Active
AIMD Building (Alleged waste oil disposal)	RIA 88	N/A	Closed 2004, NFADD
Courier Station (Septic System)	RIA 89	N/A	Closed 2002, NFADD
Fire House (Building 96)	RIA 106	N/A	Closed 2004, NFADD
Aviation Gas USTs (3 former AvGas USTs)	MCP Site 3-19064	Removal action of three USTs (2000), approximately 3,694 tons of petroleum-contaminated soil removed	Closed 2001, RAO (Class A2)
Building 8 (Steam Plant)	MCP Site 3-13157	Removal action of seven USTs (2000), approximately 810 tons of petroleum-contaminated soil removed	Closed 2000 with AUL, RAO (Class A2)
Building 14 (Fuel oil UST)	MCP Site 3-10316 & 3-15350	Removal action of one UST (1997), approximately 27 tons of petroleum-contaminated soil removed	Closed 1998, RAO (Class A2)

Table 2-1
Sites Located Within the Industrial Operations Area

Site Name	Program / Site ID	Activity	Site Status
Building 14 (Oil-Water Separator)	MCP Site 3-17527	Removal action of OWS, and associated piping and floor drains (1998), approximately 95 tons of petroleum-contaminated soil removed	Closed 2000 with AUL, RAO (Class A3)
Building 116 (Gas station)	MCP Site 3-14180 & 3-15516	Removal of one UST (1997), approximately 135 tons of petroleum-contaminated soil removed	Closed 1998, RAO (Class B1 & A1)

Notes:

AOC = Area of concern
AUL = Activity and use limitation
MCP = Massachusetts Contingency Plan
NFADD = No Further Action Decision Document
OWS = Oil water separator
PAH = Polycyclic aromatic hydrocarbon
RAO = Response action outcome
RIA = Review item area
ROD = Record of Decision
UST = Underground storage tank

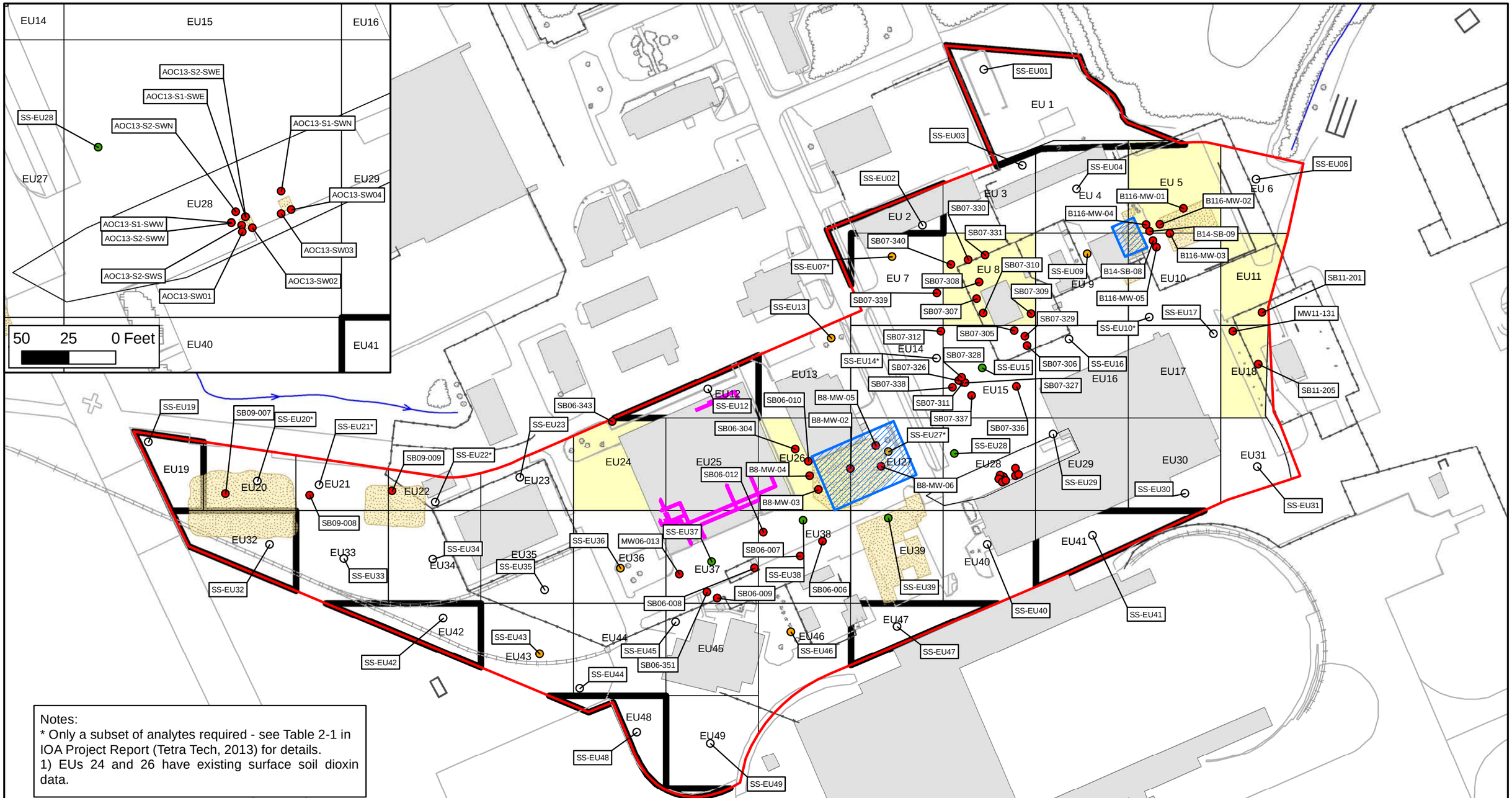
As part of the 23 June 2009, Data Quality Objective meeting for the newly-defined IOA site, which included representatives from Navy, U.S. EPA, MassDEP, and Tetra Tech NUS, Inc. (Tetra Tech), it was determined that to assist with developing a site-wide sampling plan to identify and address data gaps, a complete review of historical soil and groundwater analytical data from the 17 environmental sites within the IOA was necessary. The historical soil and groundwater quality analytical data were presented to the project team, and summarized in the 2010 IOA Technical Memorandum (Tetra Tech, 2010). The Technical Memorandum determined that there were data gaps in the existing surface and subsurface soil datasets, but that the existing groundwater data adequately documented the IOA groundwater conditions.

In 2011, the Navy conducted an additional field investigation within the IOA. For the 2011 investigation, an approved Sampling and Analysis Plan (SAP) was developed that focused on areas not previously sampled. The main objective of the SAP was to evaluate the potential presence or lack of contaminants associated with operations conducted in the IOA. The data gaps included incomplete target analyte lists for assessing potential low-level dispersed contamination in surface

soil, and assessing subsurface soil data at the former floor drain locations (RIA 33) and at the former underground storage tank (UST) area (RIA 82).

As outlined in the SAP, the 20-acre IOA was divided into 49 exposure units (EUs) with each EU comprised of approximately 0.5 acres (Figure 2-2). Although the likelihood of a release is minimal, given that building footprints would have precluded surface soil exposure during IOA operations, there are uncertainties (due to access limitations during field investigations) regarding the potential presence of COCs in soils underlying existing buildings. In the event that any impacts (attributable to the Navy) are identified by the future property owner, however, the Navy will address those impacts pursuant to Paragraph 26.3 of the South Weymouth FFA. Soil samples were not collected in 7 EUs. Six of the EUs not sampled already had complete historical surface soil data sets, were part of closed sites where removal actions were completed, or have Activity and Use Limitations (AUL) in place. Therefore, further sampling was not required in 2011. The seventh EU location was excluded because a portion of Building 117 comprises the entire EU (EU25) and no surface soil exposure was possible during industrial operations (no likelihood of release to the surface soil). Surface soil is defined as the 0 to 2 feet below ground surface (bgs) depth interval and target analyte groups included PAHs, PCBs and metals. Note that the IOA surface soil dataset does incorporate some historical data points collected across the 0 to 3 feet bgs interval; however, previous investigations suggest contaminants are generally located within the upper 2 foot interval. Surface soil samples were collected from the EUs where historical data were not available for one or more of the three analyte groups. The historical data were used along with 2011 surface soil data to complete the data set required for each EU. Surface soil samples were also collected for dioxin analysis at 12 EUs in the vicinity of the power plant (Building 8) based on potential atmospheric deposition of dioxins in those areas.

A separate, targeted approach was used for the subsurface investigation associated with RIA 33 and RIA 82 to determine whether contaminants remained after historical removal actions at the two RIAs. At RIA 33, soil samples were collected from below the base of the removal action and from select step-out locations along the floor drain system. For RIA 82, subsurface soil samples were collected on a 10-foot grid pattern around historical sample location SB06-011, a location with previously identified elevated contaminant concentrations. Field screening (PetroFLAG for total petroleum hydrocarbon) at both RIA 33 and RIA 82 was conducted to select samples for laboratory analysis and reporting. The subsurface soil samples (2 to 10 feet bgs interval) were analyzed for volatile organic compounds (VOCs), PAHs, and metals. The results of the 2011 field investigation are reported in detail in the 2013 IOA Project Report.



Notes:
* Only a subset of analytes required - see Table 2-1 in IOA Project Report (Tetra Tech, 2013) for details.
1) EUs 24 and 26 have existing surface soil dioxin data.

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Legend

- Existing IOA surface soil sample
- 2011 Samples collected for PAH/PCBs/metals and dioxin
- 2011 Samples collected for PAH/PCBs/metals
- 2011 Complete PAH/PCB/metals dataset. Samples collected for dioxin only.
- Approximate Excavation Area
- Industrial Area Boundary
- Approximate Excavation Area
- Complete PAH/PCB/metals dataset No additional sampling
- Combined areas to form EU
- Activity And Use Limitation Area
- Building Footprint - Excluded from Sampling

N

0 75 150
Scale in Feet

FIGURE 2-2
SURFACE SOIL EXPOSURE UNITS
INDUSTRIAL OPERATIONS AREA

FORMER NAVAL AIR STATION
SOUTH WEYMOUTH, MASSACHUSETTS

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As discussed in the 2013 IOA Project Report, to evaluate Site conditions, the IOA data were compared to U.S. EPA residential RSLs (U.S. EPA, 2014a) and Base background values (where appropriate). Several contaminants including PAHs, pesticides, PCBs, dioxin, and metals were present in surface soil above screening levels. Several contaminants including PAHs and metals were present in subsurface soil above screening levels.

The 2013 IOA Project Report included a HHRA that identified several COCs present at concentrations above risk-based clean-up goals in surface soil (defined as 0-2 feet below grade) and delineated the areal extent requiring remedial actions to address the surface soil contaminants. Areas identified requiring remedial action include AOC 14 and AOC 83. No remedial actions were deemed necessary at RIA 33 and RIA 82. In April 2015, a Focused Feasibility Study (FFS) (Tetra Tech, 2015) was completed, which evaluated multiple remedial options to address the site-wide surface soil contamination within the IOA. It should be noted that in the FFS, Tetra Tech incorporated new information regarding soil that was excavated during a 2002 soil removal effort that was not discussed in the 2013 IOA Project Report. As such, the areas identified with COCs above risk-based cleanup levels are different between the two reports. Specifically, EU39 was removed as an area with elevated COCs warranting action in the FFS, based on the post-excavation results from the 2002 soil removal activities.

A summary of the nature and extent of surface soil contamination at the IOA, including the four active environmental sites, is included in Section 2.5.2.

2.3 Community Participation

The Navy has performed public participation activities in accordance with CERCLA and the NCP throughout the CERCLA site cleanup process at the former NAS South Weymouth. The Navy released a Community Relations Plan in July 1998 to address community concerns and keep citizens informed about and involved in remediation activities. In September 1995, the Navy initiated a series of public meetings, at which the Restoration Advisory Board (RAB) process was explained, and community members were asked to join the RAB. A sufficient number of interested community members were assembled and RAB meetings began in March 1996. Since that time, RAB meetings have been held on a regular basis to keep the RAB and local community informed of IR Program activities. RAB meetings have included brief updates for the IOA and the four open environmental sites within the IOA, as activities have progressed.

The following locations have been designated as information repositories for NAS South Weymouth: the Tufts Library in Weymouth, Massachusetts; the Abington Public Library in Abington, Massachusetts; the Hingham Public Library in Hingham, Massachusetts; the Rockland

Memorial Library in Rockland, Massachusetts; and the U.S. Department of the Navy, Caretaker Site Office, South Weymouth, Massachusetts. All pertinent reports, fact sheets, and other documents associated with the Administrative Record for NAS South Weymouth, including the IOA, are available for public review at the above locations. Site documents and RAB meeting information are also available on the Department of the Navy BRAC Program Management Office website, www.bracpmo.navy.mil.

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from 22 June 2015 to 22 July 2015, for the proposed alternatives described in the Proposed Plan for the IOA. A public meeting to present the Proposed Plan was held on 7 July 2015, at the Southfield Redevelopment Authority (SRA) facility, Shea Memorial Drive, South Weymouth. The public meeting was followed by a public hearing to accept oral comments on the Proposed Plan. Public notice of the meeting/hearing and availability of documents was published in the Patriot Ledger and Weymouth News on 1 July 2015, and in the Rockland Mariner and Abington Standard on 3 July 2015. Comments received on the Proposed Plan are addressed in Section 3 of this ROD.

2.4 Scope and Role of Operable Units

The IOA site is being investigated as part of the Navy IR Program, a comprehensive environmental investigation and cleanup program being performed at former NAS South Weymouth under CERCLA authority and pursuant to the Federal Facility Agreement signed by the Navy and the U.S. EPA in April 2000. Eleven IR sites have been identified at former NAS South Weymouth. AOC 14 and AOC 83, located within the IOA, have been designated as Operable Unit (OU)23 and OU24, respectively.

Neither the IOA, nor the two active RIAs within the IOA, have been identified with a formal OU designation.

Investigations at the IOA indicated the presence of surface soil contamination that poses unacceptable human health risk to potential future receptors at the Site. The remedy documented in this ROD will achieve the RAOs for the IOA surface soils, which incorporates AOC 14 and AOC 83, as listed in Section 2.8. Implementation of this remedy will allow for future recreational, residential, commercial, and institutional uses of the Site that are consistent with the established zoning in place at the time this ROD is executed, and existing AULs, as well as the overall cleanup strategy for former NAS South Weymouth. Following the 2013 HHRA, no further action was deemed necessary to address residual soil contamination at RIA 33 and RIA 82.

The Site Management Plan (SMP) for former NAS South Weymouth provides further details on the status of the other IR sites, ROD issuance dates (as applicable), and schedule for post-ROD activities. The SMP is updated by the Navy on an annual basis.

As noted above, only four environmental sites are active within the IOA, with the other 13 environmental sites achieving regulatory closure through either the EBS/CERCLA program or the MCP program. Below is a summary of the four active environmental sites that are the focus of this ROD.

AOC 14 (OU23) Drum Storage Area

AOC 14 encompasses the area along two railroad spurs that brought supplies to the Base beginning in the 1940s (Figure 2-1). The site includes an area where drums had been stored along the railroad spurs. Potential staining visible on aerial photographs suggested that spills may have occurred along the spurs. Surface soil, subsurface soil, and groundwater samples were collected as part of the Phase II EBS in the area where materials were stored and possibly spilled.

In July 2002, a streamlined HHRA was conducted to evaluate the potential for risks to human health from exposures to chemicals at or originating from the site in accordance with CERCLA risk assessment guidance. Due to concerns about the adequacy of the site characterization, further actions were put on hold in 2007. In 2010, AOC 14 was included in the evaluation of existing environmental sites within the IOA boundary to identify data gaps and assist in scoping additional sampling activities. A supplemental field investigation was conducted in 2011 to address the data gaps identified in historic surface soil sampling data. Results of the 2011 field effort, presented in the 2013 IOA Project Report, revealed detections of PAHs, pesticides, chromium, and arsenic in surface soil at AOC 14 above risk-based cleanup goals. The Navy, U.S. EPA, and MassDEP agreed that a removal action should be performed to protect human health and the environment, facilitate property transfer, and allow for immediate site closure with unlimited use and unrestricted exposure for future property use.

AOC 83 (OU24) Hazardous Waste Storage Area

AOC 83 is the former Resource Conservation and Recovery Act 90-day hazardous waste accumulation area located on Shea Memorial Drive between Buildings Nos. 131 and 2 (Figure 2-1). The 90-day hazardous waste accumulation area consists of an approximately 2,400 square foot concrete pad that is covered by a supported roof (which overhangs the concrete pad by more than 2 feet) and a fire suppression system. This area is surrounded by a chain-link fence.

In October 2004, a streamlined HHRA was conducted to evaluate the potential for risks to human health from exposures to chemicals at or originating from the site in accordance with CERCLA risk assessment guidance. Due to concerns about the adequacy of the site characterization, further actions were put on hold in 2007. In 2010, AOC 83 was included in the evaluation of existing environmental sites within the IOA boundary to identify data gaps and assist

in scoping additional sampling activities. A supplemental field investigation was conducted in 2011 to address the data gaps identified in historic surface soil sampling data. Results of the 2011 field effort, presented in the 2013 IOA Project Report, revealed detections of the PCB Aroclor-1260 in surface soil above risk-based cleanup goals at AOC 83. The Navy, U.S. EPA, and MassDEP agreed that a removal action should be performed to protect human health and the environment, facilitate property transfer, and allow for immediate site closure with unlimited use and unrestricted exposure for future property use.

RIA 33 AIMD Building Shop (Building 117)

RIA 33 is associated with the floor drain system located within the former AIMD Building Shop (Figure 2-1). During the Phase I EBS, floor drains were identified in Building 117 and deemed a potential source for contaminants to enter the environment. In the 2000 — 2001 timeframe, the floor drain system and surrounding shallow soil were removed from Building 117. A subsequent investigation was conducted as part of the 2013 IOA Project Report to assess the potential for subsurface soil contamination. Results from the additional subsurface investigation activities at RIA 33, as summarized in the IOA Project Report, did not identify the presence of contaminants at levels warranting additional response actions.

RIA 82 Power House

RIA 82 is located adjacent to (west of) the former Power House, Building 8 (Figure 2-1), and is related to the identified presence of PAHs and metals in soil following removal of seven USTs in the late-1990s. The UST closeout was completed under the MCP program (RTN 3-13157). Due to the presence of the PAHs and metals identified in soil, an investigation was conducted as part of the 2013 IOA Project Report to assess the potential for subsurface soil contamination. Results from the additional investigation activities at RIA 82, as summarized in the IOA Project Report, did not identify the presence of contaminants at levels warranting additional response actions.

2.5 Site Characteristics

The conceptual site model identifies potential contaminant sources, contaminant release mechanisms, transport routes, and potential receptors under current and future land use scenarios. The establishment of the IOA boundary in 2009 provided for the continued evaluation of the four remaining active sites, as well as a site-wide assessment of low-level dispersed contamination in the 20-acre IOA. Although there are 13 other environmental sites identified within the IOA, those locations have been previously addressed (see Table 2-1) and are not considered to be ongoing sources of contamination within the IOA. Although the likelihood of a release is minimal, given that building footprints would have precluded surface soil exposure during IOA operations, there are uncertainties (due to access limitations during field investigations) regarding the potential presence of COCs in soils underlying existing buildings. In the event that any impacts (attributable to the

Navy) are identified by the future property owner, however, the Navy will address those impacts pursuant to Paragraph 26.3 of the South Weymouth FFA.

Based on the diverse land use within the IOA, multiple contaminant sources have resulted in the identification of PAHs, metals, dioxin, pesticides, and PCBs at elevated levels in surface soil across the IOA. Release mechanisms include:

- Industrial operations occurring within the IOA, including, but not limited to: storage of industrial materials, equipment and coal for the power plant, movement of materials by truck and railroad spur, and power plant operations.

The previous investigations completed within the IOA and summarized in the 2013 IOA Project Report indicate that contaminants released to the environment appear limited in vertical extent to surface soil and have not migrated to groundwater. A total of 10 areas have been identified within the IOA where contaminant concentrations in surface soil exceeding risk-based clean-up goals require action. Human health receptors evaluated as part of the 2013 IOA Project Report and the actual risks to those receptors are discussed in Section 2.7.1.

2.5.1 Physical Characteristics

Borings at the Site have generally encountered fine to medium sand and gravel, which is likely to be fill within the first few feet of the surface. According to the Basewide study (Tetra Tech, 2000); near-surface soils are part of the Hollis-Charlton-Essex-Muck association. These materials consist of soil that formed from glacial till and partially from the underlying bedrock. Bedrock beneath the Site is Dedham Granite, which is a Proterozoic-age igneous intrusive rock. The rock is described as a light grayish-pink to greenish-gray and has been metamorphosed to varying degrees. Bedrock core samples have been collected during a number of investigations and indicate that bedrock characteristics are relatively consistent throughout the Base. Depth to bedrock at the IOA is approximately 30 feet bgs.

The Basewide groundwater flow assessment, which includes wells within the IOA boundary, indicates that the groundwater table is generally flat and ranges from approximately 8 to 10 feet bgs. The overall groundwater flow direction at the Site is generally toward the west-southwest. The western portion of the IOA contains an area mapped as a medium-yield potentially productive aquifer (Tetra Tech, 2000).

Surface water runoff at the IOA follows the site topography and empties into the Basewide storm drainage system, flowing toward the Tactical Air Navigation outfall drainage system, and ultimately

discharges into French Stream. French Stream is located within the Southeastern Massachusetts Coastal Drainage Basin. There are no surface water bodies at or near the IOA.

2.5.2 Nature and Extent of Contamination

The primary contaminants present at the IOA Site are PAHs, PCBs, pesticides, dioxins, and metals. The full IOA data set of analytical results was compared to the U.S. EPA RSLs (U.S. EPA, 2014a). The historical extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) results were compared to the MCP Method 1 S-1/GW-1 values (MassDEP, 2007). Analytical results that exceeded the RSLs were then compared to Base background values, where applicable (Stone & Webster, 2002). The following section provides a summary of the surface soil, subsurface soil, and groundwater data evaluation for the IOA as presented in the 2013 IOA Project Report. Soil EUs and sampling locations are shown on Figure 2-2.

Surface Soil

In 2011, a surface soil sample (0 to 2 feet bgs) was collected from any EU where historical data were not available for one or more of the four target analyte groups (PAHs, PCBs, metals, and dioxins) within the EU to complete the IOA data set. The following is a summary of distribution by contaminant type.

PAHs

The PAHs in the IOA surface soil data set that exceeded applicable screening criteria were: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. PAHs were present at concentrations exceeding applicable RSLs at 20 EUs. The highest PAH concentrations were located at EU28, EU29, EU38, and EU40, which are in the south central portion of the IOA. Note, the highest concentrations of PAHs were from historical samples SB06-001 and SB06-002, associated with AOC 13 (EU28). These two surface soil sample locations were excavated in 2001 and results from post-excavation confirmatory sampling conducted in 2001 and again in 2004 suggested no exceedances around the area of former SB06-001 and SB06-002. However, despite the results of confirmation samples, there is varying representation of the SB06-001 and SB06-002 locations depicted in past reports and so there is uncertainty as to whether or not they have been fully excavated. The Navy recognizes the uncertainty and has determined that additional delineation within EU28 is appropriate as part of the remedy.

Pesticides

Heptachlor epoxide was the only pesticide with reported concentrations in surface soil that exceeded the applicable RSL. Exceedances were detected in the historical samples SB06-001 and SB06-002, located at AOC 13 (EU28). As noted above, samples SB06-001 and SB06-002 were included in the IOA evaluation even though historical reports suggest these sample locations were excavated during previous removal actions. The Navy recognizes the uncertainty surrounding excavation of the SB06-001 and SB06-002 locations and has determined that additional delineation within EU28 is appropriate as part of the remedy.

PCBs

Aroclor-1260 was the only PCB detected in surface soil. It exceeded its RSL in 18 of 66 samples. The PCB RSL exceedances occurred primarily at nine EUs located along the northeast portion of the IOA, with the highest Aroclor-1260 concentrations at EU8, EU10, EU15, and EU17. There was also one exceedance identified at EU43, located in the southwest portion of the IOA.

Metals

Concentrations of nine metals (aluminum, arsenic, chromium, cobalt, iron, lead, manganese, thallium, and vanadium) exceeded either the RSL or Base background screening criteria. In addition, calcium and magnesium concentrations exceeded Base background values in many samples; however, there are no U.S. EPA RSLs for these metals. Calcium and magnesium are essential nutrients that are naturally occurring in environmental matrices and are only considered toxic at high doses. The maximum concentration of chromium was associated with EU28 (SB06-002) but as noted above, there is uncertainty about the location of this sample and whether or not it was excavated. The maximum concentrations of arsenic and iron were associated with EU49. EU28 and EU49 are located in the south central portion of the Site. The remaining maximum concentrations of metals were spread out: aluminum (EU30), cobalt (EU08), manganese (EU31), and thallium (EU09) located in the northeastern or eastern portion of the IOA, and vanadium (EU39) located in the south central portion of the Site.

According to the 2013 IOA Project Report, the maximum lead concentrations were detected in EU39 and exceeded the lead RSL. However, according to the *Final Closeout Report for RIA 15 Water Tower — Addendum to Time Critical Removal Action Memorandum*, the two surface soil sample locations (SB06-005 and SS06-020) in EU39 where lead concentrations exceeded RSL were excavated as part of the March 2002 RIA 15 removal action (Foster Wheeler, 2002a). There are no remaining surface soil sample locations from any EU with measured lead concentrations exceeding the lead RSL.

Dioxins

The only individual dioxin concentration that exceeded its associated RSL was 2,3,4,7,8-pentachlorodibenzofuran (PECDF) in a sample from EU09. One dioxin group, heptachlorodibenzo-p-dioxins (HPCDD), had reported concentrations exceeding RSL at EU13, EU15, EU37, and EU43. As each dioxin compound has a different level of toxicity, Toxic Equivalents (TEQ), or weighted dioxin values, were calculated for the dioxin data set. The TEQ, and the TEQ calculated using non-detects at half the detection limit, exceeded the associated RSLs at EU09, EU13, EU26, EU37, EU39, and EU43.

EPH / VPH

EPH and VPH were detected in the historical surface soil data set, but there were no exceedances of the screening criteria in any of the historical samples. Therefore, the 2011 surface soil samples were not analyzed for EPH or VPH. It is recognized that petroleum, either defined as a separate contaminant or group of contaminants, is not addressed under CERCLA unless detected with CERCLA-regulated contaminants. However these data are included in this document for the benefit of the Commonwealth of Massachusetts, and other partners in the remedy.

Subsurface Soil

In 2011, subsurface soil samples (2-10 feet bgs) were collected at RIA 33 and RIA 82 to determine whether contaminants remained after removal actions were completed at these two RIAs. Based on historical soil data previously collected from these locations, subsurface soil samples collected from RIA 33 were analyzed for VOCs, PAHs, and metals, while subsurface soil samples collected from RIA 82 were analyzed for PAHs and metals. The following is a summary of distribution by contaminant type.

RIA 33

Volatile Organic Compounds

Three VOCs were detected in subsurface samples; however, none of the reported concentrations exceeded applicable screening criteria.

PAHs

Reported concentrations of either benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, or indeno(1,2,3-cd)pyrene exceeded applicable RSL at four of the five sample locations. Benzo(a)pyrene and dibenzo(a,h)anthracene were not identified at a concentration above the limit of detection (LOD) in soil sample SB08-0305; however, it was noted in the data usability assessment that the LOD for these two PAHs exceeded the screening criteria. Therefore, these two compounds may be present at levels above the RSL at this location.

Metals

Concentrations of aluminum, arsenic, chromium, cobalt, iron, manganese, or thallium exceeded their associated screening criteria at one or more sample locations. Arsenic, chromium, cobalt, and iron concentrations exceeded applicable RSL at all five sample locations. Manganese concentrations exceeded RSL at three of the five locations. Aluminum and thallium concentrations exceeded the screening criteria at only one location.

RIA 82

PAHs

PAHs were not detected in soil samples collected from RIA 82. However, it was noted in the data usability assessment that the LODs for benzo(a)pyrene and dibenzo(a,h)anthracene were greater than the screening criteria; therefore, these two PAHs may be present above the RSL at RIA 82.

Metals

Up to 18 metals were detected in one or more subsurface soil samples collected from RIA 82. Reported concentrations of arsenic, chromium, cobalt, or iron exceeded the associated RSL at each of the four sample locations; however, none of the concentrations exceeded Base background values.

Groundwater

As part of assessing the historical IOA data set, the 2010 Technical Memorandum determined that the existing groundwater data adequately documented the IOA groundwater conditions and no additional groundwater data collection was required. During a 22 September 2010 BRAC Cleanup Team (BCT) Meeting, it was agreed that if a review of existing groundwater data showed no exceedances to the MCP GW-2 standards, then no additional groundwater investigation would be necessary for the IOA site (Tetra Tech, 2010b). A review of the existing IOA groundwater data was completed and included in the 2010 Technical Memorandum (Tetra Tech, 2010a). The IOA groundwater data review showed that concentrations did not exceed the MCP GW-2 standards. The 2010 Technical Memorandum concluded that the vapor intrusion pathway was not a concern at the IOA and, therefore, groundwater was not a medium of concern.

The IOA does not contain any surface water bodies; therefore, sediment and surface water were not included as media of concern (Tetra Tech, 2010a).

2.6 Current and Potential Future Site and Resource Uses

Former NAS South Weymouth was designated for closure under the BRAC Act of 1990, and as part of the BRAC Commission's 1995 Base Closure List (BRAC IV). Operational closure of the former NAS South Weymouth began in September 1996 with the transfer of aircraft to other Navy facilities,

and through personnel reductions. Former NAS South Weymouth was administratively closed under BRAC on 30 September 1997.

Currently, the IOA Site is vacant and remains part of the former NAS South Weymouth property owned by the Navy. The Navy plans to transfer the property as part of the redevelopment of the Base once the environmental cleanup is implemented and the property is determined to be suitable for transfer.

The Zoning and Land Use By-Laws have established four zoning districts within the IOA:

- Main Street Overlay District
- Village Center District (VCD)
- Mixed-Use Village District (MUVD)
- Recreation District (RecD)

Zoning districts are presented on Figure 2-1. Based on the findings of the HHRA presented in the 2013 IOA Project Report, soil contamination above acceptable risk-based levels is present in each of the established zoning districts within the IOA, with the exception of the Main Street Overlay District. The VCD and MUVD allow for mixed use areas, with a range of future uses that can include any of the following: residential development, office, commercial, and institutional uses. The RecD allows for a range of future uses that can include indoor and outdoor commercial recreation, athletic fields, health and fitness clubs, some institutional uses under a special permit only, and passive recreation such as walking trails.

A medium-yield potentially productive aquifer area is mapped along the western portion of the IOA. The local redevelopment authority, as well as the master developer, have indicated that groundwater production, supply, and irrigation needs for redevelopment can be provided by sources other than the groundwater associated with the IOA Site.

As part of initial Data Quality Objective meetings held in support of developing the framework for the Sampling and Analysis Plan associated with the 2011 field activities, the Base Cleanup Team (BCT) agreed that groundwater was no longer a media of concern based on the existing data and data from sites properly closed under the MCP program. Additionally, the groundwater data was screened against MCP GW-2 standards to evaluate the potential for vapor intrusion in future buildings. The results of the screening assessment concluded that the residual contaminants in groundwater did not pose a potential vapor intrusion concern at the IOA.

2.7 Summary of Site Risks

This section of the ROD focuses on the conclusions of the human health evaluation conducted for the Site and COCs identified as posing potential risk. The summary of the assessment focuses on those exposure pathways and scenarios that drive the need for remedial action at the Site.

As addressed in Section 2.7.2, an ecological risk assessment was not conducted because there was no complete exposure pathway to ecological receptors.

2.7.1 Summary of Human Health Risks

The risk assessment estimates what risks the Site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the streamlined HHRA for this site.

The streamlined HHRA was performed using historical soil data from each of the 17 environmental sites previously investigated within the IOA, as well as site-wide soil data collected during the 2011 field event. This section summarizes the human health COCs, exposure assessment, toxicity assessment, and risk characterization for those COCs. Supporting tables are presented in Appendix B.

Identification of Contaminants of Concern

The streamlined HHRA evaluated potential risk from both surface and subsurface soil to hypothetical future residents and hypothetical future commercial receptors as described in the *Final Streamlined HHRA Work Plan for Areas of Concern at NAS South Weymouth* (EA Engineering, Science, and Technology [EA], 2001). The assessment was "streamlined" in the sense that it focused on two receptors of concern only, the hypothetical future resident and the hypothetical future commercial receptor. The HHRA identified COCs based on exposures to hypothetical future residents, which is the most conservative of the risk scenarios and is protective of all possible future land uses at the IOA. The streamlined HHRA is reported in detail in the IOA Project Report (Tetra Tech, 2013).

As described in Section 2.1, the IOA is an approximately 20-acre area located in the central part of former NAS South Weymouth. A variety of environmental investigations have been conducted across the Site related to former industrial operations. The IOA evaluation is focused on evaluating residual risk to human health from potential low-level dispersed contamination in surface soil across the IOA including four active environmental sites located within the IOA boundary. Although surface soil is defined as 0 to 2 feet bgs, the IOA surface soil data set includes samples collected from 0 to 3 feet bgs. Therefore, the HHRA for surface soil data includes samples across

the 0 to 3 feet bgs interval. Surface soil data (0 to 3 feet bgs) were evaluated in two data groupings: 1) high concentrations area EUs (EU28, EU29, EU38, EU39 and EU40) and 2) low concentrations area EUs (remaining EUs). The high concentration EUs were identified as such based on location-specific cancer risks greater than $1x10^{-4}$ (Tetra Tech, 2013). Subsurface soil data (3 to 8 feet bgs) were evaluated as a single data group. Risk estimates were also calculated on a location-by-location basis for the hypothetical future resident to allow for a more refined understanding of risk across the IOA.

As indicated in Section 2.5.2, a review of groundwater data at the site showed no exceedances of the MCP GW-2 standards. The 2010 Technical Memorandum reporting these results (Tetra Tech, 2010a) concluded that the vapor intrusion pathway was not a concern at the IOA; therefore groundwater is not a medium of concern and is not addressed in the risk evaluation. No sediment or surface water are present in the IOA; thus these media are also absent from the risk evaluation.

The media, receptors, and exposure routes evaluated in the HHRA are presented in Table 2-2. In addition to the pathways shown, soil data were compared to U.S. EPA risk-based soil screening levels (SSLs) for the protection of groundwater (U.S. EPA, 2012b). Chemicals that exceeded groundwater protection SSLs were identified as Contaminants of Potential Concern (COPCs), but were not carried in to the quantitative risk evaluation. Rather, these data were used to provide a qualitative evaluation of the potential for chemical migration from soil to groundwater. Groundwater data were evaluated as part of the refinement of the soil-to-groundwater exposure pathway.

The quantitative risk evaluation resulted in the identification of COCs that are the basis for the need for action at the site. These COCs are identified in Table 2-3 based on media (soil groupings), and on Table 2-4 on a location-by-location basis.

It is noted that chromium risks are likely overestimated because it was assumed that chromium was present in the hexavalent state (i.e., toxicity criteria for hexavalent chromium were conservatively used in the assessment). Aroclor-1260 was selected as a COC in the location-by-location evaluation for the child resident using non-cancer toxicity criteria for Aroclor-1254. Additionally, naphthalene in surface soil (in several EUs) and subsurface soil (in RIA 33) were identified as COCs based on the migration to groundwater analysis.

Table 2-5 presents the exposure point concentrations (EPCs) for each of the COCs in surface soil of the high concentrations area. EPCs are only provided for the high concentrations area because no COCs were identified for the low concentrations surface soil area or for subsurface soil.

TABLE 2-2
SELECTION OF EXPOSURE PATHWAYS
INDUSTRIAL OPERATIONS AREA
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Surface Soil	Surface Soil	IOA	Commercial Receptors	Child	Ingestion	Quant	Commerical receptors may be exposed to COPCs in surface soil while at the Site.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
				Residential Receptors	Child	Ingestion	Quant	A future residential scenario is considered to be protective of all potential future receptors at the Site.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
		Air	IOA	Commercial Receptors	Child	Inhalation	Quant	Commerical receptors may be exposed to fugitive dust and volatile emissions from surface soil while at the Site.
							Quant	
					Adult	Inhalation	Quant	
							Quant	
				Residential Receptors	Child	Inhalation	Quant	A future residential scenario is considered to be protective of all potential future receptors at the Site.
							Quant	
					Adult	Inhalation	Quant	
							Quant	
	Subsurface Soil	Subsurface Soil	IOA	Commercial Receptors	Child	Ingestion	Quant	Although exposure to subsurface soil by commercial receptors is considered unlikely at the Site, this scenario is included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
				Residential Receptors	Child	Inhalation	Quant	A future residential scenario is considered to be protective of all potential future receptors at the Site.
							Quant	
					Adult	Inhalation	Quant	
							Quant	
		Air	IOA	Commercial Receptors	Child	Inhalation	Quant	Although exposure to subsurface soil by commercial receptors is considered unlikely at the site, this scenario is included to aid in future risk management decisions.
							Quant	
					Adult	Inhalation	Quant	
							Quant	
				Residential Receptors	Child	Inhalation	Quant	A future residential scenario is considered to be protective of all potential future receptors at the Site.
							Quant	
					Adult	Inhalation	Quant	
							Quant	

Notes:
COPC = Chemical of Potential Concern.
Quant = Quantitative.

Table 2-3 Data Groupings Evaluation		
Medium / Data Grouping	**Receptor**	**COCs**
Surface soil – high concentrations area	Child resident Lifelong resident	BAP equivalents(1)(2), heptachlor epoxide(1)(2), 2,3,7,8-TCDD equivalents(2), arsenic(1)(2), chromium(1)(2)
Surface soil – high concentrations area	-	-
Subsurface Soil	-	-

Notes:

COCs = Chemicals of concern

(1) = Selected as a COC based on child resident cancer risk.

(2) = Selected as a COC based on lifelong resident cancer risk.

Table 2-4 Location-by-Location Evaluation		
Medium / Location	**Receptor**	**COCs**
Surface soil — EU 8	Child resident	Aroclor-1260(1)
Surface soil — EU 10	Child resident	Aroclor-1260(1)
Surface soil — EU 15	Child resident	Aroclor-1260(1)
Surface soil — EU 17	Child resident	Aroclor-1260(1)
Surface soil — EU 28	Lifelong resident	cPAHs(2), heptachlor epoxide(2),arsenic(2), chromium(2)
Surface soil — EU 29	Lifelong resident	cPAHs(2), arsenic(2), chromium(2)
Surface soil — EU 38	Lifelong resident	cPAHs(2), arsenic(2), chromium(2)
Surface soil — EU 40	Lifelong resident	cPAHs(2), arsenic(2), chromium(2)
Surface soil — EU 49	Child resident	Arsenic(1)

Notes:

COCs = Chemicals of concern

EU = Exposure unit

(1) = Selected as a COC based on child resident cancer risk.

(2) = Selected as a COC based on lifelong resident cancer risk.

TABLE 2-5 RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Current/Future
Medium: Surface Soil - Higher Concentrations EUs
Exposure Medium: Surface Soil - Higher Concentrations EUs

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
IOA	Benzo(a)pyrene Equivalents	mg/kg	2.1	3.8 (G)	15.6 J	3.8	mg/kg	95% KM (BCA) UCL	ProUCL 4.1.01
	Aroclor-1260	mg/kg	NA[1]	NA[1]	0.063	0.063	mg/kg	Maximum Detected Concentration	(1)
	Heptachlor Epoxide	mg/kg	0.047	0.16 (G)	0.20 J	0.160	mg/kg	95% KM (Chebyshev) UCL	ProUCL 4.1.01
	2,3,7,8-TCDD Equivalents	mg/kg	NA[2]	NA[2]	0.0000092 J	0.0000092	mg/kg	Maximum Detected Concentration	(2)
	Aluminum	mg/kg	6800	8000 (N)	10000	8000	mg/kg	95% Student's-t UCL	ProUCL 4.1.01
	Arsenic	mg/kg	5.3	7.1 (N)	10.4	7.1	mg/kg	95% Student's-t UCL	ProUCL 4.1.01
	Chromium VI	mg/kg	27.3	93.8 (NP)	149	93.8	mg/kg	95% Chebyshev (Mean, Sd) UCL	ProUCL 4.1.01
	Cobalt	mg/kg	3.6	4.2 (N)	5.9	4.2	mg/kg	95% Student's-t UCL	ProUCL 4.1.01
	Iron	mg/kg	13000	15000 (N)	21000	15000	mg/kg	95% Student's-t UCL	ProUCL 4.1.01
	Lead	mg/kg	240	600 (G)	1280	240	mg/kg	Arithmetic Mean Concentration	ProUCL 4.1.01
	Manganese	mg/kg	180	220 (N)	294	220	mg/kg	95% Student's-t UCL	ProUCL 4.1.01

1 - There are less than four detected concentrations. Reliable statistics cannot be computed. The maximum concentration was used as the EPC.
2 - There are less than five samples. Reliable statistics cannot be computed. The Maximum concentration was used as the EPC.
3 - The mean concentration is used as the exposure point concentration for lead.

EU = Exposure unit
G = Gamma
IOA = Industrial Operations Area
mg/kg = milligram per kilogram
N = Normal
NA = Not applicable.
NP = Non-parametric
UCL = Upper confidence limit

Exposure Assessment

During the exposure assessment, potential current and future exposure pathways through which humans might come into contact with the COCs were evaluated. Potential exposure routes for soil include inadvertent ingestion (swallowing small amounts of soil), dermal contact (skin exposure), and inhalation (breathing) of airborne soil particulates. The HHRA considered receptor exposure under current and future residential and commercial land use, as presented in Table 2-2 (above). Exposure parameters are summarized in Appendix B, Table B-1.

Toxicity Assessment

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

Tables B-2 and B-3 in Appendix B show non-carcinogenic risk information relevant to the COCs for oral and dermal exposure and for inhalation exposure, respectively. Appendix B, Tables B-4 and B-5 provide carcinogenic hazard information relevant to the COCs for oral and dermal exposure and inhalation exposure, respectively.

Risk Characterization

During the risk characterization process, 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 the reasonable maximum exposure (RME) scenario, which assumes the maximum level (worst-case scenario) of human exposure that could reasonably be expected to occur. The HHRA presents equations (Appendix B, Tables B-6 through B-13) and discusses in detail the methods used to calculate the site risks. RME cancer risk estimates and hazard indices for the significant receptors and routes of exposure across all media are shown in Table 2-6.

Table 2-6

SUMMARY OF HAZARD INDICES AND CANCER RISKS

Exposure Scenario			Results	
			Hazard Index	Cancer Risk
Commercial Receptors	Child	Surface soil – high concentrations area	0.4	1E-04
		Surface soil – low concentrations area	0.6	1E-05
		Subsurface soil	0.1	1E-05
	Adult	Surface soil – high concentrations area	0.05	2E-05
		Surface soil – low concentrations area	0.07	3E-06
		Subsurface soil	0.01	2E-06
	Lifelong	Surface soil – high concentrations area	NA	1E-04
		Surface soil – low concentrations area	NA	2E-05
		Subsurface soil	NA	1E-05
Residents	Child	Surface soil – high concentrations area	2[1]	5E-04
		Surface soil – low concentrations area	3[1]	6E-05
		Subsurface soil	0.6	4E-05
	Adult	Surface soil – high concentrations area	0.2	8E-05
		Surface soil – low concentrations area	0.3	1E-05
		Subsurface soil	0.06	8E-06
	Lifelong	Surface soil – high concentrations area	NA	6E-04
		Surface soil – low concentrations area	NA	7E-05
		Subsurface soil	NA	5E-05

Notes:
NA - not applicable.
[1] The target organ-specific HIs do not exceed 1.

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 unit less probability (e.g., 2×10^{-5}) of an individual developing cancer

CDI = chronic daily intake averaged over 70 years, milligram per kilogram (mg/kg)-day

SF = slope factor $(\text{mg/kg-day})^{-1}$

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 reasonable maximum exposure estimate has an "excess lifetime cancer risk" 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. U.S. EPA's generally acceptable risk range for site-related exposures is 1×10^{-4} (one in ten thousand) to 1×10^{-6} (one in one million).

Table 2-6 provides RME cancer risk estimates 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 about the toxicity of the COCs. Appendix B, Tables B-14 through B-17, provide details of the risk calculations. Total cancer risk estimates were 1×10^{-4} for child and lifelong commercial receptors, 5×10^{-4} for child residents and 6×10^{-4} for lifelong residents in surface soil high concentrations area. Lifetime cancer risk is the summation of risk from child and adult exposures. 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 be approximately 1 in 10,000 for commercial adult and lifetime receptors, 5 in 10,000 for child residents, and 6 in 10,000 for lifetime residents. Lifetime cancer risk was within U.S. EPA's target cancer risk range for the surface soil low concentrations area and for subsurface soils.

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 to toxicity 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, mg/kg-day

RfD = reference dose, 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).

Table 2-6, above, provides total HIs for all routes of exposure based on the RME. Appendix B, Tables B-18 through B-23, provide details of the risk calculations. Total HIs for the child and adult commercial receptors were less than 1. Total HIs for the child residents for the high concentrations area and low concentrations area were 2 and 3, respectively. However, the target organ-specific HIs for these exposure scenarios did not exceed 1. Appendix B, Table B-21 shows target organ-specific HIs for the child resident exposed to high concentrations area and low concentrations area surface soil, respectively.

In summary, under the RME scenario, unacceptable cancer hazards were identified for hypothetical commercial receptors (child and lifelong) and hypothetical future residents (child and lifelong). No unacceptable non-cancer hazards were identified for commercial or residential receptors. The COCs that contribute most significantly to cancer-causing human health risks include carcinogenic PAHs (cPAHs) and chromium (which was evaluated using hexavalent chromium criteria). Heptachlor epoxide, 2,3,7,8-TCDD equivalents (dioxin), and arsenic were also identified as COCs. Major sources of uncertainty, other than those typically associated with risk assessment estimates, include likely overestimation of chromium risk because it was assumed that chromium was present in the hexavalent state. Additionally, the Aroclor-1260 evaluation was based on toxicity criteria for Aroclor-1254.

Location-by-Location Risk Evaluation

As indicated above, in addition to the risk evaluations conducted for low concentrations area surface soil, high concentrations area surface soil, and subsurface soil, a location-by-location evaluation was conducted for the hypothetical future resident to allow for a more refined understanding of risk across the IOA.

The HHRA determined that non-cancer HIs, estimated as part of the location-by-location evaluation for residents, exceeded 1 for sample locations within EU8, EU10, EU15, EU17, EU39, EU43, and EU49. The HI exceedances for EU8, EU10, and EU15 are due to Aroclor-1260 (calculated using non-cancer toxicity criteria for Aroclor-1254). Aroclor-1260 is the only chemical contributing to the HIs in EU8, EU10, and EU15. The target organ HIs (immune system) for each of these sample locations also exceeds 1, and Aroclor-1260 is a primary risk driver for each of these EUs. The detected concentrations of Aroclor-1260 reported for these locations were greater than 1 mg/kg, which is the federal Toxic Substances Control Act soil cleanup level for high occupancy areas (U.S. EPA, 2005). In EU17, EU39, EU43, and EU49, multiple chemicals contribute to the HI exceedances, including Aroclor-1260, dioxins, pesticides, and metals. However, only Aroclor-1260 and arsenic were identified as a primary risk driver in EU17 and EU49, respectively.

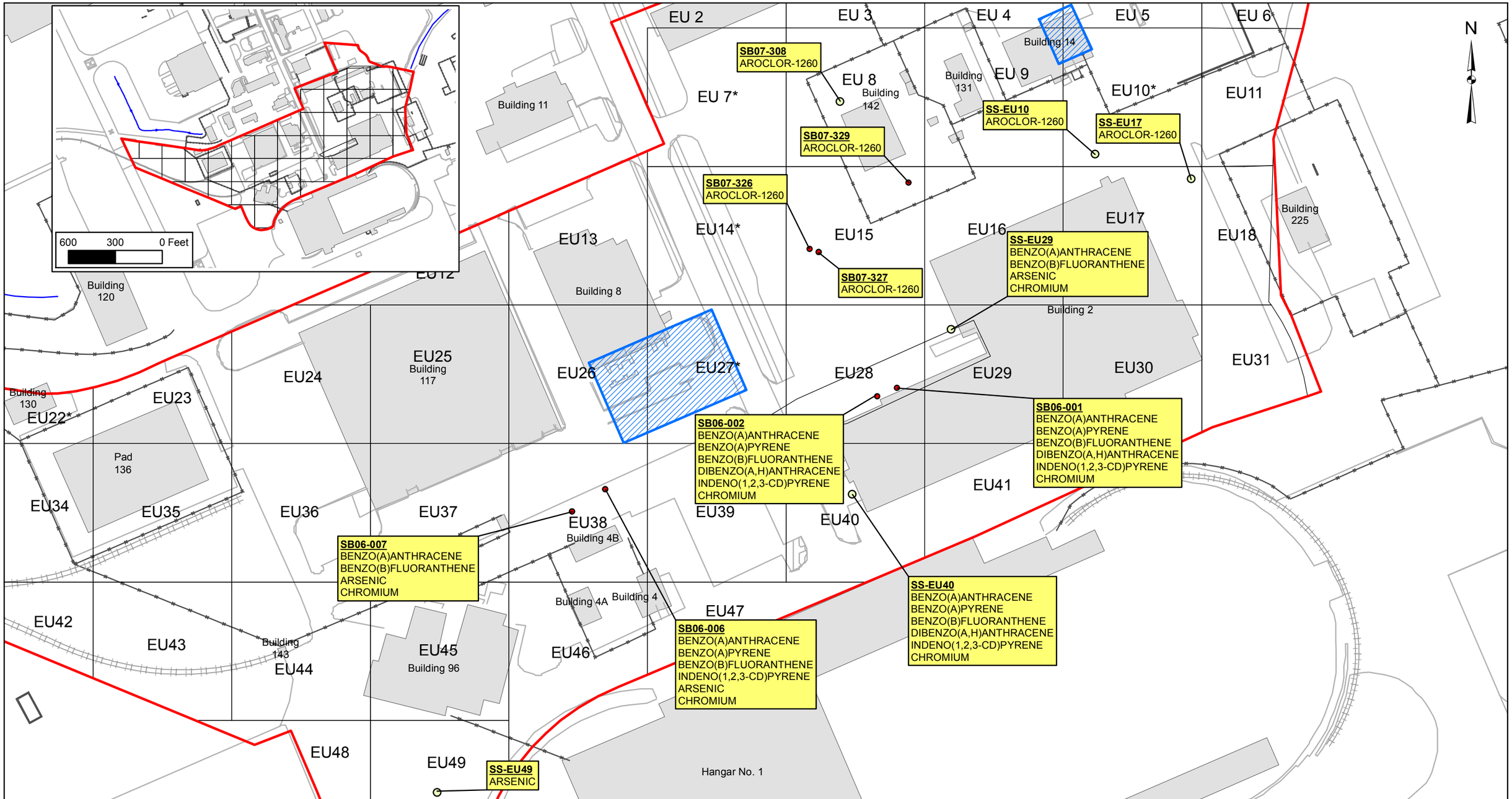
The HHRA also concluded that cancer risk, estimated as part of the location-by-location evaluation, exceeded 1×10^{-4} for sample locations in EU28, EU29, EU38, EU39, and EU40. The exceedances are primarily due to PAHs. At EU28, heptachlor epoxide, arsenic, and chromium are also risk contributors. Arsenic and chromium are also risk drivers at EU29, EU38, EU39, and EU40.

An evaluation of lead risks, based on location-by-location estimates, was also conducted. Lead was identified in EU39 as a primary risk driver and COC for EU39. However, according to the *Final Closeout Report for RIA 15 Water Tower – Addendum to Time Critical Removal Action Memorandum*, the two surface soil sample locations (SB06-005 and SS06-020) in EU39 contributing to lead risk were excavated in the March 2002 RIA 15 removal action (Foster Wheeler, 2002a). Therefore, there are no remaining surface soil sample locations with measured lead concentrations exceeding the residential soil screening level of 400 mg/kg. Lead concentrations do not exceed the screening level in any other samples or EUs and; therefore, lead has been removed from the list of COCs for the IOA Site.

Although the combined risk from multiple compounds at EU43 resulted in a non-cancer HI greater than 1, the HHRA concluded that on a chemical by chemical basis the target organ-specific HIs calculated for EU43 do not exceed 1; therefore, no primary risk drivers are identified for EU43. Based on the findings from the HHRA, EU43 was subsequently removed from the areas identified for corrective action.

Summary

The results of the IOA data evaluation and streamlined HHRA indicate that the surface soil was likely impacted by industrial operations, mainly in the center portion of the Site (EU28, EU29, EU38, EU39, EU40, EU43, and EU49) where concentrations of PAHs, arsenic, chromium, and lead exceed the risk-based screening criteria and the northeastern portion of the Site (EU8, EU10, EU15, and EU17) where concentrations of Aroclor-1260 exceed the screening criteria. As discussed above, lead impacts at EU39 were excavated to below SSLs during the March 2002 RIA 15 removal action, and EU43 was excluded based on findings from the HHRA that did not identify a primary risk driver. Remaining COC exceedances of the risk-based screening criteria in EUs where risk is identified are shown on Figure 2-3.



RESOLUTION CONSULTANTS

Drawn:	JB	09/09/2015
Approved:	MS	09/09/2015
Project #:	60274866	

Legend

- Industrial Operations Area Boundary
- Activity And Use Limitation Area Boundary
- Historical IOA Surface Soil Sample (Exceedance)
- 2011 Surface Soil Sample (Exceedance)
- Building Footprint

Notes:
1) Yellow highlighted tags represent COC exceedances of PRG and background values in EUs with identified risk.
2) EU size is based on a half-acre grid.
3) Historical information suggests SB06-001 and SB06-002 locations are uncertain.

N

0 500 1,000
Scale in Feet

FIGURE 2-3
EUs WITH COCs
WARRANTING REMEDIATION
INDUSTRIAL OPERATIONS AREA

FORMER NAVAL AIR STATION
SOUTH WEYMOUTH, MASSACHUSETTS

Path: P:\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\South Weymouth\GIS\Projects\IOA\ROD\MXD\Fig_2_3_EUs_with_COCs_Warrant_Remed.mxd

Concentrations in site-wide soil were observed to decrease with depth bgs (Tetra Tech, 2010b). Additionally, risk to human health from subsurface soil at RIA 33 and RIA 82 was not found to exceed the U.S. EPA target risk range (Tetra Tech, 2013) and, therefore; subsurface soils were determined not to be a medium of concern.

Groundwater was determined not to be a medium of concern. Surface water and sediment are not present within the IOA and, therefore, not media of concern.

The results of the 2011 field investigation, data evaluation, and HHRA were discussed at a BCT meeting on 14 February 2013. The Navy, U.S. EPA, and MassDEP agreed at that time that the results of the 2011 field investigation, data evaluation, and HHRA provided sufficient evidence to justify a remedial action for surface soil under CERCLA.

2.7.2 Summary of Ecological Risks

As documented in the IOA Project Report (Tetra Tech, 2013), an ecological risk assessment was not required since the IOA is largely paved and located in the central industrial portion of the Base. The western portion of the site is listed as a Priority Habitat of Rare Species; however, there is no exposure pathway for Site contaminants to create an ecological risk as the site is mainly covered with buildings, and pavement.

2.7.3 Basis for Action

Unacceptable human health cancer risks were estimated in the 2013 IOA Project Report baseline risk assessment for future residents (child and lifetime residents) from exposures to surface soil via ingestion, dermal, or inhalation (fugitive dust) commercial receptors. The theoretical risk exceedances were based on the presence of the following COCs: Benzo(a)pyrene equivalents, carcinogenic PAHs, Aroclor-1260, heptachlor epoxide, 2,3,7,8-TCDD equivalents, arsenic, and chromium in surface soil.

No unacceptable risks were estimated from exposures to groundwater.

Since risks were identified for hypothetical future residential receptors and commercial workers, a response action is necessary to protect the public health and welfare from actual or threatened releases of hazardous substances into the environment that may present an imminent and substantial endangerment to public health or welfare.

The distribution of contaminants that are present in surface soil at concentrations exceeding risk-based clean-up goals are depicted in Figure 2-3.

2.8 Remedial Action Objectives

RAOs are goals, specific to each medium, that define the objective of remedial actions to protect human health and the environment. RAOs specify the COCs, potential exposure pathways and receptors, and acceptable concentrations (i.e., cleanup levels) for a site and provide a general description of what the cleanup will accomplish. Additionally, RAOs are developed to ensure compliance with federal and state applicable or relevant and appropriate requirements (ARARs). RAOs typically serve as the design basis for the remedial alternatives described below in Section 2.9.

To protect the public from potential future health risks under possible future residential use, as well as to protect the environment, the following RAO has been developed for surface soil at the Site.

- Prevent exposure (i.e. direct contact or ingestion) to COCs in soils exceeding risk-based cleanup goals.

Site-specific preliminary remediation goals (PRGs) were developed for the IOA to establish target cleanup goals for remedial actions to reduce COC concentrations in Site media and mitigate the unacceptable risks to human health and the environment. As part of the HHRA, site-specific risk-based PRGs were calculated for the COCs based on exposures of hypothetical future residents to surface soil (while the HHRA evaluated potential risks to both the hypothetical future resident and hypothetical future commercial receptor, the risk-based PRGs were calculated based on future residential risks only, due to the fact that this exposure scenario is more protective, and therefore inclusive, of other potential future receptors in the IOA). As part of preparing the FFS, PRGs for COCs were reviewed and re-calculated to accommodate recent updates in exposure assumptions published in scientific literature and in regulatory guidance documents. The proposed cleanup goal for each COC is either the calculated PRG or surface soil background value (whichever greater) (Table 2-7).

Table 2-7
Summary of Surface Soil PRGs and Proposed Cleanup Goals

Contaminant of Concern	Units	Hypothetical Risk-Based PRG[1]	Background Value	Selected PRG / Proposed Cleanup Goal	Basis for Selection
Benzo(a)pyrene Equivalents	µg/Kg	150	2,130	2,130	Background
Benzo(a)anthracene	µg/Kg	1,500	810	1,500	Residential Risk
Benzo(a)pyrene	µg/Kg	150	1,828.8	1,828.8	Background
Benzo(b)fluoranthene	µg/Kg	1,500	770	1,500	Residential Risk
Benzo(k)fluoranthene	µg/Kg	15,000	2,700	15,000	Residential Risk
Dibenzo(a,h)anthracene	µg/Kg	150	96	150	Residential Risk
Indeno(1,2,3-cd)pyrene	µg/Kg	1,500	175	1,500	Residential Risk
Aroclor-1260	µg/Kg	1,100*	NA	1,100	Residential Risk
Heptachlor Epoxide	µg/Kg	590	NA	590	Residential Risk
2,3,7,8-TCDD Equivalents	µg/Kg	0.049	NA	0.049	Residential Risk
Arsenic	mg/Kg	6.7	5.31	6.7	Residential Risk
Chromium	mg/Kg	3.1	10.1	10.1	Background
Lead	mg/Kg	400	301.7	400	Residential Risk

Notes:

* = Calculated using the non-cancer toxicity for Aroclor-1254

[1] = PRG is based on residential exposures

µg/Kg = Microgram per kilogram

mg/kg = Milligram per kilogram

2.9 Description of Alternative

To address the COCs and the associated human health risks in surface soil, a screening of General Response Actions, remedial technologies, and process options was conducted as part of the FFS. The technologies and process options retained from the detailed screening were assembled into three remedial alternatives for the IOA. Consistent with the NCP, the No Action alternative was evaluated as a baseline for comparison with other alternatives during the comparative analysis. The alternatives evaluated and presented in the FFS include:

- Alternative S-1: No Action
- Alternative S-2: Excavation and Off-Site Disposal
- Alternative S-3: Asphalt Capping and Land Use Controls (LUCs)

A description and detailed analysis of these alternatives are presented below.

2.9.1 Alternative S-1: No Action

The No Action alternative does not address the surface soil contamination and is retained to provide a baseline for comparison to other alternatives. There would be no reduction in toxicity, mobility, or volume of the contaminants. In accordance with CERCLA Section 121(c) and Section 300.430(f)(4)(ii) of the revised NCP, the Navy, with support from U.S. EPA and MassDEP, would conduct 5-year review(s) under the No Action alternative because hazardous substances would remain at the IOA above levels that allow for unlimited use and unrestricted exposure.

Alternative S-1 would not provide long-term effectiveness and permanence because contaminated surface soil would remain on site and there would be no LUCs to restrict human exposure to surface soils. Although the No Action alternative would not pose new hazards to the community or site workers, it may result in increased community exposure in the long-term due to the potential future residential zoning of the IOA site. Other than 5-year reviews of the site status (conducted as part of the overall 5-year review for former NAS South Weymouth), there would be no capital costs and the operations & maintenance (O&M) costs would be nominal for implementing Alternative S-1.

2.9.2 Alternative S-2: Excavation and Off-Site Disposal

In Alternative S-2, soil from the ten areas identified in the HHRA (where surface soil with COC concentrations exceed cleanup goals) would be excavated and temporarily stockpiled onsite. Following waste characterization sampling, the soil stockpile would be transported offsite for final disposal. Pre-excavation surface soil sampling would be conducted to further define the areas to be excavated. Post-excavation soil sampling would be conducted to confirm that the RAO for the site has been achieved and to document remaining conditions. A Remedial Action Work Plan

(RAWP) would be developed following issuance of this ROD that will include a detailed description of the pre- and post-excavation sampling activities.

2.9.3 Alternative S-3: Asphalt Capping and LUCs

Under Alternative S-3, an asphalt cap would be constructed over the 10 areas identified in the HHRA to cover soil containing COCs that exceed the cleanup goals. Pre-cap soil sampling would be performed to further define the target areas prior to constructing the cap. A RAWP would be developed following issuance of the ROD that will include a detailed description of the pre-cap sampling activities and locations.

LUCs, such as a lease restriction (during Navy ownership) or a deed restriction (in the event of property transfer), would be required in conjunction with capping, to limit the future use of the capped areas within the IOA and to maintain the integrity of the cap. The LUCs would be implemented to prevent both residential and recreation future use of those 10 areas of the IOA identified in the HHRA. The LUCs would apply to the capped areas and ensure that surface soils and the cap are not interrupted by persons unaware of soil conditions and the need for personal protective gear, management of soil disturbed, and replacement of the cap to the proper specifications.

Annual inspections of the LUCs and evaluation of the cap integrity would be required. In addition, 5-year reviews would be required under this alternative to evaluate the continued adequacy of the remedy and to ensure that the Site LUCs continue to be met. The 5-year reviews would describe, at a minimum, the findings of the annual LUC inspections and recommendations for repair.

2.10 Comparative Analysis of Alternative

Table 2-8 and the 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 Code of Federal Regulations (CFR) 300.430(e)(9)(iii) and categorized as threshold, primary balancing, and modifying criteria. Further information on the detailed comparison of remedial alternatives is presented in the IOA FFS.

Table 2-8
Summary of Comparison Analysis of Alternatives

Alternative No.	**S-1**	**S-2**	**S-3**
Estimated Timeframes (years)			
Design and Construction of Alternative	NA	1	1
Criteria Analysis			
Threshold Criteria			
Protects human health and the environment • Will it protect you and animal life on and near the site?	⊘	●	○
Meets federal and state regulations • Does the alternative meet federal and state environmental statues, regulations, and requirements?	⊘	●	●
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 contaminants, their ability to spread, and the amount of contaminated material present reduced?	⊘	●	○
Provides short-term protection • How soon will the risks be reduced? • Are there hazards to workers, residents, or the environment that could occur during cleanup?	⊘	○	●
Can be implemented • Is the alternative technically feasible? • Are the goods and services necessary to implement the alternative readily available?	●	●	○
Cost: • Up-front costs to design and construct the alternative (capital costs) • Operating and maintain any system associated with the alternative (O & M costs) • Total cost in today's dollars (net present worth cost)	$0 nominal nominal	$1.4M $0 $1.4M	$580K $0 $755K
Modifying Criteria			
State Acceptance	To be determined after the public comment period		
Community Acceptance			
● = Good ○ = Average ⊘ = Poor K = Thousand M = Million			

Threshold Criteria

Overall Protection of Human Health and the Environment: Alternatives S-2 and S-3 would provide protection to human health and the environment. Alternative S-2 would provide the greatest protection because it permanently removes the source areas with COC concentrations exceeding the cleanup goals. Alternative S-2 would also allow for the site to be rendered suitable for unlimited use and unrestricted exposure with the exception of the two existing AUL areas. Alternative S-3 would provide the second best protection because installing a cap would prevent exposure to elevated COC concentrations exceeding the cleanup goals, although the elevated COC concentrations would remain in-place and require long term management. Alternative S-3 would not allow for the site to be suitable for unlimited use and unrestricted exposure; implementation of LUCs would be required. LUCs would provide adequate protection of human health with a permanent restriction on the use of surface soil preventing unrestricted or residential uses.

Alternative S-1, No Action, would not achieve the RAOs and therefore does not protect human health and the environment. Thus, Alternative S-1 is not discussed further in this evaluation.

Compliance with ARARs: 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.

Alternative S-2 would comply with chemical-specific ARARs and To Be Considered (TBC) guidance through excavation and offsite disposal of surface soil COC concentrations exceeding the cleanup goals. This would be verified through post-excavation confirmatory sampling. Alternative S-3 would comply with chemical-specific ARARs and TBCs through capping site soils and preventing exposure to COCs in surface soil. Alternatives S-2 and S-3 would also comply with action-specific ARARs and TBCs; there are no location-specific ARARs or TBCs.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Alternative S-2 would provide the most long-term effectiveness and permanence through excavation and offsite disposal of surface soil with COC concentrations exceeding the cleanup goals. Alternative S-3 would provide the second best long-term effectiveness and permanence through long term maintenance of the asphalt cap and implementation and management of LUCs. LUCs or a deed restriction would be required in conjunction with capping to prevent residential and recreation future use of the capped areas, and to maintain integrity of the cap. Regardless, Alternative S-2 would provide a higher level of

permanence compared to Alternative S-3 because the excavation component would permanently remove COC contamination exceeding the cleanup goals.

Reduction in Toxicity, Mobility, or Volume Through Treatment: None of the alternatives would provide any active treatment technologies that would achieve reduction in the toxicity, mobility or volume of COCs. Thus, toxicity mobility and volume are addressed by managing the contaminants in a secured landfill setting. Alternative S-3 would achieve a lower level reduction in COC mobility through passive treatment by the asphalt cap but would not decrease their toxicity or volume.

Short-Term Effectiveness: Short-term effects of Alternative S-2 include the possibility of exposing site workers to contaminated surface soil during excavation. Dust control during excavation may also be required to protect onsite workers and the surrounding community. Alternative S-3 would result in a slightly lower short-term risk, with the potential for exposure only during installation of the asphalt cap. However, these risks of exposure would be effectively controlled by wearing appropriate PPE and compliance with proper site-specific health and safety procedures. Implementation of Alternatives S-2 through S-3 would not adversely impact the surrounding community or environment.

Implementability: Alternatives S-2 and S-3 are both readily implementable. The required materials and services for surface soil excavation and offsite disposal and for constructing an asphalt cap are both readily available. However, Alternative S-3 would have additional administrative requirements over the long term such as LUCs and 5-year reviews. Complexities associated with retaining the cap and ensuring the LUCs are maintained during and after redevelopment of the site are manageable but should be recognized. Use of the property may be affected by the implementation of the alternatives. Alternatives S-2 and S-3, would temporarily impact site use during excavation and installation of the asphalt cap, respectively.

Cost: The capital and O&M costs and net present worth (NPW) of the alternatives are as follows.

Alternative S-2:

Capital Cost:	$1,391,544
30-Year net NPW of Annual Costs:	0.00
30-Year NPW:	$1,391,544

The relative costs to implement Alternative S-2 may range from moderate to high due to the quantity of material that must be transported offsite for disposal. Excavation of the 10 target areas with COC exceedances would render the site suitable for unlimited use and unrestricted exposure; therefore, there would be no subsequent O&M costs.

Alternative S-3:

Capital Cost:	$588,367
30-Year NPW of Annual Costs:	$166,777
30-Year NPW:	$755,144

The relative capital costs for Alternative S-3 are low to moderate. O&M costs are relatively low and would consist of site inspections, reporting, and cap maintenance.

A detailed breakdown of estimated costs for this alternative is provided in Appendix C.

Modifying Criteria

State Acceptance: State involvement has been solicited throughout the CERCLA process. MassDEP's statement on the selected remedy is presented in Appendix A.

Community Acceptance: The community expressed support for Alternative S-2. Comments were received during the public hearing on 7 July 2015 and written comments were also received. These comments and Navy responses are discussed in Section 3.0.

2.11 Principal Threat Waste

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 at a site wherever practicable. Principal threat wastes are defined as those source materials considered to be highly toxic or highly mobile, and which generally cannot be contained in a reliable manner or 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.

Although contaminants detected at the Site (i.e., PAHs, PCBs, heptachlor epoxide, 2,3,7,8-TCDD equivalents, arsenic, and chromium) could potentially pose unacceptable risks to certain receptors under specific exposure scenarios, it has been determined that since there are no current receptors or concerns and any future exposures can be prevented through either source removal (Alternative S-2) or capping and LUCs (Alternative S-3), there are no principal threat wastes present at the IOA Site. Specific to Alternative S-3, the use of the capped area as either an unrestricted property (recreational area or residential property) or disturbing or removing the cap without controls and without replacement of the cap would be considered non-compliant with the LUC.

2.12 Selected Remedy

2.12.1 Rationale for the Selected Remedy

The Selected Remedy for the IOA, which includes AOC 14 and AOC 83 is Alternative S-2, excavation and offsite disposal. Per the 2013 HHRA, no further action is required at RIA 33 and RIA 82. The Navy and U.S. EPA have concluded that this remedy is protective of human health and the environment, and achieves the overall goals established for the Site. This remedy is expected to clean the surface soil contaminant concentrations to the RAOs described in this ROD in the shortest amount of time of the alternatives evaluated. The remedy will meet the RAOs by reducing COC concentrations through removal and offsite disposal. The Navy proposes that this remedy be the final CERCLA remedy for the IOA. The Selected Remedy does not apply to the MCP sites located with the IOA, including the two RTNs closed with AULs.

The principal factors in the selection of this remedy included the following:

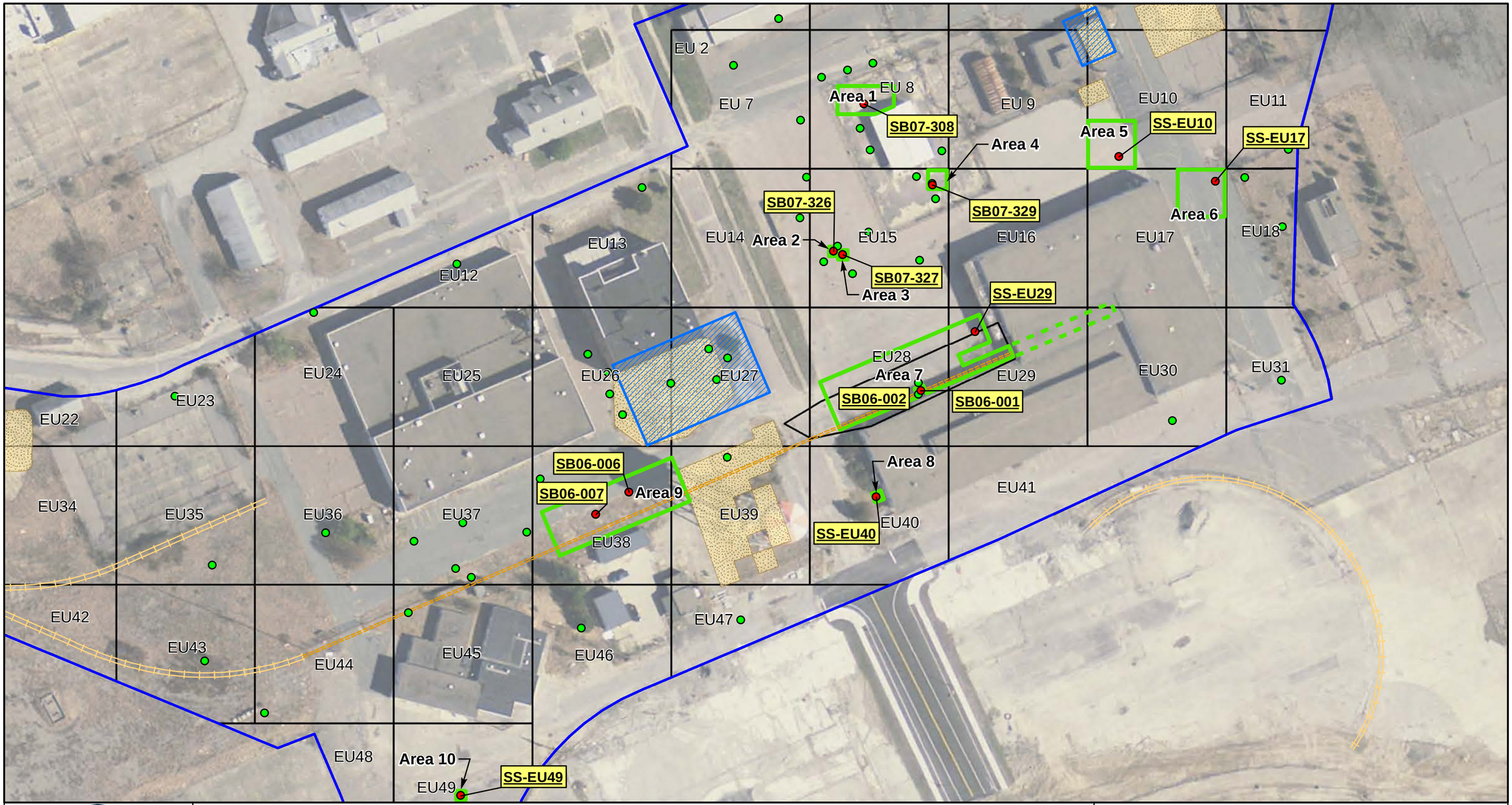
- The remedy will achieve substantial risk reduction by removing the source materials.
- The remedy will provide safe management of surface soil.
- The remedy is consistent with the future zoning uses of the Site.

Alternative S-2 would provide long-term effectiveness and permanence through excavation and offsite disposal. Excavation, combined with subsequent offsite disposal, would be a permanent solution and would attain the RAO for the protection of human health and the environment.

2.12.2 Description of the Selected Remedy

The selected remedy includes the following components, described below and shown on Figure 2-4:

- Pre-excavation soil sampling (to better define areas to be excavated).
- Site clearing (i.e. removal of asphalt/pavement from areas to be excavated).
- Excavation of soil with COCs exceeding Cleanup Goals.
- Post-excavation confirmatory sampling (to confirm achievement of RAO).
- Off-site transport and disposal of contaminated soils at a licensed facility.
- Site restoration.



RESOLUTION CONSULTANTS

Drawn:	JB	08/20/2015
Approved:	MS	08/20/2015
Project #:	60274866	

Legend

- Historical IOA Surface Soil Sample (Exceedance)
- Existing Surface Soil Sample (No Exceedance)
- Industrial Area Boundary
- Railroad Spur (Portions Removed)
- Approximate Soil Removal Action Limits Under Roof Awning
- Approximate Soil Removal Action Limits
- Previously Excavated Area
- Activity And Use Limitation Area Boundary

Note:
1. Historical information suggests SB06-001 and SB06-002 locations are uncertain.

N

0 50 100
Scale in Feet

FIGURE 2-4
PROPOSED REMEDIAL ACTION - ALTERNATIVE #2
EXCAVATION AND OFF-SITE DISPOSAL
INDUSTRIAL OPERATIONS AREA

FORMER NAVAL AIR STATION
SOUTH WEYMOUTH, MASSACHUSETTS

Path: P:\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\South Weymouth\GIS\Projects\IOA\ROD\MXD\Fig_2_4_Prop_Remedial_Action_Number_2.mxd

Pre-excavation soil sampling

Pre-excavation surface soil sampling will be conducted to further define the areas to be excavated. Two types of pre-excavation samples are likely necessary; additional delineation soil samples and target area soil samples. Additional delineation soil samples will be collected in areas that appear to be in need of further delineation and target area soil samples will be collected surrounding sample locations where contamination has already been found to exceed the cleanup goals. A RAWP will be developed following issuance of this ROD that will include a detailed description of the pre-excavation activities and sampling locations.

Site Clearing

A total of ten locations have been identified for soil excavation under Alternative S-2. Some of these areas are currently covered with asphalt and others are not. Asphalt, pavement, concrete, and other solid materials will be cleared from planned excavation areas and handled appropriately.

Excavation of soil with COCs exceeding PRGs

The proposed soil removal areas (Areas 1 through 10) for Alternative S-2 are illustrated on Figure 2-4. The proposed soil removal areas are based on existing data available; final adjustments may be made following review of the analytical results from the pre-excavation sampling described above. Each proposed removal area targets a surface soil sample location with a COC, or COCs, exceeding the cleanup goals. The proposed areas to be excavated are approximate areas based on existing IOA data. The removal areas and soil quantities to be excavated will be further defined by pre-excavation soil sampling and described in the RAWP. The available sampling data indicate elevated COC concentrations at a depth up to approximately 2 feet bgs. The depth to groundwater in this area is generally between 8 and 10 feet bgs (Tetra Tech, 2013); therefore, dewatering during excavation activities will not be necessary. The total soil removal area under Alternative S-2 is approximately 25,100 square feet (ft^2). Based on the proposed removal area dimensions the total volume of soil that will be removed is approximately 1,862 cubic yards. A summary of the proposed soil removal areas (Areas 1 through 10) and the estimated soil volumes to be excavated are provided in Appendix E, Table E-1.

Post-excavation confirmatory sampling

Once the proposed limits of excavation are reached, confirmatory samples will collected from the floor and sidewalls of the excavated area and sent offsite for laboratory analysis as appropriate. Locations where sample results exceed cleanup levels will be over-excavated and resampled for confirmation that concentrations of COCs are below cleanup goals.

During the public comment period, summarized below in Section 3.3 below, a request was made toinclude analysis for perfluorinated compounds (PFCs) as part of soil sampling related to the excavation activates of the Selected Remedy. Of the areas identified for excavation under the Selected Remedy, Area 10 at EU49 is in a location where historical uses of aqueous film forming foam (AFFF), which can contain PFCs, may have occurred (Building 96 is the former fire station). Therefore, PFC analysis will be included with a select number of confirmatory soil samples collected from the extent of the Area 10 excavation.

Off-site transport and disposal of contaminated soils

Excavated soil will be temporarily stockpiled on-site or live-loaded into dump trucks. If stockpiled, soil stockpiles will be placed on top of a protective ground cover (e.g. poly sheeting), and covered at the end of each day. Following receipt of waste characterization sampling results from the stockpiles, contaminated soil will be transported off-site and disposed at a licensed facility designed to secure contaminants.

Site Restoration

Following completion of excavation activities, the site will be restored by backfilling the excavated areas with a stable fill material.

2.12.3 Expected Outcomes of the Selected Remedy

The expected outcome of the Selected Remedy is to eliminate the potential for human exposure to surface soil containing contaminant concentrations in excess of the cleanup levels. Alternative S-2 is expected to decrease COC concentrations in the source areas (Figure 2-4) to acceptable levels following completion of excavation activities. Alternative S-2 will reduce the toxicity, mobility, and volume of surface soil COCs through excavation and offsite disposal. Upon achieving the surface soil cleanup levels identified in Table 2-7, the Site will be suitable for unrestricted land use, including the Main Street Overlay District, MUVD, VCD, and RecD uses.

The Selected Remedy does not apply to the MCP sites located with the IOA, including the two RTNs closed with AULs.

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 will be protective of human health and the environment through the reduction of COC concentrations in site surface soil to achieve cleanup levels. Site conditions do not pose unacceptable risks to human receptors under current site use. The selected remedy will be protective of human

receptors under all future site use scenarios. There are no ecological receptors or complete exposure pathways at the Site.

- *Compliance with ARARS* — The selected remedy will comply with all federal and state ARARs as presented in Appendix D.
- *Cost-Effectiveness* — The selected remedy is a cost-effective means to achieve site remediation. The costs are proportional to the overall effectiveness during the remediation time frame. Detailed costs for the selected remedy are presented in Appendix C.
- *Utilization of Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable* — Neither of the alternatives evaluated utilize treatment to address COC concentrations at the IOA. The selected remedy will be an effective and permanent means of eliminating COC concentrations in surface soil through excavation and offsite disposal.
- *Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility, or Volume of the Hazardous Substances as a Principal Element* — By excavating surface soil, the selected remedy addresses contamination in the source areas. By utilizing offsite disposal as a significant portion of the remedy, the statutory preference for remedies that employ disposal as a principal element is satisfied. The selected remedy includes excavation of 10 areas within the IOA to reduce the source mass, thereby reducing the toxicity, mobility, and volume of the surface soil contamination at the Site.
- *Five-Year Review Requirement* — Because the selected remedy will result in reduction of hazardous substances, pollutants, or contaminants remaining on site to below RPGs and thereby allow for unlimited use and unrestricted exposure, five-year review requirements are not required for the IOA.

2.14 Documentation of No Significant Changes

CERCLA Section 117(b) requires an explanation of significant changes from the remedy presented in the Proposed Plan that was published for public comment. Comments received during the public comment period and the 7 July 2015 public hearing, were generally supportive of the Proposed Plan. Therefore, no significant changes to the remedy as originally identified in the Proposed Plan were necessary or appropriate. The comments received on the Proposed Plan during the public comment period are presented in Section 3.0.

3.0 RESPONSIVENESS SUMMARY

The Responsiveness Summary is a concise and complete summary of significant comments received from the public and includes responses to these comments. In addition, this summary provides the decision makers with information about the views of the community. It also Pagedocuments how the Navy, U.S. EPA, and MassDEP considered public comments during the decision-making process, and provides answers to significant comments.

3.1 Overview

The Proposed Plan, as presented to the public, identified excavation and off-site disposal of contaminated soil (Alternative S-2) as the proposed remedy and preferred alternative for the IOA. This alternative was selected because it is protective of human health and the environment, attains all ARARs, and was considered by the Navy, U.S. EPA, and MassDEP as the alternative that provided the best balance of the evaluation criteria.

3.2 Background on Community Involvement

The public comment period for the Proposed Plan for the IOA began on 22 June 2015 and ended on 22 July 2015. A public meeting was held on 7 July 2015 at the SRA facility, Shea Memorial Drive, South Weymouth, Massachusetts to accept verbal comments on the proposed remedy. A legal notice was placed in three local community newspapers notifying the public of the comment period and of the public meeting, prior to the opening of the comment period. Three comments on the proposed remedy for the IOA were received during either the public meeting or in writing during the public comment period; however, no revisions to the Selected Remedy, as identified in the Proposed Plan, were necessary or appropriate as a result of the comments. The transcript from the public meeting is included in Appendix F.

3.3 Stakeholder Comments and Lead Agency Responses

Participants in the public meeting held 7 July 2015 included members of the public and representatives of the Navy, EPA, and MassDEP. There were two significant comments received during the 7 July 2015 public meeting, along with one letter of support. The comments are summarized below, along with Navy's responses.

1. **Comment:** Two participants requested that the Navy consider sampling for the presence of perfluorinated compounds (PFCs) at the IOA, prior to property transfer. It was noted that the former fire station (Building 96) is located within the IOA boundary. The comments suggested that sampling occur during both pre- and post- remedial activities.

   Response: Navy has previously reviewed historical site information and there was no reported release of PFC related compounds in the IOA area. However, the Navy is planning to conduct a PFC Remedial Investigation at Hangar I, which includes installing four monitoring wells in the IOA, immediately in the vicinity of Building 96.

2. **Comment:** The MassDEP representative commented that if contaminant levels in excavation confirmatory soil samples do not reach the proposed remedial goals for residential use, than the proposed goal of not having any Activity and Use Limitations (AULs) on the IOA property would likely need to be reconsidered.

   Response: Comment noted. Prior to excavation activities, a pre-excavation soil investigation will be conducted to assess the horizontal and vertical extent of contamination at each of the areas identified for remediation. The purpose of the pre-excavation soil sampling is to refine the extent of the anticipated areas of excavation. If initial excavation end-point soil data indicates that contamination is still present above clean-up goals at any of the excavated areas, additional soil removal activities would likely be conducted to remove the contaminated material. Should subsequent confirmatory soil data still indicate contamination is present, the Navy would then likely consider either additional excavation work or conducting a soil risk characterization to assess post-excavation conditions at the IOA.

   It should be noted that two former sites managed under the MCP program and located within the IOA were closed with AULs.

3. **Comment:** The Weymouth Town Council – District Six commented that they are in full support of the selected alternative.

   Response: The Navy appreciates the support of Weymouth Town Council – District Six.

3.4 Technical and Legal Issues

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

4.0 REFERENCES

Department of Defense. *Principals and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions*. October 2003.

EA Engineering, Science, and Technology. *Final Phase II Environmental Baseline Survey Sampling Work Plan*. November 1998.

— *Final Streamlined Human Health Risk Assessment Work Plan: Areas of Concern at NAS South Weymouth. South Weymouth, Massachusetts.* Work Order No. 29600.75.0500. March 2011.

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— *Final Removal Action for PSSA#1, RIA 100, RIA 3 and RIA 13, Naval Air Station South Weymouth, Weymouth, Massachusetts*. May 2002b.

Massachusetts Department of Environmental Protection. *Massachusetts Contingency Plan (MCP) Method 1: Soil Category S-1 Standards*. 310 CMR 40.0000. December 2007.

South Shore Tri-Town Development Corporation. *Zoning and Land Use By-Laws for the Naval Air Station South Weymouth*. May 2007.

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— *Addendum No. 1 to the Closeout Report Action Memorandum for Area of Concern 13, Naval Air Station South Weymouth, Weymouth, Massachusetts*. February 2005.

— *Industrial Operations Area Technical Memorandum*. May 2010a.

— *Meeting Notes, Industrial Operations Area Scoping Meeting*, *NAS South Weymouth, Weymouth, Massachusetts*. 22 September 2010.

— *Draft Final Sampling and Analysis Plan (Field Sampling and Quality Assurance Project Plan) Industrial Operations Area Site Investigation, Former Naval Air Station South Weymouth, Weymouth, Massachusetts*. August 2011.

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— *Focused Feasibility Study Report, Industrial Operations Area, Former Naval Air Station South Weymouth, Weymouth, Massachusetts.* April 2015.

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— *Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual, Part A.* December 1989.

— *Risk Assessment Guidance for Superfund: Volume 1 Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals)*. Office of Emergency and Remedial Response, Washington, D.C. December 1991.

— *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.* Office of Solid Waste and Emergency Response, Washington, D.C. December 2002.

— *Human Health Toxicity Values in Superfund Risk Assessments. Office of Superfund Remediation and Technology Innovation, OSWER 9285.7 53*. Washington, D.C. December 2003.

— *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final Guidance*. July 2004.

— *Polychlorinated Biphenyl (PCB) Site Revitalization Guidance Under the Toxic Substances Control Act (TSCA)*. November 2005.

— *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, "Supplemental Guidance for Inhalation Risk Assessment"), Final.* Office of Superfund Remediation and Technology Innovation, Washington, D.C. 20460 EPA 540 R 070 002, OSWER 9285.7 82. January 2009.

— *Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil and Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil Documents. OSWER Directive 9200.1-113*. Office of Superfund Remediation and Technology Innovation. Washington, D.C. December 2012.

— *Regional Screening Levels for Chemical Contaminants at Superfund Sites*. Oak Ridge National Laboratory (ORNL). May 2014a. Retrieved from: http://epa-prgs.ornl.gov/chemicals/index.shtml.

— Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER 9200.1-120. 6 February 2014b.

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U.S. Navy. *Navy Environmental Restoration Program Manual*. August 2006

Appendix A

Massachusetts Department of Environmental Protection Concurrance Letter

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

Ms. Nancy Barmakian, Acting Director
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Mail Code: OSRR07-03
Boston, MA 02114-2023

Re: Record of Decision
Industrial Operations Area
Former South Weymouth NAS
MassDEP RTN 4-3002621
Date: September 15, 2015

Dear Ms. Barmakian:

The Massachusetts Department of Environmental Protection (MassDEP) reviewed the *Record of Decision, Industrial Operations Area (AOC 14(OU23), AOC 83 (OU24), RIA 33, and RIA 82), Naval Air Station South Weymouth*, dated September 2015. The Record of Decision summarizes the results from the site investigations and feasibility study that were used to characterize and develop cleanup options for the site and documents the Navy's rationale for selecting Remedial Alternative S-2: Excavation and Off-Site Disposal. MassDEP concurs with the selected remedy.

If you have any questions or comments, please contact David Chaffin, Project Manager (617-348-4005), or Anne Malewicz, Federal Facilities Section Chief (617-292-5659).

Sincerely,

Paul Locke
Acting Assistant Commissioner
Bureau of Waste Site Cleanup

cc: D. Barney, USN-S. Weymouth
C. Keating, USEPA
Board of Directors, SRA
RAB Members
J. Naparstek, MADEP-Boston

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TTY# MassRelay Service 1-800-439-2370
MassDEP Website: www.mass.gov/dep

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Appendix B

Human Health Risk Assessment Summary Tables

TABLE B-1
RECEPTOR EXPOSURE ASSUMPTIONS
INDUSTRIAL OPERATIONS AREA
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Exposure Parameter	Commercial Receptors[1]		Future Resident	
	Child	Adult	Child	Adult
All Exposures				
C_{soil} (mg/kg)	Maximum or 95% UCL[2]	Maximum or 95% UCL[2]	Maximum or 95% UCL[2]	Maximum or 95% UCL[2]
ED (years)	6[3]	24[3]	6[4]	24[4]
BW (kg)	15[3]	70[3]	15[4]	70[4]
AT_n (days)	ED x 365[4]	ED x 365[4]	ED x 365[4]	ED x 365[4]
AT_c (days)	25550[4]	25550[4]	25550[4]	25550[4]
Incidental Ingestion/Dermal Contact with Soil				
IR (mg/day)	200[3]	100[3]	200[9]	100[9]
EF-Soil (days/year)	150[5]	150[5]	350[10]	350[10]
FI (unitless)	0.5[6]	0.5[6]	1[7]	1[7]
SA (cm^2)	2800[3]	5700[3]	2800[10]	5700[10]
AF (mg/cm^2-event)	0.2[3]	0.07[3]	0.2[10]	0.07[10]
EV (events/day)	1[3]	1[3]	1[10]	1[10]
ABS (unitless)	Chemical Specific	Chemical Specific	Chemical Specific	Chemical Specific
CF (kg/mg)	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil				
C_{air} (mg/m^3)	Calculated	Calculated	Calculated	Calculated
ET (hours/day)	4[7]	4[7]	24[9]	24[9]
PEF (m^3/kg)	1.10E+10[8]	1.10E+10[8]	1.10E+10[8]	1.10E+10[8]

Notes:

ABS Absorption factor
AF Soil-to-skin adherence factor
AT_c Averaging time for carcinogenic effects
AT_n Averaging time for noncarcinogenic effects
BW Body weight
CF Conversion factor
$C_{soil/air}$ Exposure concentration for soil/air
ED Exposure duration
EF Exposure frequency
ET Exposure time
EV Event frequency
FI Fraction ingested from contaminated source
IR Ingestion rate
PEF Particulate Emission Factor
SA Skin surface area available for contact
UCL Upper Confidence Limit

1 - Small child and adult commercial receptors are assumed to be customers or apartment dwellers.
2 - USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
3 - Assumed same as resident.
4 - USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
5 - Commercial receptors are assumed to visit facility/open spaces approximately three times per week.
6 - Commercial receptors are assumed to visit facility/open spaces only for a portion of the day.
7 - Professional judgment.
8 - USEPA, 2012: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Hartford, CT.
9 - USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.
10 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE B-2
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
INDUSTRIAL OPERATIONS AREA
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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										
Benzo(a)pyrene Equivalents	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs										
Aroclor-1260[3]	Chronic	2.00E-05	mg/kg/day	1	2.0E-05	mg/kg/day	Immune	300/1	IRIS	3/13/2013
Heptachlor Epoxide	Chronic	1.30E-05	mg/kg/day	1	1.3E-05	mg/kg/day	Liver	1000/1	IRIS	3/13/2013
Dioxins/Furans										
2,3,7,8-TCDD Equivalents	Subchronic	2.0E-08	mg/kg/day	1	2.0E-08	mg/kg/day	Developmental	30/1	ATSDR	12/1998
	Chronic	7.00E-10	mg/kg/day	1	7.0E-10	mg/kg/day	Reproductive	30/1	IRIS	6/22/2012
Inorganics										
Aluminum	Chronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	CNS	100/1	PPRTV	10/23/2006
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	3/13/2013
Chromium[4]	Subchronic	2.0E-02	mg/kg/day	0.025	5.0E-04	mg/kg/day	None Specified	100/3	HEAST	9/1997
	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	None Specified	300/3	IRIS	3/13/2013
Cobalt	Subchronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Thyroid	NA	PPRTV	8/25/2008
	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Thyroid	NA	PPRTV	8/25/2008
Iron	Subchronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	GS	1.5	PPRTV	9/11/2006
	Chronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	GS	1.5	PPRTV	9/11/2006
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese[5]	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	CNS	1	IRIS	3/13/2013

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 dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.
3 - Value is for Aroclor-1254.
4 - Value is for hexavalent chromium.
5 - Adjusted IRIS value in accordance with IRIS.

ATSDR = Agency for Toxic Substances and Disease Registry
CNS = Central nervous system
CVS = Cardiovascular system
GS = Gastrointestinal system
HEAST = Health Effects Assessment Summary Tables IRIS = Integrated Risk Information System
NA = Not available
PAHs = Polycyclic aromatic hydrocarbon
PPRTV = Provisional Peer Reviewed Toxicity Value
RfD = Reference dose
mg/kg/day = Milligram per kilograms per day

TABLE B-3
NON-CANCER TOXICITY DATA -- INHALATION
INDUSTRIAL OPERATIONS AREA
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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									
Benzo(a)pyrene Equivalents	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs									
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans									
2,3,7,8-TCDD Equivalents	Chronic	4.0E-08	mg/m^3	1.1E-08	(mg/kg/day)	Developmental	NA	Cal EPA	9/2009
Inorganics									
Aluminum	Chronic	5.0E-03	mg/m^3	1.4E-03	(mg/kg/day)	CNS	300/1	PPRTV	10/23/2006
Arsenic	Chronic	1.5E-05	mg/m^3	4.3E-06	(mg/kg/day)	NA	NA	Cal EPA	9/2009
Chromium[2]	Chronic	1.0E-04	mg/m^3	2.9E-05	(mg/kg/day)	Respiratory	300/1	IRIS	3/13/2013
Cobalt	Subchronic	2.0E-05	mg/m^3	5.7E-06	(mg/kg/day)	Respiratory	NA	PPRTV	8/25/2008
	Chronic	6.0E-06	mg/m^3	1.7E-06	(mg/kg/day)	Respiratory	NA	PPRTV	8/25/2008
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	5.0E-05	mg/m^3	1.4E-05	(mg/kg/day)	CNS	1000/1	IRIS	3/13/2013

Notes:
1 - Extrapolated RfD = RfC *20m^3/day / 70 kg.
2 - Value is for hexavalent chromium.

Cal EPA = California Environmental Protection Agency
CNS = Central nervous system
IRIS = Integrated Risk Information System
NA = Not Applicable
PAH = Polycyclic aromatic hydrocarbon
PPRTV = Provisional Peer Reviewed Toxicity Value
RfC = Reference concentration
RfD = Reference dose
mg/m^3 = Milligram per cubic meter
mg/kg/day = Milligram per kilograms per day

TABLE B-4
CANCER TOXICITY DATA -- ORAL/DERMAL
INDUSTRIAL OPERATIONS AREA
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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								
BAP Equivalents[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Pesticides/PCBs								
Aroclor-1260	2.0E+00	$(mg/kg/day)^{-1}$	1	2.0E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(2)	9/1996
Heptachlor Epoxide	9.1E+00	$(mg/kg/day)^{-1}$	1	9.1E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	3/13/2013
Dioxins/Furans								
2,3,7,8-TCDD Equivalents	1.3E+05	$(mg/kg/day)^{-1}$	1	1.3E+05	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Metals								
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	3/13/2013
Chromium[3][4]	5.0E-01	$(mg/kg/day)^{-1}$	0.025	2.0E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	NJDEP	4/8/2009
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	3/13/2013

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 - Benzo(a)pyrene and related compounds and hexavalent chromium are considered to act via the mutagenic mode of action and were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).
4 - Value is for hexavalent chromium.

Cal EPA = California Environmental Protection Agency.
CSF = Cancer slope factor.
IRIS = Integrated Risk Information System.
NA = Not Available.
mg/kg/day = Milligram per kilograms per day
Sodium Dichromate Dihydrate, April 8, 2009.
PAH = Polycyclic aromatic hydrocarbon.
USEPA(1) = Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, July 1993 EPA/600/R-93/089.
USEPA(2) = USEPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

TABLE B-5
CANCER TOXICITY DATA -- INHALATION
INDUSTRIAL OPERATIONS AREA
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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							
Benzo(a)pyrene Equivalents[1]	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	3/13/2013
Pesticides/PCBs							
Aroclor-1260	5.7E-04	$(ug/m^3)^{-1}$	2.0E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(2)	9/1996
Heptachlor Epoxide	2.6E-03	$(ug/m^3)^{-1}$	9.1E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	6/22/2012
Dioxins/Furans							
2,3,7,8-TCDD Equivalents	3.8E+01	$(ug/m^3)^{-1}$	1.3E+05	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Inorganics							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	6/22/2012
Chromium[2][3]	8.4E-02	$(ug/m^3)^{-1}$	2.9E+02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	6/22/2012
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	NA	PPRTV	8/25/2008
Iron	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	6/22/2012

Notes:
1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.
2 - Benzo(a)pyrene and related compounds and hexavalent chromium are considered to act via the mutagenic mode of action and were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).
3 - Value is for hexavalent chromium.
4 - USEPA(2) = USEPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

Cal EPA = California Environmental Protection Agency.
CSF = Cancer slope factor.
IRIS = Integrated Risk Information System.
NA = Not Available.
PAHs = Polycylic aromatic hydrocarbons.
PPRTV = Provisional Peer Reviewed Toxicity Value.
mg/kg/day = Milligram per kilograms per day

TABLE B-6

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD COMMERCIAL RECEPTORS - SOILS

NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Commercial Receptor	Child	IOA	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(2)	BW x AT
				EF	Exposure Frequency	150	days/year	(3)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Commercial Receptor	Child	IOA	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	150	days/year	(3)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

2 - Commercial receptors are assumed to visit facility/open spaces only for a portion of the day.

3 - Commercial receptors are assumed to visit facility/open spaces approximately three times per week.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

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

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 2.35E-07 Cancer Dermal Intake (Age 0 - 6) = 1.32E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 7.83E-08 Cancer Dermal Intake (Age 0 - 2) = 4.38E-07

Cancer Ingestion Intake (Age 2 - 6) = 1.57E-07 Cancer Dermal Intake (Age 2 - 6) = 8.77E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.74E-06 Noncancer Dermal Intake = 1.53E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE B-7

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD COMMERCIAL RECEPTORS - SOILS TO AIR

NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Commercial Receptor	Child	IOA	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(2)	CA x ET x EF x ED
				EF	Exposure Frequency	150	days/year	(3)	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.10E+10	m3/kg	USEPA, 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	73.95045	g/m2-s per kg/m3	USEPA 2011	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

2 - Professional judgment.

3 - Commercial receptors are assumed to visit facility/open spaces approximately three times per week.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2011: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Hartford, Connecticut.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 5.87E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 1.96E-03

Cancer Inhalation Intake (Age 2 - 6) = 3.91E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 1.37E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE B-8

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT COMMERCIAL RECEPTORS - SOILS

NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Commercial Receptor	Adult	IOA	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(2)	BW x AT
				EF	Exposure Frequency	150	days/year	(3)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Commercial Receptor	Adult	IOA	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	150	days/year	(3)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

2 - Commercial receptors are assumed to visit facility/open spaces only for a portion of the day.

3 - Commercial receptors are assumed to visit facility/open spaces approximately three times per week.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

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

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 1.01E-07 Cancer Dermal Intake (Age 6 - 30) = 8.03E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 4.19E-08 Cancer Dermal Intake (Age 6 - 16) = 3.35E-07

Cancer Ingestion Intake (Age 16 - 30) = 5.87E-08 Cancer Dermal Intake (Age 16 - 30) = 4.68E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.94E-07 Noncancer Dermal Intake = 2.34E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE B-9

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT COMMERCIAL RECEPTORS - SOILS TO AIR

NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Commercial Receptor	Adult	IOA	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(2)	CA x ET x EF x ED
				EF	Exposure Frequency	150	days/year	(3)	AT x 24 hours/day
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.10E+10	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	73.95045	g/m2-s per kg/m3	USEPA 2011	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

2 - Professional judgment.

3 - Commercial receptors are assumed to visit facility/open spaces approximately three times per week.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2011: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Hartford, Connecticut.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 2.35E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 9.78E-03

Cancer Inhalation Intake (Age 16 - 30) = 1.37E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.85E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE B-10

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SOILS

NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	IOA	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 2002b	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	IOA	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 2002b	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors interim Final.

USEPA, 2002a.Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

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

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 1.10E-06 Cancer Dermal Intake (Age 0 - 6) = 3.07E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.65E-07 Cancer Dermal Intake (Age 0 - 2) = 1.02E-06

Cancer Ingestion Intake (Age 2 - 6) = 7.31E-07 Cancer Dermal Intake (Age 2 - 6) = 2.05E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.28E-05 Noncancer Dermal Intake = 3.58E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from Ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE B-11

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS SOILS TO AIR

NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Child	IOA	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	CA x ET x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 2002b	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.10E+10	m3/kg	USEPA, 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	73.95045	g/m2-s per kg/m3	USEPA 2011	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2011: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Hartford, Connecticut.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 8.22E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 2.74E-02

Cancer Inhalation Intake (Age 2 - 6) = 5.48E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 1.92E+00

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE B-12

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS

NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	IOA	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 2002b	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Resident	Adult	IOA	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 2002b	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual. Part A.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

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

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 4.70E-07 Cancer Dermal Intake (Age 6 - 30) = 1.87E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.96E-07 Cancer Dermal Intake (Age 6 - 16) = 7.81E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.74E-07 Cancer Dermal Intake (Age 16 - 30) = 1.09E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.37E-06 Noncancer Dermal Intake = 5.47E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE B-13

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS TO AIR

NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	IOA	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	CA x ET x EF x ED / AT x 24 hours/day
				EF	Exposure Frequency	350	days/year	USEPA, 2002a	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.10E+10	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	73.95045	g/m2-s per kg/m3	USEPA 2011	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2011: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Hartford, Connecticut.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 3.29E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.37E-01

Cancer Inhalation Intake (Age 16 - 30) = 1.92E-01

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE B-14
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	IOA - High Concentrations Area	Ingestion	Benzo(a)pyrene Equivalents	3.80	mg/kg	4.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-05	1.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.063	mg/kg	1.5E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.0E-08	1.7E-07	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.009
				Heptachlor Epoxide	0.160	mg/kg	3.8E-08	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	3.4E-07	4.4E-07	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.03
				2,3,7,8-TCDD Equivalents	9.2E-6	mg/kg	2.2E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	2.8E-07	2.5E-11	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.04
				Aluminum	8,000	mg/kg	1.9E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.2E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	7.10	mg/kg	1.7E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.5E-06	1.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Chromium VI	93.8	mg/kg	1.2E-04	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.9E-05	2.6E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.09
				Cobalt	4.20	mg/kg	9.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Iron	15,000	mg/kg	3.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.06
				Lead	240	mg/kg	5.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	220	mg/kg	5.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.0E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.03
			Exp. Route Total								9.7E-05					0.4
			Dermal	Benzo(a)pyrene Equivalents	3.80	mg/kg	3.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-05	7.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.063	mg/kg	1.2E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	2.3E-08	1.4E-07	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.007
				Heptachlor Epoxide	0.160	mg/kg	2.1E-08	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	1.9E-07	2.5E-07	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.02
				2,3,7,8-TCDD Equivalents	9.2E-6	mg/kg	3.6E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	4.7E-08	4.2E-12	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.006
				Aluminum	8,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	7.10	mg/kg	2.8E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.2E-07	3.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Chromium VI	93.8	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.20	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	15,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Lead	240	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	220	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								2.6E-05					0.04
		Exposure Point Total									1.2E-04					0.4
	Exposure Medium Total										1.2E-04					0.4
	Air	IOA - High Concentrations Area	Inhalation	Benzo(a)pyrene Equivalents	3.5E-10	mg/m^3	1.1E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.2E-11	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	5.7E-12	mg/m^3	3.4E-14	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.9E-14	3.9E-13	(mg/m^3)	NA	(mg/m^3)	--
				Heptachlor Epoxide	1.5E-11	mg/m^3	8.5E-14	(mg/m^3)	2.6E-03	$(ug/m^3)^{-1}$	2.2E-13	1.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				2,3,7,8-TCDD Equivalents	8.4E-16	mg/m^3	4.9E-18	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	1.9E-13	5.7E-17	(mg/m^3)	4.0E-08	(mg/m^3)	1.4E-9
				Aluminum	7.3E-7	mg/m^3	4.3E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	5.0E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.000010
				Arsenic	6.5E-10	mg/m^3	3.8E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.6E-11	4.4E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000003
				Chromium VI	8.5E-9	mg/m^3	2.7E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.2E-08	5.8E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000006
				Cobalt	3.8E-10	mg/m^3	2.2E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.0E-11	2.6E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000004
				Iron	1.4E-6	mg/m^3	8.0E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	9.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Lead	2.2E-8	mg/m^3	1.3E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.0E-8	mg/m^3	1.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.4E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.00003
			Exp. Route Total								2.2E-08					0.00005
		Exposure Point Total									2.2E-08					0.00005
	Exposure Medium Total										2.2E-08					0.00005
Medium Total											1.2E-04					0.4

TABLE B-14
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	IOA - Low Concentrations Area	Ingestion	Benzo(a)pyrene Equivalents	0.210	mg/kg	2.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-06	5.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	1.50	mg/kg	3.5E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	7.0E-07	4.1E-06	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.2
				Heptachlor Epoxide	0.007	mg/kg	1.6E-09	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	1.4E-08	1.8E-08	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.001
				2,3,7,8-TCDD Equivalents	8.0E-6	mg/kg	1.9E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	2.4E-07	2.2E-11	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.03
				Aluminum	7,300	mg/kg	1.7E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.0E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	6.20	mg/kg	1.5E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-06	1.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Chromium VI	9.90	mg/kg	1.2E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	6.2E-06	2.7E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.009
				Cobalt	4.10	mg/kg	9.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Iron	15,000	mg/kg	3.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.06
				Lead	24.0	mg/kg	5.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	240	mg/kg	5.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.6E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.03
			Exp. Route Total								1.1E-05					0.4
			Dermal	Benzo(a)pyrene Equivalents	0.210	mg/kg	1.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-06	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	1.50	mg/kg	2.8E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	5.5E-07	3.2E-06	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.2
				Heptachlor Epoxide	0.007	mg/kg	8.8E-10	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	8.0E-09	1.0E-08	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.0008
				2,3,7,8-TCDD Equivalents	8.0E-6	mg/kg	3.2E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	4.1E-08	3.7E-12	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.005
				Aluminum	7,300	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.20	mg/kg	2.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.7E-07	2.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.010
				Chromium VI	9.90	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.10	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	15,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Lead	24.0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	240	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								2.4E-06					0.2
		Exposure Point Total									1.4E-05					0.6
	Exposure Medium Total										1.4E-05					0.6
	Air	IOA - Low Concentrations Area	Inhalation	Benzo(a)pyrene Equivalents	1.9E-11	mg/m^3		(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	--		(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-10	mg/m^3		(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	--		(mg/m^3)	NA	(mg/m^3)	--
				Heptachlor Epoxide	6.1E-13	mg/m^3		(mg/m^3)	2.6E-03	$(ug/m^3)^{-1}$	--		(mg/m^3)	NA	(mg/m^3)	--
				2,3,7,8-TCDD Equivalents	7.3E-16	mg/m^3		(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	--		(mg/m^3)	4.0E-08	(mg/m^3)	--
				Aluminum	6.6E-7	mg/m^3		(mg/m^3)	NA	$(ug/m^3)^{-1}$	--		(mg/m^3)	5.0E-03	(mg/m^3)	--
				Arsenic	5.6E-10	mg/m^3		(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	--		(mg/m^3)	1.5E-05	(mg/m^3)	--
				Chromium VI	9.0E-10	mg/m^3		(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	--		(mg/m^3)	1.0E-04	(mg/m^3)	--
				Cobalt	3.7E-10	mg/m^3		(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	--		(mg/m^3)	6.0E-06	(mg/m^3)	--
				Iron	1.4E-6	mg/m^3		(mg/m^3)	NA	$(ug/m^3)^{-1}$	--		(mg/m^3)	NA	(mg/m^3)	--
				Lead	2.2E-9	mg/m^3		(mg/m^3)	NA	$(ug/m^3)^{-1}$	--		(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.2E-8	mg/m^3		(mg/m^3)	NA	$(ug/m^3)^{-1}$	--		(mg/m^3)	5.0E-05	(mg/m^3)	--
			Exp. Route Total								--					--
		Exposure Point Total									--					--
	Exposure Medium Total										--					--
Medium Total											1.4E-05					0.6

TABLE B-14
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Ingestion	Benzo(a)pyrene Equivalents	0.253	mg/kg	3.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-06	6.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	1.70	mg/kg	4.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.0E-07	4.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium VI	9.20	mg/kg	1.2E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	5.8E-06	2.5E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.008
				Cobalt	4.70	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Iron	13,000	mg/kg	3.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.6E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.05
			Exp. Route Total								8.7E-06					0.1
			Dermal	Benzo(a)pyrene Equivalents	0.253	mg/kg	2.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	1.70	mg/kg	6.7E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.0E-07	7.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium VI	9.20	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.70	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	13,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
			Exp. Route Total								1.8E-06					0.003
		Exposure Point Total									1.0E-05					0.1
	Exposure Medium Total										1.0E-05					0.1
	Air	IOA - Entire Site	Inhalation	Benzo(a)pyrene Equivalents	2.3E-11	mg/m^3	7.2E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.9E-13	1.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	1.5E-10	mg/m^3	9.1E-13	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.9E-12	1.1E-11	(mg/m^3)	1.5E-05	(mg/m^3)	7.1E-7
				Chromium VI	8.4E-10	mg/m^3	2.6E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	2.2E-09	5.7E-11	(mg/m^3)	1.0E-04	(mg/m^3)	5.7E-7
				Cobalt	4.3E-10	mg/m^3	2.5E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.3E-11	2.9E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000005
				Iron	1.2E-6	mg/m^3	6.9E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	8.1E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-09					0.000006
		Exposure Point Total									2.2E-09					0.000006
	Exposure Medium Total										2.2E-09					0.000006
Medium Total											1.0E-05					0.1
										Total of Receptor Risks Across All Media	1.5E-04				Total of Receptor Hazards Across All Media	1.2

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

TABLE B-15
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	IOA - High Concentrations Area	Ingestion	Benzo(a)pyrene Equivalents	3.80	mg/kg	7.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-06	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.063	mg/kg	6.3E-09	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.3E-08	1.8E-08	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.0009
				Heptachlor Epoxide	0.160	mg/kg	1.6E-08	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	1.5E-07	4.7E-08	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.004
				2,3,7,8-TCDD Equivalents	9.2E-6	mg/kg	9.3E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	1.2E-07	2.7E-12	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.004
				Aluminum	8,000	mg/kg	8.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.3E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				Arsenic	7.10	mg/kg	7.1E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	2.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Chromium VI	93.8	mg/kg	1.7E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.7E-06	2.8E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.009
				Cobalt	4.20	mg/kg	4.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Iron	15,000	mg/kg	1.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.4E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.006
				Lead	240	mg/kg	2.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	7.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	220	mg/kg	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.5E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.003
			Exp. Route Total								1.5E-05					0.04
			Dermal	Benzo(a)pyrene Equivalents	3.80	mg/kg	7.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.3E-06	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.063	mg/kg	7.1E-09	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.4E-08	2.1E-08	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.001
				Heptachlor Epoxide	0.160	mg/kg	1.3E-08	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	1.2E-07	3.7E-08	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.003
				2,3,7,8-TCDD Equivalents	9.2E-6	mg/kg	2.2E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	2.9E-08	6.5E-13	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.0009
				Aluminum	8,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	7.10	mg/kg	1.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.6E-07	5.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Chromium VI	93.8	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.20	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	15,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Lead	240	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	220	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								5.7E-06					0.007
		Exposure Point Total									2.1E-05					0.05
	Exposure Medium Total										2.1E-05					0.05
	Air	IOA - High Concentrations Area	Inhalation	Benzo(a)pyrene Equivalents	3.5E-10	mg/m^3	1.5E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.6E-11	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	5.7E-12	mg/m^3	1.3E-13	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	7.7E-14	3.9E-13	(mg/m^3)	NA	(mg/m^3)	--
				Heptachlor Epoxide	1.5E-11	mg/m^3	3.4E-13	(mg/m^3)	2.6E-03	$(ug/m^3)^{-1}$	8.9E-13	1.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				2,3,7,8-TCDD Equivalents	8.4E-16	mg/m^3	2.0E-17	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	7.5E-13	5.7E-17	(mg/m^3)	4.0E-08	(mg/m^3)	1.4E-9
				Aluminum	7.3E-7	mg/m^3	1.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	5.0E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.000010
				Arsenic	6.5E-10	mg/m^3	1.5E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	6.5E-11	4.4E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000003
				Chromium VI	8.5E-9	mg/m^3	3.7E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.1E-08	5.8E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000006
				Cobalt	3.8E-10	mg/m^3	9.0E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	8.1E-11	2.6E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000004
				Iron	1.4E-6	mg/m^3	3.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	9.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Lead	2.2E-8	mg/m^3	5.1E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.0E-8	mg/m^3	4.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.4E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.00003
			Exp. Route Total								3.1E-08					0.00005
		Exposure Point Total									3.1E-08					0.00005
	Exposure Medium Total										3.1E-08					0.00005
Medium Total											2.1E-05					0.05

TABLE B-15
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	IOA - Low Concentrations Area	Ingestion	Benzo(a)pyrene Equivalents	0.210	mg/kg	3.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-07	6.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	1.50	mg/kg	1.5E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.0E-07	4.4E-07	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.02
				Heptachlor Epoxide	0.007	mg/kg	6.7E-10	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	6.1E-09	2.0E-09	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.0002
				2,3,7,8-TCDD Equivalents	8.0E-6	mg/kg	8.1E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	1.0E-07	2.3E-12	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.003
				Aluminum	7,300	mg/kg	7.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.1E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				Arsenic	6.20	mg/kg	6.2E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.4E-07	1.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
				Chromium VI	9.90	mg/kg	1.8E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	9.1E-07	2.9E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0010
				Cobalt	4.10	mg/kg	4.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Iron	15,000	mg/kg	1.5E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.4E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.006
				Lead	24.0	mg/kg	2.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	7.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	240	mg/kg	2.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	7.0E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.003
			Exp. Route Total								2.5E-06					0.05
			Dermal	Benzo(a)pyrene Equivalents	0.210	mg/kg	4.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.9E-07	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	1.50	mg/kg	1.7E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.4E-07	4.9E-07	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.02
				Heptachlor Epoxide	0.007	mg/kg	5.4E-10	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	4.9E-09	1.6E-09	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.0001
				2,3,7,8-TCDD Equivalents	8.0E-6	mg/kg	1.9E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	2.5E-08	5.6E-13	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.0008
				Aluminum	7,300	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.20	mg/kg	1.5E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-07	4.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				Chromium VI	9.90	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.10	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	15,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Lead	24.0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	240	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								8.8E-07					0.03
		Exposure Point Total									3.4E-06					0.07
	Exposure Medium Total										3.4E-06					0.07
	Air	IOA - Low Concentrations Area	Inhalation	Benzo(a)pyrene Equivalents	1.9E-11	mg/m^3	6.2E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.0E-13	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-10	mg/m^3	3.2E-12	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.8E-12	9.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Heptachlor Epoxide	6.1E-13	mg/m^3	1.4E-14	(mg/m^3)	2.6E-03	$(ug/m^3)^{-1}$	3.7E-14	4.2E-14	(mg/m^3)	NA	(mg/m^3)	--
				2,3,7,8-TCDD Equivalents	7.3E-16	mg/m^3	1.7E-17	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	6.5E-13	5.0E-17	(mg/m^3)	4.0E-08	(mg/m^3)	1.2E-9
				Aluminum	6.6E-7	mg/m^3	1.6E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	4.5E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.000009
				Arsenic	5.6E-10	mg/m^3	1.3E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	5.7E-11	3.9E-11	(mg/m^3)	1.5E-05	(mg/m^3)	0.000003
				Chromium VI	9.0E-10	mg/m^3	3.9E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.3E-09	6.2E-11	(mg/m^3)	1.0E-04	(mg/m^3)	6.2E-7
				Cobalt	3.7E-10	mg/m^3	8.8E-12	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	7.9E-11	2.6E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000004
				Iron	1.4E-6	mg/m^3	3.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	9.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Lead	2.2E-9	mg/m^3	5.1E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.2E-8	mg/m^3	5.1E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.5E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.00003
			Exp. Route Total								3.4E-09					0.00005
		Exposure Point Total									3.4E-09					0.00005
	Exposure Medium Total										3.4E-09					0.00005
Medium Total											3.4E-06					0.07

TABLE B-15
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Ingestion	Benzo(a)pyrene Equivalents	0.253	mg/kg	4.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.4E-07	7.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	1.70	mg/kg	1.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.6E-07	5.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Chromium VI	9.20	mg/kg	1.7E-06	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	8.5E-07	2.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0009
				Cobalt	4.70	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Iron	13,000	mg/kg	1.3E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.8E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
			Exp. Route Total								1.4E-06					0.01
			Dermal	Benzo(a)pyrene Equivalents	0.253	mg/kg	4.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-07	7.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	1.70	mg/kg	4.1E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.1E-08	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				Chromium VI	9.20	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.70	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	13,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
			Exp. Route Total								4.1E-07					0.0004
		Exposure Point Total									1.9E-06					0.01
	Exposure Medium Total										1.9E-06					0.01
	Air	IOA - Entire Site	Inhalation	Benzo(a)pyrene Equivalents	2.3E-11	mg/m^3	9.9E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-12	1.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	1.5E-10	mg/m^3	3.6E-12	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.6E-11	1.1E-11	(mg/m^3)	1.5E-05	(mg/m^3)	7.1E-7
				Chromium VI	8.4E-10	mg/m^3	3.6E-11	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.0E-09	5.7E-11	(mg/m^3)	1.0E-04	(mg/m^3)	5.7E-7
				Cobalt	4.3E-10	mg/m^3	1.0E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	9.0E-11	2.9E-11	(mg/m^3)	6.0E-06	(mg/m^3)	0.000005
				Iron	1.2E-6	mg/m^3	2.8E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	8.1E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.1E-09					0.000006
		Exposure Point Total									3.1E-09					0.000006
	Exposure Medium Total										3.1E-09					0.000006
Medium Total											1.9E-06					0.01
										Total of Receptor Risks Across All Media	2.6E-05				Total of Receptor Hazards Across All Media	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).

TABLE B-16
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	IOA - High Concentrations Area	Ingestion	Benzo(a)pyrene Equivalents	3.80	mg/kg	2.2E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-04	4.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.063	mg/kg	6.9E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.4E-07	8.1E-07	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.04
				Heptachlor Epoxide	0.160	mg/kg	1.8E-07	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	1.6E-06	2.0E-06	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.2
				2,3,7,8-TCDD Equivalents	9.2E-6	mg/kg	1.0E-11	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	1.3E-06	1.2E-10	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.2
				Aluminum	8,000	mg/kg	8.8E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.0E-01	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.1
				Arsenic	7.10	mg/kg	7.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-05	9.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Chromium VI	93.8	mg/kg	5.5E-04	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.7E-04	1.2E-03	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.4
				Cobalt	4.20	mg/kg	4.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	5.4E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Iron	15,000	mg/kg	1.6E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.9E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.3
				Lead	240	mg/kg	2.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.1E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	220	mg/kg	2.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.8E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.1
			Exp. Route Total								4.5E-04					1.7
			Dermal	Benzo(a)pyrene Equivalents	3.80	mg/kg	8.1E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.9E-05	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.063	mg/kg	2.7E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	5.4E-08	3.2E-07	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.02
				Heptachlor Epoxide	0.160	mg/kg	4.9E-08	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	4.5E-07	5.7E-07	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.04
				2,3,7,8-TCDD Equivalents	9.2E-6	mg/kg	8.5E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	1.1E-07	9.9E-12	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.01
				Aluminum	8,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	7.10	mg/kg	6.5E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.8E-07	7.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Chromium VI	93.8	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.20	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	15,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Lead	240	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	220	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								6.1E-05					0.10
		Exposure Point Total									5.1E-04					1.8
	Exposure Medium Total										5.1E-04					1.8
	Air	IOA - High Concentrations Area	Inhalation	Benzo(a)pyrene Equivalents	3.5E-10	mg/m^3	1.5E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-10	3.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	5.7E-12	mg/m^3	4.7E-13	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	2.7E-13	5.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Heptachlor Epoxide	1.5E-11	mg/m^3	1.2E-12	(mg/m^3)	2.6E-03	$(ug/m^3)^{-1}$	3.1E-12	1.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				2,3,7,8-TCDD Equivalents	8.4E-16	mg/m^3	6.9E-17	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	2.6E-12	8.0E-16	(mg/m^3)	4.0E-08	(mg/m^3)	2.0E-8
				Aluminum	7.3E-7	mg/m^3	6.0E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	7.0E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.0001
				Arsenic	6.5E-10	mg/m^3	5.3E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.3E-10	6.2E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00004
				Chromium VI	8.5E-9	mg/m^3	3.7E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.1E-07	8.2E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Cobalt	3.8E-10	mg/m^3	3.1E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.8E-10	3.7E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00006
				Iron	1.4E-6	mg/m^3	1.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Lead	2.2E-8	mg/m^3	1.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.0E-8	mg/m^3	1.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.9E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
			Exp. Route Total								3.1E-07					0.0007
		Exposure Point Total									3.1E-07					0.0007
	Exposure Medium Total										3.1E-07					0.0007
Medium Total											5.1E-04					1.8

TABLE B-16
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	IOA - Low Concentrations Area	Ingestion	Benzo(a)pyrene Equivalents	0.210	mg/kg	1.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.0E-06	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	1.50	mg/kg	1.6E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.3E-06	1.9E-05	(mg/kg/day)	2.0E-05	(mg/kg/day)	1.0
				Heptachlor Epoxide	0.007	mg/kg	7.3E-09	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	6.7E-08	8.6E-08	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.007
				2,3,7,8-TCDD Equivalents	8.0E-6	mg/kg	8.8E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	1.1E-06	1.0E-10	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.1
				Aluminum	7,300	mg/kg	8.0E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	9.3E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.09
				Arsenic	6.20	mg/kg	6.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.0E-05	7.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Chromium VI	9.90	mg/kg	5.8E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.9E-05	1.3E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
				Cobalt	4.10	mg/kg	4.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	5.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Iron	15,000	mg/kg	1.6E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.9E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.3
				Lead	24.0	mg/kg	2.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	240	mg/kg	2.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.1E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.1
			Exp. Route Total								5.3E-05					2.1
			Dermal	Benzo(a)pyrene Equivalents	0.210	mg/kg	4.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-06	9.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	1.50	mg/kg	6.4E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.3E-06	7.5E-06	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.4
				Heptachlor Epoxide	0.007	mg/kg	2.1E-09	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	1.9E-08	2.4E-08	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.002
				2,3,7,8-TCDD Equivalents	8.0E-6	mg/kg	7.4E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	9.6E-08	8.6E-12	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.01
				Aluminum	7,300	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.20	mg/kg	5.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.6E-07	6.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Chromium VI	9.90	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.10	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	15,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Lead	24.0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	240	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								5.5E-06					0.4
		Exposure Point Total									5.8E-05					2.5
	Exposure Medium Total										5.8E-05					2.5
	Air	IOA - Low Concentrations Area	Inhalation	Benzo(a)pyrene Equivalents	1.9E-11	mg/m^3	8.4E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.2E-12	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-10	mg/m^3	1.1E-11	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	6.4E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Heptachlor Epoxide	6.1E-13	mg/m^3	5.0E-14	(mg/m^3)	2.6E-03	$(ug/m^3)^{-1}$	1.3E-13	5.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				2,3,7,8-TCDD Equivalents	7.3E-16	mg/m^3	6.0E-17	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	2.3E-12	7.0E-16	(mg/m^3)	4.0E-08	(mg/m^3)	1.7E-8
				Aluminum	6.6E-7	mg/m^3	5.5E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	6.4E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.0001
				Arsenic	5.6E-10	mg/m^3	4.6E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	2.0E-10	5.4E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00004
				Chromium VI	9.0E-10	mg/m^3	3.9E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.3E-08	8.6E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000009
				Cobalt	3.7E-10	mg/m^3	3.1E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	2.8E-10	3.6E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00006
				Iron	1.4E-6	mg/m^3	1.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Lead	2.2E-9	mg/m^3	1.8E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.1E-09	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.2E-8	mg/m^3	1.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.1E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
			Exp. Route Total								3.4E-08					0.0006
		Exposure Point Total									3.4E-08					0.0006
	Exposure Medium Total										3.4E-08					0.0006
Medium Total											5.8E-05					2.5

TABLE B-16
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Ingestion	Benzo(a)pyrene Equivalents	0.253	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	1.70	mg/kg	1.9E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.8E-06	2.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Chromium VI	9.20	mg/kg	5.4E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	2.7E-05	1.2E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
				Cobalt	4.70	mg/kg	5.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.0E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Iron	13,000	mg/kg	1.4E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.7E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.2
			Exp. Route Total								4.0E-05					0.5
			Dermal	Benzo(a)pyrene Equivalents	0.253	mg/kg	5.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-06	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	1.70	mg/kg	1.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.3E-07	1.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
				Chromium VI	9.20	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.70	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	13,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
			Exp. Route Total								4.2E-06					0.006
		Exposure Point Total									4.5E-05					0.6
	Exposure Medium Total										4.5E-05					0.6
	Air	IOA - Entire Site	Inhalation	Benzo(a)pyrene Equivalents	2.3E-11	mg/m^3	1.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-11	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	1.5E-10	mg/m^3	1.3E-11	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	5.5E-11	1.5E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.000010
				Chromium VI	8.4E-10	mg/m^3	3.7E-10	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	3.1E-08	8.0E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000008
				Cobalt	4.3E-10	mg/m^3	3.5E-11	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.2E-10	4.1E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00007
				Iron	1.2E-6	mg/m^3	9.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.1E-08					0.00009
		Exposure Point Total									3.1E-08					0.00009
	Exposure Medium Total										3.1E-08					0.00009
Medium Total											4.5E-05					0.6
										Total of Receptor Risks Across All Media	6.1E-04				Total of Receptor Hazards Across All Media	4.9

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

TABLE B-17
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	IOA - High Concentrations Area	Ingestion	Benzo(a)pyrene Equivalents	3.80	mg/kg	3.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-05	5.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.063	mg/kg	3.0E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	5.9E-08	8.6E-08	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.004
				Heptachlor Epoxide	0.160	mg/kg	7.5E-08	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	6.8E-07	2.2E-07	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.02
				2,3,7,8-TCDD Equivalents	9.2E-6	mg/kg	4.3E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	5.6E-07	1.3E-11	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.02
				Aluminum	8,000	mg/kg	3.8E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.1E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.01
				Arsenic	7.10	mg/kg	3.3E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.0E-06	9.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Chromium VI	93.8	mg/kg	8.1E-05	(mg/kg/day)	5.0E-01	$(mg/kg/day)^{-1}$	4.0E-05	1.3E-04	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.04
				Cobalt	4.20	mg/kg	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	5.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	15,000	mg/kg	7.0E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Lead	240	mg/kg	1.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	220	mg/kg	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.0E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.01
			Exp. Route Total								7.1E-05					0.2
			Dermal	Benzo(a)pyrene Equivalents	3.80	mg/kg	1.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-05	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.063	mg/kg	1.7E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.3E-08	4.8E-08	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.002
				Heptachlor Epoxide	0.160	mg/kg	3.0E-08	(mg/kg/day)	9.1E+00	$(mg/kg/day)^{-1}$	2.7E-07	8.7E-08	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.007
				2,3,7,8-TCDD Equivalents	9.2E-6	mg/kg	5.2E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	6.7E-08	1.5E-12	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.002
				Aluminum	8,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	7.10	mg/kg	4.0E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.0E-07	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Chromium VI	93.8	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.20	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	15,000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Lead	240	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	220	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								1.3E-05					0.02
		Exposure Point Total									8.4E-05					0.2
	Exposure Medium Total										8.4E-05					0.2
	Air	IOA - High Concentrations Area	Inhalation	Benzo(a)pyrene Equivalents	3.5E-10	mg/m^3	2.1E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.3E-10	3.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	5.7E-12	mg/m^3	1.9E-12	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.1E-12	5.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Heptachlor Epoxide	1.5E-11	mg/m^3	4.8E-12	(mg/m^3)	2.6E-03	$(ug/m^3)^{-1}$	1.2E-11	1.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				2,3,7,8-TCDD Equivalents	8.4E-16	mg/m^3	2.7E-16	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	1.0E-11	8.0E-16	(mg/m^3)	4.0E-08	(mg/m^3)	2.0E-8
				Aluminum	7.3E-7	mg/m^3	2.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	7.0E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.0001
				Arsenic	6.5E-10	mg/m^3	2.1E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	9.1E-10	6.2E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00004
				Chromium VI	8.5E-9	mg/m^3	5.1E-09	(mg/m^3)	8.4E-02	$(ug/m^3)^{-1}$	4.3E-07	8.2E-09	(mg/m^3)	1.0E-04	(mg/m^3)	0.00008
				Cobalt	3.8E-10	mg/m^3	1.3E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.1E-09	3.7E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00006
				Iron	1.4E-6	mg/m^3	4.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Lead	2.2E-8	mg/m^3	7.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.0E-8	mg/m^3	6.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.9E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
			Exp. Route Total								4.3E-07					0.0007
		Exposure Point Total									4.3E-07					0.0007
	Exposure Medium Total										4.3E-07					0.0007
Medium Total											8.4E-05					0.2

TABLE B-17
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	IOA - Low Concentrations Area	Ingestion	Benzo(a)pyrene Equivalents	0.210	mg/kg	1.8E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.3E-06	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	1.50	mg/kg	7.0E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.4E-06	2.1E-06	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.1
				Heptachlor Epoxide	0.007	mg/kg	3.1E-09	(mg/kg/day)	9.1E+00	(mg/kg/day)$^{-1}$	2.9E-08	9.2E-09	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.0007
				2,3,7,8-TCDD Equivalents	8.0E-6	mg/kg	3.8E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	4.9E-07	1.1E-11	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.02
				Aluminum	7,300	mg/kg	3.4E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.0E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.010
				Arsenic	6.20	mg/kg	2.9E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.4E-06	8.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				Chromium VI	9.90	mg/kg	8.5E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	4.3E-06	1.4E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.005
				Cobalt	4.10	mg/kg	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	5.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	15,000	mg/kg	7.0E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	2.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Lead	24.0	mg/kg	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	3.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	240	mg/kg	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	3.3E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.01
			Exp. Route Total								1.2E-05					0.2
			Dermal	Benzo(a)pyrene Equivalents	0.210	mg/kg	9.4E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	6.8E-07	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	1.50	mg/kg	3.9E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	7.9E-07	1.1E-06	(mg/kg/day)	2.0E-05	(mg/kg/day)	0.06
				Heptachlor Epoxide	0.007	mg/kg	1.3E-09	(mg/kg/day)	9.1E+00	(mg/kg/day)$^{-1}$	1.1E-08	3.7E-09	(mg/kg/day)	1.3E-05	(mg/kg/day)	0.0003
				2,3,7,8-TCDD Equivalents	8.0E-6	mg/kg	4.5E-13	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	5.8E-08	1.3E-12	(mg/kg/day)	7.0E-10	(mg/kg/day)	0.002
				Aluminum	7,300	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	1.0E+00	(mg/kg/day)	--
				Arsenic	6.20	mg/kg	3.5E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.2E-07	1.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Chromium VI	9.90	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.10	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	15,000	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
				Lead	24.0	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Manganese	240	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	9.6E-04	(mg/kg/day)	--
			Exp. Route Total								2.1E-06					0.06
		Exposure Point Total									1.4E-05					0.3
	Exposure Medium Total										1.4E-05					0.3
	Air	IOA - Low Concentrations Area	Inhalation	Benzo(a)pyrene Equivalents	1.9E-11	mg/m^3	1.2E-11	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.3E-11	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-10	mg/m^3	4.5E-11	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	2.6E-11	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Heptachlor Epoxide	6.1E-13	mg/m^3	2.0E-13	(mg/m^3)	2.6E-03	(ug/m^3)$^{-1}$	5.2E-13	5.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				2,3,7,8-TCDD Equivalents	7.3E-16	mg/m^3	2.4E-16	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	9.1E-12	7.0E-16	(mg/m^3)	4.0E-08	(mg/m^3)	1.7E-8
				Aluminum	6.6E-7	mg/m^3	2.2E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	6.4E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.0001
				Arsenic	5.6E-10	mg/m^3	1.9E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	8.0E-10	5.4E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00004
				Chromium VI	9.0E-10	mg/m^3	5.4E-10	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	4.6E-08	8.6E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000009
				Cobalt	3.7E-10	mg/m^3	1.2E-10	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	1.1E-09	3.6E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00006
				Iron	1.4E-6	mg/m^3	4.5E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	1.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Lead	2.2E-9	mg/m^3	7.2E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	2.1E-09	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	2.2E-8	mg/m^3	7.2E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	2.1E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0004
			Exp. Route Total								4.8E-08					0.0006
		Exposure Point Total									4.8E-08					0.0006
	Exposure Medium Total										4.8E-08					0.0006
Medium Total											1.4E-05					0.3

TABLE B-17
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Ingestion	Benzo(a)pyrene Equivalents	0.253	mg/kg	2.2E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.6E-06	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	1.70	mg/kg	8.0E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.2E-06	2.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.008
				Chromium VI	9.20	mg/kg	7.9E-06	(mg/kg/day)	5.0E-01	(mg/kg/day)$^{-1}$	4.0E-06	1.3E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Cobalt	4.70	mg/kg	2.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	6.4E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	13,000	mg/kg	6.1E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.8E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
			Exp. Route Total								6.7E-06					0.06
			Dermal	Benzo(a)pyrene Equivalents	0.253	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	8.2E-07	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Arsenic	1.70	mg/kg	9.6E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-07	2.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0009
				Chromium VI	9.20	mg/kg	0.0E+00	(mg/kg/day)	2.0E+01	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	7.5E-05	(mg/kg/day)	--
				Cobalt	4.70	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	3.0E-04	(mg/kg/day)	--
				Iron	13,000	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	7.0E-01	(mg/kg/day)	--
			Exp. Route Total								9.7E-07					0.0009
		Exposure Point Total									7.7E-06					0.06
	Exposure Medium Total										7.7E-06					0.06
	Air	IOA - Entire Site	Inhalation	Benzo(a)pyrene Equivalents	2.3E-11	mg/m^3	1.4E-11	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.5E-11	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Arsenic	1.5E-10	mg/m^3	5.1E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	2.2E-10	1.5E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.000010
				Chromium VI	8.4E-10	mg/m^3	5.0E-10	(mg/m^3)	8.4E-02	(ug/m^3)$^{-1}$	4.2E-08	8.0E-10	(mg/m^3)	1.0E-04	(mg/m^3)	0.000008
				Cobalt	4.3E-10	mg/m^3	1.4E-10	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	1.3E-09	4.1E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00007
				Iron	1.2E-6	mg/m^3	3.9E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.4E-08					0.00009
		Exposure Point Total									4.4E-08					0.00009
	Exposure Medium Total										4.4E-08					0.00009
Medium Total											7.8E-06					0.06
										Total of Receptor Risks Across All Media	1.1E-04				Total of Receptor Hazards Across All Media	0.5

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

TABLE B-18
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Commercial Receptor
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	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	3E-05	--	3E-05	--	6E-05	NA	--	--	--	--
			Aroclor-1260	3E-08	--	2E-08	--	5E-08	Immune	0.009	--	0.007	0.02
			Heptachlor Epoxide	3E-07	--	2E-07	--	5E-07	Liver	0.03	--	0.02	0.05
			2,3,7,8-TCDD Equivalents	3E-07	--	5E-08	--	3E-07	Reproductive	0.04	--	0.006	0.04
			Aluminum	--	--	--	--	--	CNS	0.02	--	--	0.02
			Arsenic	3E-06	--	4E-07	--	3E-06	Skin, CVS	0.06	--	0.01	0.08
			Chromium VI	6E-05	--	--	--	6E-05	None Specified	0.09	--	--	0.09
			Cobalt	--	--	--	--	--	Thyroid	0.04	--	--	0.04
			Iron	--	--	--	--	--	GS	0.06	--	--	0.06
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	0.03	--	--	0.03
			Chemical Total	1E-04	--	3E-05	--	1E-04		0.4	--	0.04	0.4
		Exposure Point Total						1E-04					0.4
	Exposure Medium Total							1E-04					0.4
	Air	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Aroclor-1260	--	2E-14	--	--	2E-14	NA	--	--	--	--
			Heptachlor Epoxide	--	2E-13	--	--	2E-13	NA	--	--	--	--
			2,3,7,8-TCDD Equivalents	--	2E-13	--	--	2E-13	Reproductive, Respir	--	1E-9	--	1E-9
			Aluminum	--	--	--	--	--	CNS	--	0.000010	--	0.000010
			Arsenic	--	2E-11	--	--	2E-11	NA	--	0.000003	--	0.000003
			Chromium VI	--	2E-08	--	--	2E-08	Respiratory	--	0.000006	--	0.000006
			Cobalt	--	2E-11	--	--	2E-11	Respiratory	--	0.000004	--	0.000004
			Iron	--	--	--	--	--	NA	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	0.00003	--	0.00003
			Chemical Total	--	2E-08	--	--	2E-08		--	0.00005	--	0.00005
		Exposure Point Total						2E-08					0.00005
	Exposure Medium Total							2E-08					0.00005
Medium Total								1E-04					0.4

TABLE B-18
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Commercial Receptor
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	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	2E-06	--	1E-06	--	3E-06	NA	--	--	--	--
			Aroclor-1260	7E-07	--	6E-07	--	1E-06	Immune	0.2	--	0.2	0.4
			Heptachlor Epoxide	1E-08	--	8E-09	--	2E-08	Liver	0.001	--	0.0008	0.002
			2,3,7,8-TCDD Equivalents	2E-07	--	4E-08	--	3E-07	Reproductive	0.03	--	0.005	0.04
			Aluminum	--	--	--	--	--	CNS	0.02	--	--	0.02
			Arsenic	2E-06	--	4E-07	--	3E-06	Skin, CVS	0.06	--	0.010	0.07
			Chromium VI	6E-06	--	--	--	6E-06	None Specified	0.009	--	--	0.009
			Cobalt	--	--	--	--	--	Thyroid	0.04	--	--	0.04
			Iron	--	--	--	--	--	GS	0.06	--	--	0.06
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	0.03	--	--	0.03
			Chemical Total	1E-05	--	2E-06	--	1E-05		0.4	--	0.2	0.6
		Exposure Point Total						1E-05					0.6
	Exposure Medium Total							1E-05					0.6
	Air	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	--	--	--	--	--	NA	--	--	--	--
			Aroclor-1260	--	--	--	--	--	NA	--	--	--	--
			Heptachlor Epoxide	--	--	--	--	--	NA	--	--	--	--
			2,3,7,8-TCDD Equivalents	--	--	--	--	--	Reproductive, Respir	--	--	--	--
			Aluminum	--	--	--	--	--	CNS	--	--	--	--
			Arsenic	--	--	--	--	--	NA	--	--	--	--
			Chromium VI	--	--	--	--	--	Respiratory	--	--	--	--
			Cobalt	--	--	--	--	--	Respiratory	--	--	--	--
			Iron	--	--	--	--	--	NA	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	--	--	--
			Chemical Total	--	--	--	--	--		--	--	--	--
		Exposure Point Total						--					--
	Exposure Medium Total							--					--
Medium Total								1E-05					0.6
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Benzo(a)pyrene Equivalents	2E-06	--	2E-06	--	4E-06	NA	--	--	--	--
			Arsenic	6E-07	--	1E-07	--	7E-07	Skin, CVS	0.02	--	0.003	0.02
			Chromium VI	6E-06	--	--	--	6E-06	None Specified	0.008	--	--	0.008
			Cobalt	--	--	--	--	--	Thyroid	0.04	--	--	0.04
			Iron	--	--	--	--	--	GS	0.05	--	--	0.05
			Chemical Total	9E-06	--	2E-06	--	1E-05		0.1	--	0.003	0.1
		Exposure Point Total						1E-05					0.1
	Exposure Medium Total							1E-05					0.1
	Air	IOA - Entire Site	Benzo(a)pyrene Equivalents	--	8E-13	--	--	8E-13	NA	--	--	--	--
			Arsenic	--	4E-12	--	--	4E-12	NA	--	0.0000007	--	0.0000007
			Chromium VI	--	2E-09	--	--	2E-09	Respiratory	--	0.0000006	--	0.0000006
			Cobalt	--	2E-11	--	--	2E-11	Respiratory	--	0.000005	--	0.000005
			Iron	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		--	0.000006	--	0.000006
		Exposure Point Total						2E-09					0.000006
	Exposure Medium Total							2E-09					0.000006
Medium Total								1E-05					0.1
Receptor Total							Receptor Risk Total	1E-04				Receptor HI Total	1

TABLE B-18
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Commercial Receptor
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

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

Total CNS HI	0.09
Total CVS HI	0.2
Total GS HI	0.2
Total Immune HI	0.4
Total Liver HI	0.05
Total Respiratory HI	0.00002
Total None Specified HI	0.1
Total Skin HI	0.2
Total Thyroid HI	0.1
Total Reproductive HI	0.08

TABLE B-19
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Commercial Receptor
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	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	5E-06	--	5E-06	--	1E-05	NA	--	--	--	--
			Aroclor-1260	1E-08	--	1E-08	--	3E-08	Immune	0.0009	--	0.001	0.002
			Heptachlor Epoxide	1E-07	--	1E-07	--	3E-07	Liver	0.004	--	0.003	0.006
			2,3,7,8-TCDD Equivalents	1E-07	--	3E-08	--	1E-07	Reproductive	0.004	--	0.0009	0.005
			Aluminum	--	--	--	--	--	CNS	0.002	--	--	0.002
			Arsenic	1E-06	--	3E-07	--	1E-06	Skin, CVS	0.007	--	0.002	0.009
			Chromium VI	9E-06	--	--	--	9E-06	None Specified	0.009	--	--	0.009
			Cobalt	--	--	--	--	--	Thyroid	0.004	--	--	0.004
			Iron	--	--	--	--	--	GS	0.006	--	--	0.006
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	0.003	--	--	0.003
			Chemical Total	2E-05	--	6E-06	--	2E-05		0.04	--	0.007	0.05
		Exposure Point Total						2E-05					0.05
	Exposure Medium Total							2E 05					0.05
	Air	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	8E-14	--	--	8E-14	NA	--	--	--	--
			Heptachlor Epoxide	--	9E-13	--	--	9E-13	NA	--	--	--	--
			2,3,7,8-TCDD Equivalents	--	7E-13	--	--	7E-13	Reproductive, Respir	--	1E-9	--	1E-9
			Aluminum	--	--	--	--	--	CNS	--	0.000010	--	0.000010
			Arsenic	--	7E-11	--	--	7E-11	NA	--	0.000003	--	0.000003
			Chromium VI	--	3E-08	--	--	3E-08	Respiratory	--	0.000006	--	0.000006
			Cobalt	--	8E-11	--	--	8E-11	Respiratory	--	0.000004	--	0.000004
			Iron	--	--	--	--	--	NA	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	0.00003	--	0.00003
			Chemical Total	--	3E-08	--	--	3E-08		--	0.00005	--	0.00005
		Exposure Point Total						3E-08					0.00005
	Exposure Medium Total							3E-08					0.00005
Medium Total								2E-05					0.05

TABLE B-19
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Commercial Receptor
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	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	3E-07	--	3E-07	--	6E-07	NA	--	--	--	--
			Aroclor-1260	3E-07	--	3E-07	--	6E-07	Immune	0.02	--	0.02	0.05
			Heptachlor Epoxide	6E-09	--	5E-09	--	1E-08	Liver	0.0002	--	0.0001	0.0003
			2,3,7,8-TCDD Equivalents	1E-07	--	3E-08	--	1E-07	Reproductive	0.003	--	0.0008	0.004
			Aluminum	--	--	--	--	--	CNS	0.002	--	--	0.002
			Arsenic	9E-07	--	2E-07	--	1E-06	Skin, CVS	0.006	--	0.001	0.008
			Chromium VI	9E-07	--	--	--	9E-07	None Specified	0.0010	--	--	0.0010
			Cobalt	--	--	--	--	--	Thyroid	0.004	--	--	0.004
			Iron	--	--	--	--	--	GS	0.006	--	--	0.006
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	0.003	--	--	0.003
			Chemical Total	3E-06	--	9E-07	--	3E-06		0.05	--	0.03	0.07
		Exposure Point Total						3E-06					0.07
	Exposure Medium Total							3E-06					0.07
	Air	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	--	9E-13	--	--	9E-13	NA	--	--	--	--
			Aroclor-1260	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Heptachlor Epoxide	--	4E-14	--	--	4E-14	NA	--	--	--	--
			2,3,7,8-TCDD Equivalents	--	6E-13	--	--	6E-13	Reproductive, Respir	--	1E-9	--	1E-9
			Aluminum	--	--	--	--	--	CNS	--	0.000009	--	0.000009
			Arsenic	--	6E-11	--	--	6E-11	NA	--	0.000003	--	0.000003
			Chromium VI	--	3E-09	--	--	3E-09	Respiratory	--	0.0000006	--	0.0000006
			Cobalt	--	8E-11	--	--	8E-11	Respiratory	--	0.000004	--	0.000004
			Iron	--	--	--	--	--	NA	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	0.00003	--	0.00003
			Chemical Total	--	3E-09	--	--	3E-09		--	0.00005	--	0.00005
		Exposure Point Total						3E-09					0.00005
	Exposure Medium Total							3E-09					0.00005
Medium Total								3E-06					0.07
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Benzo(a)pyrene Equivalents	3E-07	--	4E-07	--	7E-07	NA	--	--	--	--
			Arsenic	3E-07	--	6E-08	--	3E-07	Skin, CVS	0.002	--	0.0004	0.002
			Chromium VI	8E-07	--	--	--	8E-07	None Specified	0.0009	--	--	0.0009
			Cobalt	--	--	--	--	--	Thyroid	0.005	--	--	0.005
			Iron	--	--	--	--	--	GS	0.005	--	--	0.005
			Chemical Total	1E-06	--	4E-07	--	2E-06		0.01	--	0.0004	0.01
		Exposure Point Total						2E-06					0.01
	Exposure Medium Total							2E-06					0.01
	Air	IOA - Entire Site	Benzo(a)pyrene Equivalents	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Arsenic	--	2E-11	--	--	2E-11	NA	--	0.0000007	--	0.0000007
			Chromium VI	--	3E-09	--	--	3E-09	Respiratory	--	0.0000006	--	0.0000006
			Cobalt	--	9E-11	--	--	9E-11	Respiratory	--	0.000005	--	0.000005
			Iron	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	3E-09	--	--	3E-09		--	0.000006	--	0.000006
		Exposure Point Total						3E-09					0.000006
	Exposure Medium Total							3E-09					0.000006
Medium Total								2E-06					0.01
Receptor Total							Receptor Risk Total	3E-05				Receptor HI Total	0.1

TABLE B-19
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Commercial Receptor
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

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

Total CNS HI	0.01
Total CVS HI	0.02
Total GS HI	0.02
Total Immune HI	0.05
Total Liver HI	0.007
Total Respiratory HI	0.00002
Total None Specified HI	0.01
Total Skin HI	0.02
Total Thyroid HI	0.01
Total Reproductive HI	0.009

TABLE B-20
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Commercial Receptor
Receptor Age: Lifelong (Child and 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	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	4E-05	--	3E-05	--	7E-05					
			Aroclor-1260	4E-08	--	4E-08	--	8E-08					
			Heptachlor Epoxide	5E-07	--	3E-07	--	8E-07					
			2,3,7,8-TCDD Equivalents	4E-07	--	8E-08	--	5E-07					
			Aluminum	--	--	--	--	--					
			Arsenic	4E-06	--	7E-07	--	4E-06					
			Chromium VI	7E-05	--	--	--	7E-05					
			Cobalt	--	--	--	--	--					
			Iron	--	--	--	--	--					
			Lead	--	--	--	--	--					
			Manganese	--	--	--	--	--					
			Chemical Total	1E-04	--	3E-05	--	1E-04					
		Exposure Point Total						1E-04					
	Exposure Medium Total							1E-04					
	Air	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	--	3E-11	--	--	3E-11					
			Aroclor-1260	--	1E-13	--	--	1E-13					
			Heptachlor Epoxide	--	1E-12	--	--	1E-12					
			2,3,7,8-TCDD Equivalents	--	9E-13	--	--	9E-13					
			Aluminum	--	--	--	--	--					
			Arsenic	--	8E-11	--	--	8E-11					
			Chromium VI	--	5E-08	--	--	5E-08					
			Cobalt	--	1E-10	--	--	1E-10					
			Iron	--	--	--	--	--					
			Lead	--	--	--	--	--					
			Manganese	--	--	--	--	--					
			Chemical Total	--	5E-08	--	--	5E-08					
		Exposure Point Total						5E-08					
	Exposure Medium Total							5E-08					
Medium Total								1E-04					

TABLE B-20
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Commercial Receptor
Receptor Age: Lifelong (Child and 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	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	2E-06	--	2E-06	--	4E-06					
			Aroclor-1260	1E-06	--	9E-07	--	2E-06					
			Heptachlor Epoxide	2E-08	--	1E-08	--	3E-08					
			2,3,7,8-TCDD Equivalents	3E-07	--	7E-08	--	4E-07					
			Aluminum	--	--	--	--	--					
			Arsenic	3E-06	--	6E-07	--	4E-06					
			Chromium VI	7E-06	--	--	--	7E-06					
			Cobalt	--	--	--	--	--					
			Iron	--	--	--	--	--					
			Lead	--	--	--	--	--					
			Manganese	--	--	--	--	--					
			Chemical Total	1E-05	--	3E-06	--	2E-05					
		Exposure Point Total						2E-05					
	Exposure Medium Total							2E-05					
	Air	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	--	9E-13	--	--	9E-13					
			Aroclor-1260	--	2E-12	--	--	2E-12					
			Heptachlor Epoxide	--	4E-14	--	--	4E-14					
			2,3,7,8-TCDD Equivalents	--	6E-13	--	--	6E-13					
			Aluminum	--	--	--	--	--					
			Arsenic	--	6E-11	--	--	6E-11					
			Chromium VI	--	3E-09	--	--	3E-09					
			Cobalt	--	8E-11	--	--	8E-11					
			Iron	--	--	--	--	--					
			Lead	--	--	--	--	--					
			Manganese	--	--	--	--	--					
			Chemical Total	--	3E-09	--	--	3E-09					
		Exposure Point Total						3E-09					
	Exposure Medium Total							3E-09					
Medium Total								2E-05					
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Benzo(a)pyrene Equivalents	3E-06	--	2E-06	--	5E-06					
			Arsenic	9E-07	--	2E-07	--	1E-06					
			Chromium VI	7E-06	--	--	--	7E-06					
			Cobalt	--	--	--	--	--					
			Iron	--	--	--	--	--					
			Chemical Total	1E-05	--	2E-06	--	1E-05					
		Exposure Point Total						1E-05					
	Exposure Medium Total							1E-05					
	Air	IOA - Entire Site	Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12					
			Arsenic	--	2E-11	--	--	2E-11					
			Chromium VI	--	5E-09	--	--	5E-09					
			Cobalt	--	1E-10	--	--	1E-10					
			Iron	--	--	--	--	--					
			Chemical Total	--	5E-09	--	--	5E-09					
		Exposure Point Total						5E-09					
	Exposure Medium Total							5E-09					
Medium Total								1E-05					
Receptor Total							Receptor Risk Total	2E-04					

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

TABLE B-21
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	2E-04	--	6E-05	--	2E-04	NA	--	--	--	--
			Aroclor-1260	1E-07	--	5E-08	--	2E-07	Immune	0.04	--	0.02	0.06
			Heptachlor Epoxide	2E-06	--	4E-07	--	2E-06	Liver	0.2	--	0.04	0.2
			2,3,7,8-TCDD Equivalents	1E-06	--	1E-07	--	1E-06	Reproductive	0.2	--	0.01	0.2
			Aluminum	--	--	--	--	--	CNS	0.1	--	--	0.1
			Arsenic	1E-05	--	1E-06	--	1E-05	Skin, CVS	0.3	--	0.03	0.3
			Chromium VI	3E-04	--	--	--	3E-04	None Specified	0.4	--	--	0.4
			Cobalt	--	--	--	--	--	Thyroid	0.2	--	--	0.2
			Iron	--	--	--	--	--	GS	0.3	--	--	0.3
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	0.1	--	--	0.1
			Chemical Total	5E-04	--	6E-05	--	5E-04		2	--	0.10	2
		Exposure Point Total						5E-04					2
	Exposure Medium Total							5E-04					2
	Air	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	--	2E-10	--	--	2E-10	NA	--	--	--	--
			Aroclor-1260	--	3E-13	--	--	3E-13	NA	--	--	--	--
			Heptachlor Epoxide	--	3E-12	--	--	3E-12	NA	--	--	--	--
			2,3,7,8-TCDD Equivalents	--	3E-12	--	--	3E-12	Reproductive, Respi	--	2E-8	--	2E-8
			Aluminum	--	--	--	--	--	CNS	--	0.0001	--	0.0001
			Arsenic	--	2E-10	--	--	2E-10	NA	--	0.00004	--	0.00004
			Chromium VI	--	3E-07	--	--	3E-07	Respiratory	--	0.00008	--	0.00008
			Cobalt	--	3E-10	--	--	3E-10	Respiratory	--	0.00006	--	0.00006
			Iron	--	--	--	--	--	NA	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	0.0004	--	0.0004
			Chemical Total	--	3E-07	--	--	3E-07		--	0.0007	--	0.0007
		Exposure Point Total						3E-07					0.0007
	Exposure Medium Total							3E-07					0.0007
Medium Total								5E-04					2

TABLE B-21
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	9E-06	--	3E-06	--	1E-05	NA	--	--	--	--
			Aroclor-1260	3E-06	--	1E-06	--	5E-06	Immune	1.0	--	0.4	1
			Heptachlor Epoxide	7E-08	--	2E-08	--	9E-08	Liver	0.007	--	0.002	0.008
			2,3,7,8-TCDD Equivalents	1E-06	--	1E-07	--	1E-06	Reproductive	0.1	--	0.01	0.2
			Aluminum	--	--	--	--	--	CNS	0.09	--	--	0.09
			Arsenic	1E-05	--	9E-07	--	1E-05	Skin, CVS	0.3	--	0.02	0.3
			Chromium VI	3E-05	--	--	--	3E-05	None Specified	0.04	--	--	0.04
			Cobalt	--	--	--	--	--	Thyroid	0.2	--	--	0.2
			Iron	--	--	--	--	--	GS	0.3	--	--	0.3
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	0.1	--	--	0.1
			Chemical Total	5E-05	--	6E-06	--	6E-05		2	--	0.4	3
		Exposure Point Total						6E-05					3
	Exposure Medium Total							6E-05					3
	Air	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	--	9E-12	--	--	9E-12	NA	--	--	--	--
			Aroclor-1260	--	6E-12	--	--	6E-12	NA	--	--	--	--
			Heptachlor Epoxide	--	1E-13	--	--	1E-13	NA	--	--	--	--
			2,3,7,8-TCDD Equivalents	--	2E-12	--	--	2E-12	Reproductive, Respi	--	2E-8	--	2E-8
			Aluminum	--	--	--	--	--	CNS	--	0.0001	--	0.0001
			Arsenic	--	2E-10	--	--	2E-10	NA	--	0.00004	--	0.00004
			Chromium VI	--	3E-08	--	--	3E-08	Respiratory	--	0.000009	--	0.000009
			Cobalt	--	3E-10	--	--	3E-10	Respiratory	--	0.00006	--	0.00006
			Iron	--	--	--	--	--	NA	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	0.0004	--	0.0004
			Chemical Total	--	3E-08	--	--	3E-08		--	0.0006	--	0.0006
		Exposure Point Total						3E-08					0.0006
	Exposure Medium Total							3E-08					0.0006
Medium Total								6E-05					3
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Benzo(a)pyrene Equivalents	1E-05	--	4E-06	--	1E-05	NA	--	--	--	--
			Arsenic	3E-06	--	2E-07	--	3E-06	Skin, CVS	0.07	--	0.006	0.08
			Chromium VI	3E-05	--	--	--	3E-05	None Specified	0.04	--	--	0.04
			Cobalt	--	--	--	--	--	Thyroid	0.2	--	--	0.2
			Iron	--	--	--	--	--	GS	0.2	--	--	0.2
			Chemical Total	4E-05	--	4E-06	--	4E-05		0.5	--	0.006	0.6
		Exposure Point Total						4E-05					0.6
	Exposure Medium Total							4E-05					0.6
	Air	IOA - Entire Site	Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Arsenic	--	5E-11	--	--	5E-11	NA	--	0.000010	--	0.000010
			Chromium VI	--	3E-08	--	--	3E-08	Respiratory	--	0.000008	--	0.000008
			Cobalt	--	3E-10	--	--	3E-10	Respiratory	--	0.00007	--	0.00007
			Iron	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	3E-08	--	--	3E-08		--	0.00009	--	0.00009
		Exposure Point Total						3E-08					0.00009
	Exposure Medium Total							3E-08					0.00009
Medium Total								4E-05					0.6
Receptor Total							Receptor Risk Total	6E-04				Receptor HI Total	5

TABLE B-21
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

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

Total CNS HI	0.4
Total CVS HI	0.7
Total GS HI	0.8
Total Immune HI	1
Total Liver HI	0.2
Total Respiratory HI	0.0003
Total None Specified HI	0.5
Total Skin HI	0.7
Total Thyroid HI	0.6
Total Reproductive HI	0.3

TABLE B-22
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	2E-05	--	1E-05	--	4E-05	NA	--	--	--	--
			Aroclor-1260	6E-08	--	3E-08	--	9E-08	Immune	0.004	--	0.002	0.007
			Heptachlor Epoxide	7E-07	--	3E-07	--	1E-06	Liver	0.02	--	0.007	0.02
			2,3,7,8-TCDD Equivalents	6E-07	--	7E-08	--	6E-07	Reproductive	0.02	--	0.002	0.02
			Aluminum	--	--	--	--	--	CNS	0.01	--	--	0.01
			Arsenic	5E-06	--	6E-07	--	6E-06	Skin, CVS	0.03	--	0.004	0.04
			Chromium VI	4E-05	--	--	--	4E-05	None Specified	0.04	--	--	0.04
			Cobalt	--	--	--	--	--	Thyroid	0.02	--	--	0.02
			Iron	--	--	--	--	--	GS	0.03	--	--	0.03
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	0.01	--	--	0.01
			Chemical Total	7E-05	--	1E-05	--	8E-05		0.2	--	0.02	0.2
		Exposure Point Total						8E-05					0.2
	Exposure Medium Total							8E-05					0.2
	Air	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	--	2E-10	--	--	2E-10	NA	--	--	--	--
			Aroclor-1260	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Heptachlor Epoxide	--	1E-11	--	--	1E-11	NA	--	--	--	--
			2,3,7,8-TCDD Equivalents	--	1E-11	--	--	1E-11	Reproductive, Respir	--	2E-8	--	2E-8
			Aluminum	--	--	--	--	--	CNS	--	0.0001	--	0.0001
			Arsenic	--	9E-10	--	--	9E-10	NA	--	0.00004	--	0.00004
			Chromium VI	--	4E-07	--	--	4E-07	Respiratory	--	0.00008	--	0.00008
			Cobalt	--	1E-09	--	--	1E-09	Respiratory	--	0.00006	--	0.00006
			Iron	--	--	--	--	--	NA	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	0.0004	--	0.0004
			Chemical Total	--	4E-07	--	--	4E-07		--	0.0007	--	0.0007
		Exposure Point Total						4E-07					0.0007
	Exposure Medium Total							4E-07					0.0007
Medium Total								8E-05					0.2

TABLE B-22
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	1E-06	--	7E-07	--	2E-06	NA	--	--	--	--
			Aroclor-1260	1E-06	--	8E-07	--	2E-06	Immune	0.1	--	0.06	0.2
			Heptachlor Epoxide	3E-08	--	1E-08	--	4E-08	Liver	0.0007	--	0.0003	0.0010
			2,3,7,8-TCDD Equivalents	5E-07	--	6E-08	--	5E-07	Reproductive	0.02	--	0.002	0.02
			Aluminum	--	--	--	--	--	CNS	0.010	--	--	0.010
			Arsenic	4E-06	--	5E-07	--	5E-06	Skin, CVS	0.03	--	0.003	0.03
			Chromium VI	4E-06	--	--	--	4E-06	None Specified	0.005	--	--	0.005
			Cobalt	--	--	--	--	--	Thyroid	0.02	--	--	0.02
			Iron	--	--	--	--	--	GS	0.03	--	--	0.03
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	0.01	--	--	0.01
			Chemical Total	1E-05	--	2E-06	--	1E-05		0.2	--	0.06	0.3
		Exposure Point Total						1E-05					0.3
	Exposure Medium Total							1E-05					0.3
	Air	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Aroclor-1260	--	3E-11	--	--	3E-11	NA	--	--	--	--
			Heptachlor Epoxide	--	5E-13	--	--	5E-13	NA	--	--	--	--
			2,3,7,8-TCDD Equivalents	--	9E-12	--	--	9E-12	Reproductive, Respi	--	2E-8	--	2E-8
			Aluminum	--	--	--	--	--	CNS	--	0.0001	--	0.0001
			Arsenic	--	8E-10	--	--	8E-10	NA	--	0.00004	--	0.00004
			Chromium VI	--	5E-08	--	--	5E-08	Respiratory	--	0.000009	--	0.000009
			Cobalt	--	1E-09	--	--	1E-09	Respiratory	--	0.00006	--	0.00006
			Iron	--	--	--	--	--	NA	--	--	--	--
			Lead	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	0.0004	--	0.0004
			Chemical Total	--	5E-08	--	--	5E-08		--	0.0006	--	0.0006
		Exposure Point Total						5E-08					0.0006
	Exposure Medium Total							5E-08					0.0006
Medium Total								1E-05					0.3
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Benzo(a)pyrene Equivalents	2E-06	--	8E-07	--	2E-06	NA	--	--	--	--
			Arsenic	1E-06	--	1E-07	--	1E-06	Skin, CVS	0.008	--	0.0009	0.009
			Chromium VI	4E-06	--	--	--	4E-06	None Specified	0.004	--	--	0.004
			Cobalt	--	--	--	--	--	Thyroid	0.02	--	--	0.02
			Iron	--	--	--	--	--	GS	0.03	--	--	0.03
			Chemical Total	7E-06	--	1E-06	--	8E-06		0.06	--	0.0009	0.06
		Exposure Point Total						8E-06					0.06
	Exposure Medium Total							8E-06					0.06
	Air	IOA - Entire Site	Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Arsenic	--	2E-10	--	--	2E-10	NA	--	0.000010	--	0.000010
			Chromium VI	--	4E-08	--	--	4E-08	Respiratory	--	0.000008	--	0.000008
			Cobalt	--	1E-09	--	--	1E-09	Respiratory	--	0.00007	--	0.00007
			Iron	--	--	--	--	--	NA	--	--	--	--
			Chemical Total	--	4E-08	--	--	4E-08		--	0.00009	--	0.00009
		Exposure Point Total						4E-08					0.00009
	Exposure Medium Total							4E-08					0.00009
Medium Total								8E-06					0.06
Receptor Total							Receptor Risk Total	1E-04				Receptor HI Total	0.5

TABLE B-22
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

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

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

Total CNS HI	0.05
Total CVS HI	0.08
Total GS HI	0.08
Total Immune HI	0.2
Total Liver HI	0.02
Total Respiratory HI	0.0003
Total None Specified HI	0.05
Total Skin HI	0.08
Total Thyroid HI	0.06
Total Reproductive HI	0.04

TABLE B-23
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifelong (Child and 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	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	2E-04	--	7E-05	--	3E-04					
			Aroclor-1260	2E-07	--	9E-08	--	3E-07					
			Heptachlor Epoxide	2E-06	--	7E-07	--	3E-06					
			2,3,7,8-TCDD Equivalents	2E-06	--	2E-07	--	2E-06					
			Aluminum	--	--	--	--	--					
			Arsenic	2E-05	--	2E-06	--	2E-05					
			Chromium VI	3E-04	--	--	--	3E-04					
			Cobalt	--	--	--	--	--					
			Iron	--	--	--	--	--					
			Lead	--	--	--	--	--					
			Manganese	--	--	--	--	--					
			Chemical Total	5E-04	--	7E-05	--	6E-04					
		Exposure Point Total						6E-04					
	Exposure Medium Total							6E-04					
	Air	IOA - High Concentrations Area	Benzo(a)pyrene Equivalents	--	4E-10	--	--	4E-10					
			Aroclor-1260	--	1E-12	--	--	1E-12					
			Heptachlor Epoxide	--	2E-11	--	--	2E-11					
			2,3,7,8-TCDD Equivalents	--	1E-11	--	--	1E-11					
			Aluminum	--	--	--	--	--					
			Arsenic	--	1E-09	--	--	1E-09					
			Chromium VI	--	7E-07	--	--	7E-07					
			Cobalt	--	1E-09	--	--	1E-09					
			Iron	--	--	--	--	--					
			Lead	--	--	--	--	--					
			Manganese	--	--	--	--	--					
			Chemical Total	--	7E-07	--	--	7E-07					
		Exposure Point Total						7E-07					
	Exposure Medium Total							7E-07					
Medium Total								6E-04					

TABLE B-23
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifelong (Child and 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	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	1E-05	--	4E-06	--	1E-05					
			Aroclor-1260	5E-06	--	2E-06	--	7E-06					
			Heptachlor Epoxide	1E-07	--	3E-08	--	1E-07					
			2,3,7,8-TCDD Equivalents	2E-06	--	2E-07	--	2E-06					
			Aluminum	--	--	--	--	--					
			Arsenic	1E-05	--	1E-06	--	2E-05					
			Chromium VI	3E-05	--	--	--	3E-05					
			Cobalt	--	--	--	--	--					
			Iron	--	--	--	--	--					
			Lead	--	--	--	--	--					
			Manganese	--	--	--	--	--					
			Chemical Total	6E-05	--	8E-06	--	7E-05					
		Exposure Point Total						7E-05					
	Exposure Medium Total							7E-05					
	Air	IOA - Low Concentrations Area	Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11					
			Aroclor-1260	--	3E-11	--	--	3E-11					
			Heptachlor Epoxide	--	7E-13	--	--	7E-13					
			2,3,7,8-TCDD Equivalents	--	1E-11	--	--	1E-11					
			Aluminum	--	--	--	--	--					
			Arsenic	--	1E-09	--	--	1E-09					
			Chromium VI	--	8E-08	--	--	8E-08					
			Cobalt	--	1E-09	--	--	1E-09					
			Iron	--	--	--	--	--					
			Lead	--	--	--	--	--					
			Manganese	--	--	--	--	--					
			Chemical Total	--	8E-08	--	--	8E-08					
		Exposure Point Total						8E-08					
	Exposure Medium Total							8E-08					
Medium Total								7E-05					
Subsurface Soil	Subsurface Soil	IOA - Entire Site	Benzo(a)pyrene Equivalents	1E-05	--	5E-06	--	2E-05					
			Arsenic	4E-06	--	4E-07	--	4E-06					
			Chromium VI	3E-05	--	--	--	3E-05					
			Cobalt	--	--	--	--	--					
			Iron	--	--	--	--	--					
			Chemical Total	5E-05	--	5E-06	--	5E-05					
		Exposure Point Total						5E-05					
	Exposure Medium Total							5E-05					
	Air	IOA - Entire Site	Benzo(a)pyrene Equivalents	--	3E-11	--	--	3E-11					
			Arsenic	--	3E-10	--	--	3E-10					
			Chromium VI	--	7E-08	--	--	7E-08					
			Cobalt	--	2E-09	--	--	2E-09					
			Iron	--	--	--	--	--					
			Chemical Total	--	8E-08	--	--	8E-08					
		Exposure Point Total						8E-08					
	Exposure Medium Total							8E-08					
Medium Total								5E-05					
Receptor Total							Receptor Risk Total	7E-04					

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

Appendix C

Cost Estimate

APPENDIX C

COSTING CALCULATIONS

C-1 ALTERNATIVE #2: CAPITAL COST ESTIMATE

C-2 ALTERNATIVE #2: ANNUAL COST ESTIMATE

C-3 ALTERNATIVE #2: PRESENT WORTH ANALYSIS

C-4 ALTERNATIVE #3: CAPITAL COST ESTIMATE

C-5 ALTERNATIVE #3: ANNUAL COST ESTIMATE

C-6 ALTERNATIVE #3: PRESENT WORTH ANALYSIS

C-1 ALTERNATIVE #2: CAPITAL COST ESTIMATE

TABLE C-1
INDUSTRIAL OPERATIONS AREA
Former NAS South Weymouth, MA
Feasibility Study
Alternative 2: Excavation and Off-Site Soil Disposal
Capital Cost Estimate

			Unit Cost				Extended Cost				
Item	Quantity	Unit	Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
1 DOCUMENTS AND CONSTRUCTION PLANNING											
1.1 Prepare RAWP, HASP, Specs,	1	ls		$1,400.00	$30,060.00		$0	$1,400	$30,060	$0	$31,460
2 PRE-EXCAVATION SOIL INVESTIGATION											
2.1 SAP preparation	1	ls		$1,100.00	$15,290.00		$0	$1,100	$15,290	$0	$16,390
2.2 DPT Drilling Services	1	ls	$18,428.00				$18,428	$0	$0	$0	$18,428
2.3 Sampling labor and materials	1	ls		$2,000.00	$16,500.00		$0	$2,000	$16,500	$0	$18,500
2.4 Analytical analysis of soil samples	1	ls	$13,400.00				$13,400	$0	$0	$0	$13,400
3 RA MOBILIZATION AND DEMOBILIZATION											
3.1 Equipment Mobilization/Demobilization	3	ea			$177.00	$610.00	$0	$0	$531	$1,830	$2,361
3.2 Underground Utility Clearances	1	ls	$10,525.00				$10,525	$0	$0	$0	$10,525
3.3 Prepare/Maintain Staging Area with 40 mil HDPE line	1	ls	$5,000.00				$5,000	$0	$0	$0	$5,000
4 RA FIELD SUPPORT AND SITE ACCESS											
4.1 Storage Trailer	1	mo				$92.50	$0	$0	$0	$93	$93
4.2 Survey Support	4	day	$1,075.00				$4,300	$0	$0		$4,300
4.2 Site Superintendent	30	day		$206.00	$384.64		$0	$6,180	$11,539	$0	$17,719
4.3 Site Health & Safety and QA/QC	30	day		$206.00	$307.68		$0	$6,180	$9,230	$0	$15,410
5 RA DECONTAMINATION											
5.1 Equipment Decon Pad	1	ls		$400.00	$1,000.00	$725.00	$0	$400	$1,000	$725	$2,125
5.2 Decon Water	1,000	gal		$0.20			$0	$200	$0	$0	$200
5.3 Decon Water Storage Tank, 1000 gallon	1	mo				$771.00	$0	$0	$0	$771	$771
5.4 Clean Water Storage Tank, 1000 gallon	1	mo				$771.00	$0	$0	$0	$771	$771
5.5 Disposal of Decon Waste, sump water (liquid & solid)	1	ls	$5,200.00				$5,200	$0	$0	$0	$5,200
6 RA EXCAVATION/DISPOSAL											
6.1 Excavator, 1.5 cy	20	day			$464.40	$1,031.00	$0	$0	$9,288	$20,620	$29,908
6.2 Front End Loader	20	day			$355.20	$1,784.00	$0	$0	$7,104	$35,680	$42,784
6.3 Site Labor, (2 laborers)	40	day			$264.80		$0	$0	$10,592	$0	$10,592
6.4 Asphalt Cutting of old asphalt	2	day			$333.40	$689.60	$0	$0	$667	$1,379	$2,046
6.5 Transportation and Disposal of Asphalt	600	ton	$80.00				$48,000	$0	$0	$0	$48,000
6.6 Transport of Soil, non-hazardous	2,235	ton	$40.00				$89,400	$0	$0	$0	$89,400
6.7 Disposal of Soil, non-hazardous	2,235	ton	$80.00				$178,800	$0	$0	$0	$178,800
6.8 Waste Disposal Characterization / Analytical	7	ls	$1,000.00				$7,000	$0	$0	$0	$7,000
6.9 Post Excavation Confirmation Sampling	60	ea	$350.00	$40.00	$60.00	$25.00	$21,000	$2,400	$3,600	$1,500	$28,500
7 RA SITE RESTORATION											
7.1 Excavator, 1.5 cy	10	day			$464.40	$1,031.00	$0	$0	$4,644	$10,310	$14,954
7.2 Dozer	10	day			$333.40	$291.00	$0	$0	$3,334	$2,910	$6,244
7.3 Site Labor, (2 laborers)	20	day			$264.80		$0	$0	$5,296	$0	$5,296
7.4 Backfill, common fill	1,673	cy		$29.50			$0	$49,354	$0	$0	$49,354
7.5 Stone, stable fill, 3 inches	558	cy		$38.50			$0	$21,483	$0	$0	$21,483
7.6 Grading	2,789	sy	$2.81				$7,837	$0	$0	$0	$7,837
8 RA POST CONSTRUCTION COST											
8.1 Contractor Completion Report	150	hr			$37.00		$0	$0	$5,550	$0	$5,550
8.2 Remedial Action Closeout Report	200	hr			$37.00		$0	$0	$7,400	$0	$7,400

Capital Cost Estimate

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
Subtotal							$408,890	$90,697	$141,625	$76,589	$717,801
Overhead on Labor Cost @	30%								$42,488		$42,488
G & A on Labor, Material, Equipment, & Subs Cost @	10%						$40,889	$9,070	$14,163	$7,659	$71,780
Tax on Materials and Equipment Cost @	6.25%							$5,669		$4,787	$10,455
Total Direct Cost							$449,779	$105,435	$198,276	$89,034	$842,524
Indirects on Total Direct Cost @	25%	(excluding transportation and disposal cost)									$164,631
Profit on Total Direct Cost @	10%										$84,252
Subtotal											$1,091,407
Health & Safety Monitoring @	2%										$21,828
Total Field Cost											$1,113,235
Engineering on Total Field Cost @	5%										$55,662
Contingency on Total Field Cost @	20%										$222,647
TOTAL CAPITAL COST											**$1,391,544**

C-2 ALTERNATIVE #2: ANNUAL COST ESTIMATE

TABLE C-2
INDUSTRIAL OPERATIONS AREA
Former NAS South Weymouth, MA
Feasibility Study
Alternative 2: Excavation and Off-Site Soil Disposal
Annual Cost Estimate

Item	Item Cost years 1 - 30	Item Cost every 5 years	Notes
Subtotal	$0	$0	
Contingency @ 10%	$0	$0	Cost with contingency is used for Present Worth Analysis.
TOTAL	**$0**	**$0**	

C-3 ALTERNATIVE #2: PRESENT WORTH ANALYSIS

TABLE C-3
INDUSTRIAL OPERATIONS AREA
Former NAS South Weymouth, MA
Feasibility Study
Alternative 2: Excavation and Off-Site Soil Disposal
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate 2.0%	Present Worth
0	$1,391,544		$1,391,544	1.000	$1,391,544
1		$0	$0	0.980	$0
2		$0	$0	0.961	$0
3		$0	$0	0.942	$0
4		$0	$0	0.924	$0
5		$0	$0	0.906	$0
6		$0	$0	0.888	$0
7		$0	$0	0.871	$0
8		$0	$0	0.853	$0
9		$0	$0	0.837	$0
10		$0	$0	0.820	$0
11		$0	$0	0.804	$0
12		$0	$0	0.788	$0
13		$0	$0	0.773	$0
14		$0	$0	0.758	$0
15		$0	$0	0.743	$0
16		$0	$0	0.728	$0
17		$0	$0	0.714	$0
18		$0	$0	0.700	$0
19		$0	$0	0.686	$0
20		$0	$0	0.673	$0
21		$0	$0	0.660	$0
22		$0	$0	0.647	$0
23		$0	$0	0.634	$0
24		$0	$0	0.622	$0
25		$0	$0	0.610	$0
26		$0	$0	0.598	$0
27		$0	$0	0.586	$0
28		$0	$0	0.574	$0
29		$0	$0	0.563	$0
30		$0	$0	0.552	$0
			TOTAL PRESENT WORTH (30-Year)		**$1,391,544**

C-4 ALTERNATIVE #3: CAPITAL COST ESTIMATE

TABLE C-4
INDUSTRIAL OPERATIONS AREA
Former NAS South Weymouth, MA
Feasibility Study
Alternative 3: Asphalt Cap and Land Use Controls
Capital Cost Estimate

				Unit Cost				Extended Cost			
Item	Quantity	Unit	Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
1 DOUMENTS AND CONSTRUCTION PLANNING											
1.1 Prepare RAWP, HASP, Specs,	1	ls		$1,000.00	$20,040.00		$0	$1,000	$20,040	$0	$21,040
1.2 Prepare LUC RD Documents	1	ls		$1,000.00	$9,100.00		$0	$1,000	$9,100	$0	$10,100
2 PRE-CAP SAMPLING											
2.1 SAP preparation	1	ls		$1,100.00	$15,290.00		$0	$1,100	$15,290	$0	$16,390
2.2 DPT Drilling Services	1	ls	$18,428.00				$18,428	$0	$0	$0	$18,428
2.3 Sampling labor and materials	1	ls		$2,000.00	$16,500.00		$0	$2,000	$16,500	$0	$18,500
2.4 Analytical analysis of soil samples	1	ls	$13,400.00				$13,400	$0	$0	$0	$13,400
3 MOBILIZATION AND DEMOBILIZATION											
3.1 Equipment Mobilization/Demobilization	2	ea			$177.00	$610.00	$0	$0	$354	$1,220	$1,574
3.2 Underground Utility Clearances	1	ls	$10,525.00				$10,525	$0	$0	$0	$10,525
4 FIELD SUPPORT AND SITE ACCESS											
4.1 Storage Trailer	1	mo				$92.50	$0	$0	$0	$93	$93
4.2 Survey Support	3	day	$1,075.00				$3,225	$0	$0	$0	$3,225
4.3 Site Superintendent	14	day		$206.00	$384.64		$0	$2,884	$5,385	$0	$8,269
4.4 Site Health & Safety and QA/QC	14	day		$206.00	$307.68		$0	$2,884	$4,308	$0	$7,192
5 DECONTAMINATION											
5.1 Equipment Decon Pad	1.0	ls		$400.00	$1,000.00	$725.00	$0	$400	$1,000	$725	$2,125
5.2 Decon Water	1,000.0	gal		$0.20			$0	$200	$0	$0	$200
5.3 Decon Water Storage Tank, 1000 gallon	0.5	mo				$771.00	$0	$0	$0	$386	$386
5.4 Clean Water Storage Tank, 1000 gallon	0.5	mo				$771.00	$0	$0	$0	$386	$386
5.5 Disposal of Decon Waste, sump water (liquid & solid)	1.0	ls	$5,200.00				$5,200	$0	$0	$0	$5,200
6 SITE PREPARATION											
6.1 Back-Hoe	2	day			$355.20	$1,784.00	$0	$0	$710	$3,568	$4,278
6.2 Skid-Steer	2	day			$333.40	$291.00	$0	$0	$667	$582	$1,249
6.3 Site Labor, (3 laborers)	6	day			$264.80		$0	$0	$1,589	$0	$1,589
6.4 Asphalt Cutting of old asphalt	2	day			$333.40	$689.60	$0	$0	$667	$1,379	$2,046
6.5 Transportation and Disposal of Asphalt	600	ton	$80.00				$48,000	$0	$0	$0	$48,000
7 PLACE CAP											
7.1 Back-Hoe	4	day			$355.20	$1,784.00	$0	$0	$1,421	$7,136	$8,557
7.3 Site Labor, (3 laborers)	4	day			$264.80		$0	$0	$1,059	$0	$1,059
7.4 Asphalt Paving	27,610	sf	$1.68				$46,385	$0	$0	$0	$46,385
7.5 Compactor, 120 hp	4	day			$343.90	$560.60	$0	$0	$1,376	$2,242	$3,618
8 POST CONSTRUCTION COST											
8.1 Contractor Completion Report	150	hr			$75.00		$0	$0	$11,250	$0	$11,250
8.2 Remedial Action Closeout Report	200	hr			$75.00		$0	$0	$15,000	$0	$15,000

Capital Cost Estimate

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
(Continued)											
Subtotal							$145,163	$11,468	$105,715	$17,716	$280,062
Overhead on Labor Cost @	30%								$31,714		$31,714
G & A on Labor, Material, Equipment, & Subs Cost @	10%						$14,516	$1,147	$10,571	$1,772	$28,006
Tax on Materials and Equipment Cost @	7.0%							$803		$1,240	$2,043
Total Direct Cost							$159,679	$13,418	$148,001	$20,728	$341,825
Indirects on Total Direct Cost @	25%	(excluding transportation and disposal cost)									$85,456.33
Profit on Total Direct Cost @	10%										$34,183
Subtotal											$461,464
Health & Safety Monitoring @	2%										$9,229
Total Field Cost											$470,693
Engineering on Total Field Cost @	5%										$23,535
Contingency on Total Field Cost @	20%										$94,139
TOTAL CAPITAL COST											**$588,367**

C-5 ALTERNATIVE #3: ANNUAL COST ESTIMATE

TABLE C-5
INDUSTRIAL OPERATIONS AREA
Former NAS South Weymouth, MA
Feasibility Study
Alternative 3: Asphalt Cap and Land Use Controls
Annual Cost Estimate

Item	Item Cost years 1 - 30	Item Cost every 5 years	Notes
LUCs Inspection & Report	$2,350		One-day visit to verify LUCs with Report
Five -Year Review		$23,000	Assumes that this is a component of the South Weymouth NAS IRP Five Year Reivew
Subtotal	$2,350	$23,000	
Contingency @ 10%	$235	$2,300	Cost with contingency is used for Present Worth Analysis.
TOTAL	**$2,585**	**$25,300**	

C-6 ALTERNATIVE #3: PRESENT WORTH ANALYSIS

TABLE C-6
INDUSTRIAL OPERATIONS AREA
Former NAS South Weymouth, MA
Feasibility Study
Alternative 3: Asphalt Cap and Land Use Controls
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate 2.0%	Present Worth
0	$588,367		$588,367	1.000	$588,367
1		$2,585	$2,585	0.980	$2,534
2		$2,585	$2,585	0.961	$2,485
3		$2,585	$2,585	0.942	$2,436
4		$2,585	$2,585	0.924	$2,388
5		$27,885	$27,885	0.906	$25,256
6		$2,585	$2,585	0.888	$2,295
7		$2,585	$2,585	0.871	$2,250
8		$2,585	$2,585	0.853	$2,206
9		$2,585	$2,585	0.837	$2,163
10		$27,885	$27,885	0.820	$22,875
11		$2,585	$2,585	0.804	$2,079
12		$2,585	$2,585	0.788	$2,038
13		$2,585	$2,585	0.773	$1,998
14		$2,585	$2,585	0.758	$1,959
15		$27,885	$27,885	0.743	$20,719
16		$2,585	$2,585	0.728	$1,883
17		$2,585	$2,585	0.714	$1,846
18		$2,585	$2,585	0.700	$1,810
19		$2,585	$2,585	0.686	$1,774
20		$27,885	$27,885	0.673	$18,766
21		$2,585	$2,585	0.660	$1,706
22		$2,585	$2,585	0.647	$1,672
23		$2,585	$2,585	0.634	$1,639
24		$2,585	$2,585	0.622	$1,607
25		$27,885	$27,885	0.610	$16,997
26		$2,585	$2,585	0.598	$1,545
27		$2,585	$2,585	0.586	$1,514
28		$2,585	$2,585	0.574	$1,485
29		$2,585	$2,585	0.563	$1,456
30		$27,885	$27,885	0.552	$15,394
				TOTAL PRESENT WORTH	**$755,144**

Appendix D

ARAR and To Be Considered Guidance

TABLE D-1
FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs and TBCs* – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL
IOA FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Federal				
Cancer Slope Factors (CSFs)	US EPA, Integrated Risk Information System	To be considered (TBC)	Cancer Slope Factors are used to compute the incremental cancer risk resulting from exposure to site contaminants and represent the most up-to-date information on Cancer Risk from USEPA's Carcinogen Assessment Group.	This alternative will meet the risk-based cleanup goals developed through the use of this guidance since removal of contaminated soil that poses potential carcinogenic risks will address long-term risk.
Reference Doses (RfDs)	US EPA, Integrated Risk Information System	TBC	Reference Doses are estimates of daily exposure levels unlikely to cause significant adverse non-carcinogenic health effects over a lifetime. Guidance used to compute human health hazard resulting from exposure to non-carcinogens in site media.	This alternative will meet the risk-based cleanup goals developed through the use of this guidance since removal of contaminated soil that poses potential non-carcinogenic risks will address long-term risk.
Guidelines for Carcinogen Risk Assessment	EPA/630/P-03/001F March 2005	TBC	Guidelines for assessing cancer risk.	This alternative will meet the risk-based cleanup goals developed through the use of this guidance since removal of contaminated soil that poses potential carcinogenic risks will address long-term risk.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA.630/R-03/003F March 2005	TBC	Guidance for assessing cancer risks in children.	This alternative will meet the risk-based cleanup goals developed through the use of this guidance since removal of contaminated soil that poses potential carcinogenic risks will address long-term risk.

TABLE D-2
FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs and TBCs* – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL
IOA FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
State				
State Risk Thresholds	310 CMR 40.0993 (6)	TBC	When conducting a quantitative risk assessment (Method 3), cumulative risk from multiple contaminants of concern shall be compared to a cancer risk limit of one in one hundred thousand, and non-cancer hazard index of 1.	This alternative will meet the risk-based cleanup goals developed from the risk assessment that provided a comparison to a cancer risk limit of one in one hundred thousand, and non-cancer hazard index of 1.

TABLE D-3
FEDERAL AND STATE LOCATION-SPECIFIC ARARs – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL
IOA FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action to be Taken
Federal				
There are no federal location-specific ARARs.				
State				
There are no state location-specific ARARs.				

TABLE D-4

FEDERAL AND STATE ACTION-SPECIFIC ARARs AND TBCs* – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL IOA FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH WEYMOUTH, MASSACHUSETTS

Federal

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Resource Conservation and Recovery Act (RCRA)	40 CFR Part 260 Hazardous Waste Management System Part 261 Identification and Listing of Hazardous Waste Part 262 Standards Applicable to Generators of Hazardous Waste Part 268 Land Disposal Requirements Part 264 Subpart L Waste Piles	Applicable	These federal standards apply to the identification, management, and disposal of hazardous waste. In Massachusetts, the authority to administer most of these standards has been delegated to MassDEP through its state hazardous waste management regulations, which are cited below.	Wastes generated as part of remedial activities that will be disposed of off-site will be characterized as hazardous or non-hazardous. If determined to be hazardous waste, they will be stored, transported, and disposed of in accordance with the substantive portions of the applicable state hazardous waste regulations. If any federal hazardous waste standards apply for which there is no state counterpart, such federal standards will apply directly.
Toxic Substances Control Act (TSCA)	40 Code of Federal Regulations (CFR) 761.61(c)	Applicable	This section of the TSCA regulations provides risk-based cleanup and disposal options for PCB remediation waste based on the risks posed by the concentrations at which the PCBs are found. Written approval for the proposed risk-based cleanup must be obtained from the Director, Office of Site Remediation and Restoration, USEPA Region 1.	All soil exceeding identified PCB cleanup levels will be addressed in a manner to comply with TSCA. The ROD will contain a finding by the Director, Office of Site Remediation and Restoration, USEPA Region 1 that the cleanup levels selected meet these standards for protectiveness.

TABLE D-4

FEDERAL AND STATE ACTION-SPECIFIC ARARs AND TBCs* – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL IOA FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Stormwater Requirements for Small Construction Sites	40 CFR 122 (National Pollution Discharge Elimination System [NPDES]), 40 CFR 123 (State Program Reqs.), 40 CFR 124 (Procedures for Decision-Making)	Applicable	Regulates the storm water discharges from construction activities including clearing, grading, and excavating that result in land disturbance of equal to or greater than one acre and less than five acres.	This regulation would be applied only if the area of disturbance is greater than one acre. The estimated area of disturbance is less than 1 acre, but that area could increase in the remedial design.
Guide to Management of Investigation-Derived Wastes	OSWER Publication 9345.3-03FS, January, 1992	To be Considered (TBC)	Management of investigation-derived waste must ensure protectiveness of human health and the environment and comply with regulatory requirements.	Investigation-derived waste will be managed in a way to protect human health and the environment and to comply with regulatory requirements.
Massachusetts Hazardous Waste Management Act	M.G.L. c. 21C	Applicable	State statute for the management of hazardous waste.	Any hazardous wastes generated as part of the remedial action will be managed in compliance with the substantive requirements of this statute.
Hazardous Waste Management Rules	310 CMR 30.001 – 30.099	Applicable	General requirements for implementation and interpretation of Hazardous Waste Management Rules.	Any hazardous wastes generated as part of the remedial action will be handled in compliance with the substantive requirements of these regulations.

TABLE D-4

FEDERAL AND STATE ACTION-SPECIFIC ARARs AND TBCs* – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL IOA
FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

State

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Hazardous Waste Management Rules – Identification and Listing of Hazardous Wastes	310 CMR 30.100 - 30.162	Applicable	Establishes requirements for determining whether wastes are hazardous. Defines listed and characteristic hazardous wastes.	These regulations would apply when determining whether or not wastes generated as part of this remedial action are classified as hazardous, either by being listed or by exhibiting a hazardous characteristic, such as contaminated soil.
Hazardous Waste Management Rules – Requirements for Generators	310 CMR 30.300 – 30.394	Applicable	Establishes requirements for generators of hazardous waste. The regulations apply to generators of sampling waste and also apply to the accumulation of waste prior to off-site disposal.	Any hazardous wastes generated as part of the remedial action will be handled in compliance with the substantive requirements of these regulations.
Hazardous Waste Management Rules – Management	310 CMR 30.501 – 30.561	Applicable	Establishes requirements for management of hazardous waste.	Any on-site management of hazardous waste will be in compliance with the substantive requirements of these regulations.
Hazardous Waste Management Rules – Waste Piles	310 CMR 30.640	Applicable	Establishes requirements for management of hazardous waste piles.	Any on-site hazardous wastes piles generated as part of the remedial action will be managed in compliance with the substantive requirements of these regulations.
Air Pollution Control Statute	M.G.L. c. 111, §§ 142A – 142D	Applicable	State statute for control of air pollutants, including dust, odor and noise.	Any on-site generation of dust, odor, noise or other air pollutants must be controlled to prevent a condition of air pollution.

TABLE D-4
FEDERAL AND STATE ACTION-SPECIFIC ARARs AND TBCs* – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL IOA FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Air Pollution Control Regulations	310 CMR 7.06, 7.09 and 7.10	Applicable	These regulations requires that air pollutants (including dust, odor, noise and other visible emissions) must be controlled to prevent a condition of air pollution	Fugitive dust from remedial operations such as excavation and backfill will be managed using engineering controls such as water sprays. Otherwise all remedial activities will be managed to meet the standards for visible emissions, dust, odor and noise.
Massachusetts Endangered Species Act	M.G.L. c. 131A	Applicable	Massachusetts statute protecting endangered, threatened or species of special concern.	Remedial actions to comply with this statute and the regulations promulgated pursuant thereto. The statute and the regulations cited below are triggered by the presence of a Priority Habitat of State-listed Species and Priority Habitat of Rare Wildlife at the IOA.

TABLE D-4
FEDERAL AND STATE ACTION-SPECIFIC ARARs AND TBCs* – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL IOA FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Massachusetts Endangered Species Act Regulations	321 CMR 10.02 321 CMR 10.04(1) and (2) 321 CMR 10.16(1) 321 CMR 10.17 321 CMR 10.18 321 CMR 10.19 321 CMR 10.20 321 CMR 10.23 321 CMR 10.90	Applicable	Massachusetts regulations protecting endangered species, threatened species and species of special concern. 321 CMR 10.02 contains definitions, 321 CMR 10.04(1) and (2) contains the basic prohibition on "takes", 321 CMR 10.16(1) prohibits project segmentation, 321 CMR 10.17 governs information requests, 321 CMR 10.18 contains standards for determining whether a take occurred, 321 CMR 10.19 contains performance standards for the avoidance of a take, 321 CMR 10.20 describes what information is used to determine whether a take occurred, 321 CMR 10.23 describes performance standards for developing a conservation and management plan for a project that results in a take, and 321 CMR 10.90 is the Massachusetts list of species designated as endangered, threatened or special concern.	A determination must be made pursuant to the cited regulations as to whether the remedial actions will result in a "take." If a take does occur, a conservation and management plan must be developed and followed that, among other requirements, results in a long-term net benefit to the affected state-listed species.
Wetlands Protection Regulations	310 CMR 10.59	Applicable	Applies to, Estimated Habitat of State-Listed Rare Wetlands Wildlife that is present in the Industrial Operations Area	All on-site actions in the Estimated Habitat of State-Listed Rare Wetlands Wildlife must comply with these regulations.

TABLE D-4
FEDERAL AND STATE ACTION-SPECIFIC ARARs AND TBCs* – ALTERNATIVE 2 – EXCAVATION AND OFF-SITE DISPOSAL IOA FOCUSED FEASIBILITY STUDY
FORMER NAVAL AIR STATION SOUTH WEYMOUTH WEYMOUTH, MASSACHUSETTS

Requirement	Citation	Status	Synopsis	Evaluation/Action To Be Taken
Wetlands Protection Regulations	310 CMR 10.54, 310 CMR 10.55, 310 CMR 10.56, 310 CMR 10.57, 310 CMR 10.58, and 310 CMR 10.60.	Applicable	Applies to Bank, Bordering Vegetated Wetlands, Land Under Water Bodies, Land Subject to Flooding, and Riverfront Area, and Wildlife Habitat Evaluations (if applicable).	MassGIS maps show the possible presence of Bank, Bordering Vegetated Wetlands, Land Under Water Bodies and Riverfront Area proximate to the northeast edge of, and possibly overlapping, the Industrial Operations Area. A wetlands delineation should be performed, and any if any such wetlands resource areas are present, all on-site actions must comply with the cited wetlands regulations.

Appendix E

COC Mass Calculation

Table E-1
COC MASS CALCULATION
INDUSTRIAL OPERATIONS AREA
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MA

						Soil	
Zone Thickness (ft)	**Location/Remedial Action Area**	**COC**	**Area (ft^2)**	**Total Volume in Place (ft^3)**	**Bulk Density (g/cm^3)[1]**	**Average Concentration of Contaminant (mg/kg)[2,3]**	**Mass Contaminant (lb)[4]**
2	Area 1	Aroclor-1260	1,800	3,600	1.52	1.8	0.615
2	Area 2	Aroclor-1260	100	200	1.52	1.5	0.028
2	Area 3	Aroclor-1260	100	200	1.52	2.9	0.055
2	Area 4	Aroclor-1260	400	800	1.52	1.2	0.091
2	Area 5	Aroclor-1260	2,500	5,000	1.52	12.0	5.693
2	Area 6	Aroclor-1260	2,500	5,000	1.52	1.8	0.854
2	Area 7	Benzo(a)anthracene	10,000	20,000	1.52	6.5	12.336
		Benzo(a)pyrene				5.3	10.058
		Benzo(b)fluoranthene				8.4	15.942
		Dibenzo(a,h)anthracene				0.2	0.399
		Indeno(1,2,3-cd)pyrene				4.0	7.591
		Arsenic				5.7	10.818
		Chromium				14.2	26.949
2	Area 8	Benzo(a)anthracene	100	200	1.52	6.3	0.120
		Benzo(a)pyrene				5.6	0.106
		Benzo(b)fluoranthene				7.4	0.140
		Dibenzo(a,h)anthracene				0.7	0.013
		Indeno(1,2,3-cd)pyrene				2.6	0.049
		Chromium				15.0	0.285
2	Area 9	Benzo(a)anthracene	7,500	15,000	1.52	3.2	4.555
		Benzo(a)pyrene				2.6	3.701
		Benzo(b)fluoranthene				2.5	3.558
		Indeno(1,2,3-cd)pyrene				2.2	3.131
		Chromium				11.6	16.511
		Arsenic				8.9	12.668
2	Area 10	Arsenic	100	200	1.52	36.0	0.683

Total Aroclor-1260	**7.3369**
Total Benzo(a)anthracene	**17.0101**
Total Benzo(a)pyrene	**13.8654**
Total Benzo(b)fluoranthene	**19.6404**
Total Dibenzo(a,h)anthracene	**0.4118**
Total Indeno(1,2,3-cd)pyrene	**10.7720**
Total Arsenic	**24.1686**
Total Chromium	**43.7445**
TOTAL	**137**

Note:
1) Bulk density value represents sand/fill material.
2) For Remedial Action Areas that include only one sample location, the COC concentration from the one location is used; an average concentration of contaminant could not be calculated.
3) Concentrations of detected COC contaminants used to calculate average concentrations.
4) Values are subject to change based on actual volumes of soil addressed by the remedy.

Appendix F

Public Hearing Transcripts and Comments Received on the Indusrial Operations Area Proposed Plan

NAVAL AIR STATION, SOUTH WEYMOUTH

INDUSTRIAL OPERATIONS AREA

PUBLIC HEARING

Tuesday, July 7, 2015
Southfield Town Hall
Shea Memorial Drive
Naval Air Station
South Weymouth, MA
8:10 p.m.

LEAVITT REPORTING, INC.

♀

P R O C E E D I N G S

MR. GOODRICH: We'll formally open the public hearing and, as is the custom with public hearings, you're free to make any comments you want to. Please just identify who you are. The Navy will not be responding to comments. Who would like to start?

MR. BROMBERG: I guess I could. Mike Bromberg, from Rockland. I guess my comment would be just to see if I could ask the Navy to look for PFCs when they're sampling, you know, pre-remedial work and post-remedial work, I guess.

MS. PARSONS: Mary Parsons, Rockland. I'd just like to add to Mike's comment because the fire station that was used is well within the boundary of the Industrial Operations Area, so I would like it checked as well.

MR. GALLUZZO: Dominic Galluzzo, Weymouth. I agree with both Mike and Mary. At the same time, I extend kudos to

the Navy for living up to their obligation

to clean the site before they transfer it. Their historic activities and behavior speak volumes. Thank you.

MS. HILBERT: Anne Hilbert. What does the Navy say to people who say that you haven't done enough?

MR. GOODRICH: Any other comments?

MS. PARSONS: I'll add one more. Wow, I've been doing this for 20 years and I would like to say that everything has been out in the open with DEP, EPA, and the Navy. It's been out in the public. My group has put it out on cable and out in the public as well.

MR. GOODRICH: Thank you. Any other comments?

MS. HILBERT: I'd just like to say Mary has done a fantastic job.

MR. BROMBERG: Well, the last thing I'd say is to thank the Navy, too, for bringing this to residential standards with no LUC on this piece right here. I

think that's a good gesture as well.

MS. PARSONS: And the many tours that you've taken us on over the years.

MS. MALEWICZ: I just think that the final comment from MassDEP is that the final cleanup numbers, when you're doing confirmatory sampling, reach the risk range of residential. Thus we don't need AULs on the property. If not, that will have to be reconsidered.

MR. GOODRICH: Hearing no other comments, then we will close the hearing. Thank you. Thank you very much.

(Whereupon at 8:13 p.m. the hearing concluded.)

C E R T I F I C A T E

I hereby certify that the foregoing 4 pages contain a full, true and correct

transcription of all my stenographic notes to the best of my ability taken in the above-captioned matter held at the offices of the Southfield Town Hall on Tuesday, July 7, 2015, commencing at 8:10 p.m.

Linda J. Modano
Registered Professional Reporter

LEAVITT REPORTING, INC.

Town of Weymouth
Massachusetts

Michael Smart
Weymouth Town Council
District Six Councilor
39 Rhitu Drive
South Weymouth, MA 02190
(781) 331-8844
weysmart@comcast.net

July 22, 2015

Mr. Brian Helland
Remedial Project Manager
BRAC Program Management Office, East
4911 South Broad Street
Philadelphia, PA 19112

Dear Mr. Helland:

I am writing to you at this time regarding the proposed remediation plan for the Industrial Operations Area at the former Naval Air Station South Weymouth in Weymouth Massachusetts. I am in full support of the Navy alternative S-2: Excavation and Offsite Disposal. The preferred S-2 alternative provides protection for human health and the environment and establishes post excavation confirmatory sampling to ensure that all goals have been met.

Thank you for the opportunity to comment on this proposal.

Sincerely,

Michael Smart
Weymouth Town Council
District Six