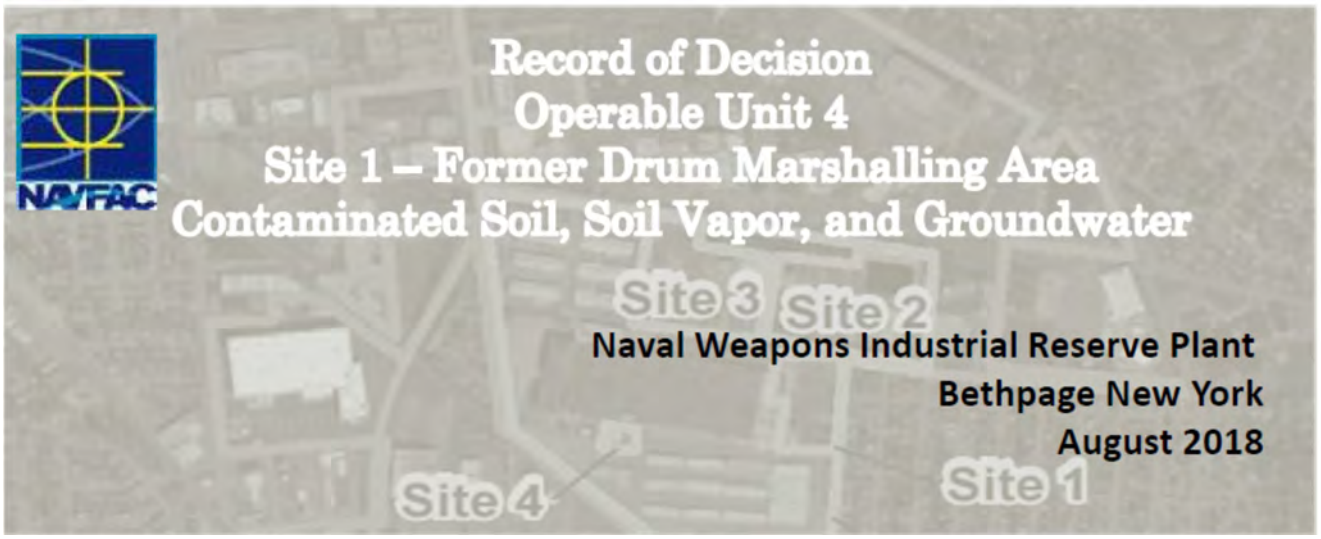


# 1.0 DECLARATION

## 1.1 Site Name and Location

This Record of Decision (ROD) presents the selected final remedy for Operable Unit (OU) 4 Site 1 – Former Drum Marshalling Area, located at Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, New York (Figure 1-1). This ROD is a supplement to Site 1 activities identified in the 1995 OU 1 ROD. Sites 2 and 3 activities are complete and those remedies remain unchanged from the OU 1 ROD dated May 1995.

## 1.2 Statement of Basis and Purpose

This decision document presents the Selected Remedy for Site 1 – Former Drum Marshalling Area soil, soil vapor, and groundwater. This OU 4 ROD is to address PCB impacts to soil and groundwater at Site 1 that were not known at the time of the 1995 OU 1 ROD and that were found during supplemental investigations. The remedy was selected in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The decision is based on information contained in the Administrative Record file for NWIRP Bethpage, which is available at http://go.usa.gov/DyXF.

The Navy is the lead federal agency in accordance with federal law and the NCP at the former NWIRP Bethpage. The Navy's Environmental Restoration Program (ERP) is responsible for ensuring that appropriate CERCLA response alternatives are developed and implemented as necessary to protect public health, welfare, and the environment. The New York State Department of Environmental Conservation (NYSDEC) is the lead state regulatory agency. The Navy, in consultation with NYSDEC and the New York State Department of Health (NYSDOH) pursuant to 10 United States Code (U.S.C.) § 2705(a) and (b) and 42 U.S.C. § 9620(f), is implementing this remedial decision document which incorporates applicable or relevant and appropriate State requirements. NYSDEC and NYSDOH actively participated throughout the investigation, have reviewed this ROD and the materials on which it is based, and concurs with the selected remedy (Appendix A). A copy of this document will be sent to United States Environmental Protection Agency (USEPA) Region II offices for informational purposes.

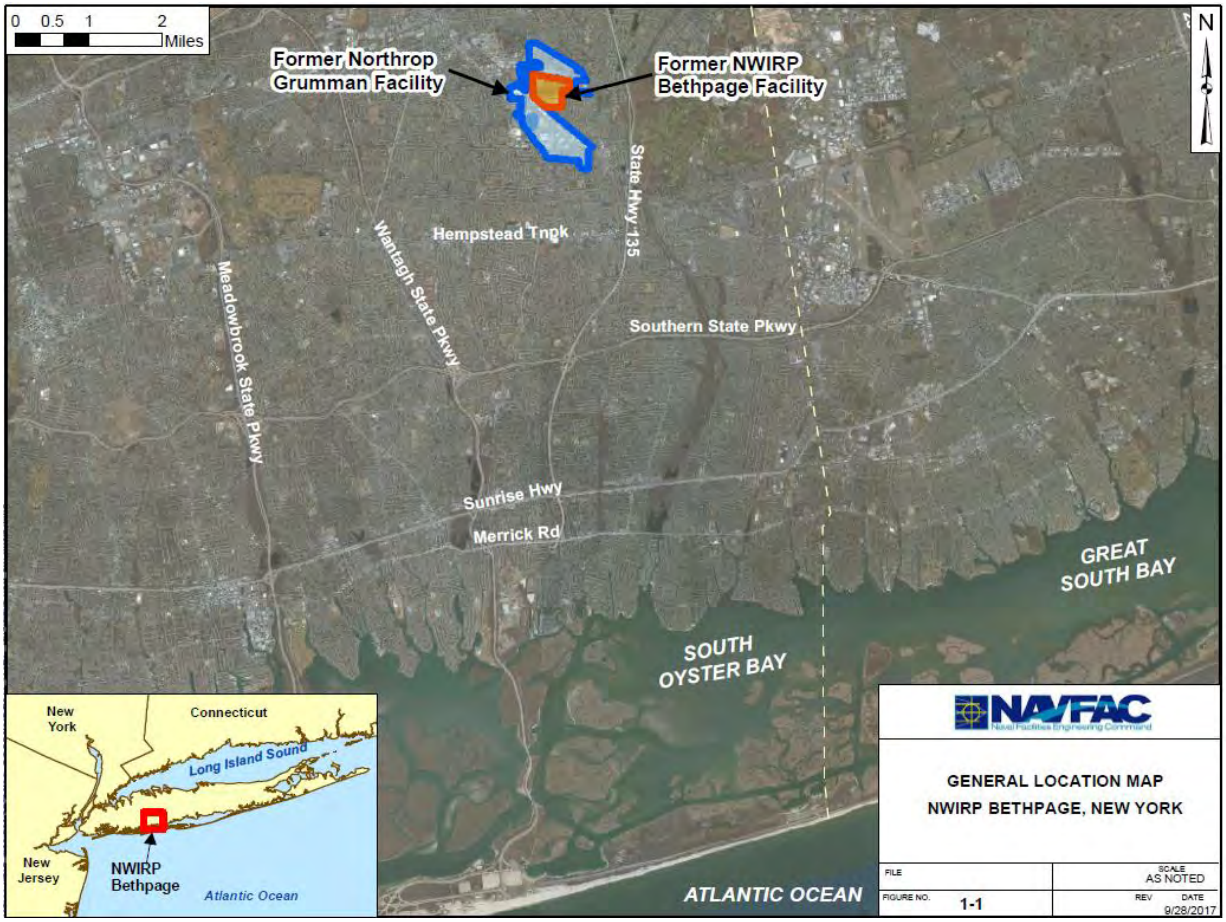


**Figure 1-1 General Location Map**

## 1.3 Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare, or the environment from actual or threatened releases of hazardous substances into the environment. Soil, soil vapor, and groundwater are addressed under this ROD.

## 1.4 Description of the Selected Remedy

Environmental investigations have identified the presence of polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals (including arsenic), and pesticides in Site 1 soils from ground surface to 65 feet below ground surface (bgs); PCBs and metals (total chromium and hexavalent chromium) in groundwater; and VOCs in soil vapor. Several response actions have been conducted at Site 1 to provide removal actions to protect human health and the environment while a strategy for the final remedy was being developed. This remedy is intended to be the final action for Site 1 and addresses contaminated soil, groundwater, and soil vapor. Upon successful remediation, the Site will be transferred to Nassau County for economic redevelopment. This section provides additional details on past actions and how those actions fit into the overall cleanup strategy.

In 1993, Northrop Grumman place a soil cover over a portion of Site 1 to reduce worker exposure to PCBs in surface soil. Workers are currently protected from exposure to contaminated soil by the construction and maintenance of a fence and a temporary cover.

In 1995, the Navy's OU 1 ROD was signed. That ROD addressed Sites 1, 2, and 3 (Figure 1-2). For Site 1, the ROD identified treatment of VOC-impacted soil and shallow groundwater to eliminate a continuing source of groundwater contamination, excavation and/or covering of PCB-, pesticide-, polynuclear aromatic hydrocarbon (PAH)-, and metal (arsenic and manganese)-impacted soil. In accordance with the OU 1 ROD, from 1997 to 2002, an air sparge/soil vapor extraction (AS/SVE) system was operated to remove the majority of VOCs in impacted soil and shallow groundwater at Site 1. This system achieved its goals and was shut down. Based on post-ROD soil delineation that showed a significant increase in the estimated volume of PCB-impacted soil for excavation, the non-VOC portions of the OU 1 ROD for Site 1 consisting of excavation and offsite disposal and covering of impacted soil were not implemented. The PCB-impacted soil identified at Site 1 in the OU 1 ROD and subsequent investigations is instead being addressed under this remedial action.

In 1997, additional PCB-contaminated soil was identified in two dry wells: 20-08 (located within Site 1) and 34-07 (located near Site 1). In 1998, contaminated soils to a depth of 30 or 32 feet were removed from these dry wells under the Underground Injection Control (UIC) program. Post excavation sampling identified residual PCB-impacted soil around and beneath the excavations. This residual PCB-contaminated soil is being addressed under this action.

In 2009, the Navy implemented a CERCLA time-critical removal action that consisted of the installation and operation of air purification units and sub-slab depressurization (SSD) units to reduce exposure to VOC-impacted vapors from Site 1 in off-property residences. In 2010, the Navy proceeded with a CERCLA non-time critical removal action in the form of an SVE containment system to control VOC-impacted vapors at the property line. Operation of this system significantly reduced the levels of VOCs in the off-property soil vapor and ultimately allowed the removal of the in-home air purification and SSD units. The SVE containment system remains in operation. Residual source material for these VOCs at Site 1 and continued operation of the SVE containment system are being addressed under this ROD.

Each of the above activities has reduced or eliminated exposure to site contaminants. To be protective in the long term, implementation of this ROD is necessary to address PCB- and metal-contaminated groundwater that was not identified until after the Navy issued its 1995 OU 1 ROD.

The shallow PCB-contaminated soil with concentrations greater than 500 milligrams per kilogram (mg/kg) constitute the remaining principal threat wastes. This soil will be treated as needed to comply with Land Disposal Restrictions. These shallow soils represent the majority of the PCBs present at the site and the depth where removal is practicable.

The major components of the selected remedy, which comprises several alternatives identified in the Proposed Plan (October 2017), are as follows:

<u>Soil- Alternative S-6A</u>

- Limited excavation and onsite consolidation or offsite disposal of PCB-contaminated soil
- Installation of a reduced permeability cover
- Land Use Controls (LUCs) to protect the cover and limit future activities

Soil Alternative S-6A will minimize direct contact with impacted soil and reduce leaching of Chemicals of Concern (COCs) to groundwater.


**Figure 1-2 Site 1 Layout Map**

Soil Vapor – Alternative SV-3

- Continued operation of the Soil Vapor Extraction (SVE) Containment System
- Installation of additional SVE wells to accelerate source area control
- Continued monitoring of on-property SVE wells and on- and off-property Soil Vapor Pressure Monitors (SVPMs)
- LUCs to identify future actions needed to control the potential for vapor intrusion

This remedy will accelerate cleanup of residual VOC contamination at Site 1 and continue to control the potential for vapor intrusion.

Groundwater – Alternative G-2

- Monitoring
- LUCs limiting the installation of groundwater extraction wells and/or use of contaminated groundwater

Groundwater Alternative G-2 will control exposure to impacted groundwater and allow tracking of the migration and attenuation of COCs.

## 1.5 Statutory Determinations

As discussed in Section 2.0 (Decision Summary), the Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after the initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

## 1.6 ROD Data Certification Checklist

The following information (Table 1-1) is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for NWIRP Bethpage.

**Table 1-1 Record of Decision (ROD) Certification Checklist**

| Data | Location in ROD |
|---|---|
| Chemicals of concern and their respective concentrations. | 2.7 and 2.8 |
| Baseline risk represented by the chemicals of concern. | 2.7 |
| Cleanup Levels established for chemicals of concern and the basis of these levels. | 2.8 |
| How source materials constituting principal threats are addressed. | 2.11 |
| Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of ground water used in the baseline risk assessment and ROD. | 2.6 |
| Potential land and groundwater use that will be available at the site as a result of the Selected Remedy. | 2.12 |
| Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected. | 2.10 and Appendix D |
| Key factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision). | 2.12 |

## 1.7 Authorizing Signature

This ROD represents the selected remedy for OU 4 Site 1 – Former Drum Marshalling Area soil, soil vapor, and groundwater at NWIRP Bethpage in Nassau County, New York.

R. D. HAYES, III
Commanding Officer
Naval Facilities Engineering Command Mid-Atlantic

30 NOV 2018
Date

# 2.0 DECISION SUMMARY

## 2.1 Site Description

The former NWIRP Bethpage is located in Nassau County on Long Island, New York (Figure 1-1). Environmental investigations at the former NWIRP Bethpage are federally funded and being conducted under CERCLA. The Navy is the lead federal agency under the NCP, 40 *Code of Federal Regulations* (CFR) Part 300, and Executive Order 12580, as amended by Executive Order 13016, for CERCLA response activities to address contamination at and from the former NWIRP Bethpage. The Navy's response authority also derives from the Defense Environmental Restoration Program amendments in 10 U.S.C. § 2701, *et seq.*

The former NWIRP Bethpage was located adjacent to the former Northrop Grumman (NG) facility, and was operated by Grumman and later NG from 1942 to the mid-1990s. The plant's primary mission was the research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. In 1996, operations ended at the NWIRP Bethpage. At that time, the NWIRP was approximately 109.5 acres in size. In 2002, 4.5 acres of the property were transferred to Nassau County. In February 2008, the Navy transferred an additional 96 acres of the remaining 105-acre main parcel to Nassau County. The remaining 9-acre parcel is being retained by the Navy for environmental investigation and remediation.

Site 1 – Former Drum Marshalling Area is situated along the eastern boundary of the former NWIRP Bethpage (Figure 1-2). Site 1 also includes Area of Concern (AOC) 23 - former above ground storage tanks (ASTs); AOC 30 - former storage sheds; AOC 32 - two former tetrachloroethene (PCE) underground storage tanks (USTs); AOC 35 - former sanitary sludge drying beds; and releases associated with these AOCs. Similarly, former Dry Wells 20-08 and 34-07 are being addressed with Site 1.

Site 1: Starting in the 1950s, NG's hazardous waste management practices, for facilities it operated on Long Island included marshalling of drummed wastes on the former NWIRP Bethpage property. Drum marshalling activities initially consisted of two drum marshalling areas located in the center of Site 1. These areas were used to store drums containing waste materials from operations at Plant 3, the main manufacturing building at NWIRP Bethpage, and potentially other sources at the former NWIRP Bethpage facility. The waste drums reportedly contained chlorinated and non-chlorinated solvents, liquid cadmium and chromium wastes. Approximately 200 to 300 drums were stored at each area at any one time. Reportedly, all drums of waste marshalled at the Former Drum Marshalling Areas were taken off-property by a private contractor for treatment or disposal. There are no known reports of leaks or spills of drum contents at Site 1.

Drum storage first took place on a cinder-covered surface over the cesspool field east of Plant 3. In 1978, the collection and marshalling point was moved a few yards south to a 100- by 100-foot concrete pad, which did not have a cover or spill containment. In 1982, drummed waste storage was transferred a third time from Site 1 to the Drum Marshalling Area, located in the Salvage Storage Area located at Site 3. This Drum Marshalling Area consisted of a concrete pad with spill containment; and in 1983, a cover was added.

Cesspools: Underlying most of Site 1 are approximately 120 abandoned cesspools that were designed to discharge sanitary waste waters from Plant 3. Each of these cesspools was approximately 10 feet in diameter and 16 feet deep. Based on field observations, the cesspools are currently filled with soil.

During the early 1990s transformers that potentially contained PCBs and autoclaves that contained PCBs were also stored on the ground at Site 1.

AOC 23: Historically, six ASTs were used by NG at Plant 3 to store waste oil. These tanks were removed from the facility by NG prior to 1985.

AOC 30: Three storage sheds were located east of Plant 3. One building was used by NG for the storage of pesticides and one was used by NG for the storage of petroleum products. The use of the third shed is unknown. These sheds were removed by NG from the site in the late 1990s.

AOC 32: Two USTs, identified as Tanks 1090 and 1091, were used by NG at Plant 3 for bulk storage of PCE. In the 1980s, when an AST was constructed adjacent to this area to store PCE, the two USTs were abandoned in place by NG. In the 1990s, NG removed the ASTs, and the USTs and the ASTs were identified in the New York State Resource Conservation and Recovery Act (RCRA) Permit as requiring "No Further Action". In 2012, the USTs and their contents were removed when they were encountered during construction activities. This remedy would address any releases from AOC 32.

AOC 35: AOC 35 included four sludge drying beds. The sludge drying beds were closed and backfilled by NG in 1980.

Dry Wells 20-08 and 34-07: Dry Wells 20-08 and 34-07 were part of a storm water management system. The dry wells functioned to infiltrate low volumes of water and overflowed higher volumes of water into the recharge basins. PCB-containing fluids are suspected to have been introduced by NG operations to the system through floor drains, and subsequently to underlying soil, through permeable well bottoms. In 1998, these dry wells were partially remediated under the USEPA's UIC program and the structures have been removed. These dry wells were identified in the RCRA Permit as being in the "RCRA Facility Investigation" status.

## 2.2 Site History and Enforcement Activities

In 1986, an Initial Assessment Study (IAS) of NWIRP Bethpage indicated that three areas, including Site 1, at the NWIRP Bethpage may pose a potential threat to human health and the environment. Between 1991 and 2016, several response actions and investigations were conducted to address soil, soil vapor, and groundwater at the site. Documents providing details of these activities may be found at the Information Repository and in the Administrative Record (http://go.usa.gov/DyXF) and are summarized below.

In August 1991, a Remedial Investigation (RI) was initiated at NWIRP Bethpage to determine the nature and extent of potential contamination identified during the IAS and how that contamination was related to Sites 1, 2, and 3. The RI process was used to identify the nature and delineate the vertical and horizontal extent of VOC-, metal-, and SVOC-contaminated soil and the nearby groundwater contamination. The RI process also refined, but did not completely delineate, the extent of PCB-contaminated soil. Further delineation was left to the remedial design phase.

In 1992, a Hazardous Rank System Preliminary Scoring and Site Inspection Report was prepared based on the 1991 RI data. This report is analogous to the CERCLA Preliminary Assessment/Site Inspection phase.

In 1993, a soil cover was placed over a portion of Site 1 (approximately 0.1 acre) to eliminate potential risk associated with fugitive dust and dermal contact with high levels of PCBs in surface soil.

In 1994, a Feasibility Study (FS) was conducted to develop, evaluate, and select potential remedial alternatives that could be implemented and that would protect human health and the environment from risks associated with environmental contamination at the NWIRP Bethpage.

In 1995, the OU 1 ROD, which addressed impacted soil and shallow groundwater at Site 1 and impacted soil at Sites 2 and 3, was signed. The major components of the selected remedy for these sites included further delineation of contaminants, soil excavation, and the construction, operation, and maintenance of an AS/SVE system. The COCs consisted of three VOCs, a pesticide, PCBs, seven PAHs, arsenic and manganese. Subsequently, post-ROD remedial design studies further delineated the extent of arsenic and PCB contamination. The results of the December 1995 pre-excavation sampling at Site 1 indicated that the volume and depth of PCB-contaminated soil was greater than originally estimated and that additional investigations would be required.

Between 1996 and 2002, additional soil samples were collected to better delineate the extent of arsenic- and PCB-contaminated soil. Due to the extensive vertical distribution of PCBs, the boundary of the PCB-contaminated soil was not defined and it was concluded at the time that the selected remedy would need to be re-evaluated. This testing also determined that arsenic was not a significant contaminant by volume, and that separate excavation and off-site disposal of that contaminant was not required. Any arsenic contamination at the site would be addressed with the PCBs.

Between 1997 and 2002, the AS/SVE system treated VOC-impacted soil and shallow groundwater and removed approximately 4,500 pounds of VOCs. In October 2002, the Navy reported that the objectives of the AS/SVE system had been met and recommended removal of the system. In December 2003, NYSDEC concurred with this recommendation and operation of the AS/SVE system was discontinued.

In 1998, NG implemented a soil removal action at Dry Wells 34-07 and 20-08 to a depth of 30 to 32 feet bgs. Confirmation testing below the dry well found that PCB-impacted soil remains at depths near and below the water table (approximately 50 feet bgs). These dry wells were removed and closed out in 1998 under the RCRA UIC program.

In 2006, the existing soil data were evaluated and it was estimated that PCB-impacted soil would need to be excavated to a depth of 65 feet. Based on the estimated depth, it was concluded that the OU 1 ROD for Site 1 could not be implemented as originally anticipated with respect to PCBs.

In addition, during the intervening years, the NYSDOH finalized guidance to address vapor intrusion that may occur through volatilization of contaminants from groundwater, through the vadose zone, and then potentially into indoor air. The 1995 ROD did not identify the vapor intrusion pathway as a potential concern. In January 2008, the Navy initiated an investigation along the eastern edge of Site 1, adjacent to the residential neighborhood. The results of this investigation identified several VOCs including PCE and trichloroethene (TCE) in soil vapor that exceeded NYSDOH subslab screening values for evaluating potential vapor intrusion.

In 2009, as a time-critical removal action, the Navy installed air purification systems and SSD systems in several residential homes. As a non-time-critical removal action, an SVE containment system was also constructed along the eastern boundary of the Navy property and began operation. SVPMs and soil vapor monitoring points were installed to monitor the vacuum field established by the system.

By November 2010, indoor air concentrations were below the NYSDOH air guideline values. Based on subsequent testing, it was concluded that no further in-home action was necessary to mitigate vapor intrusion while the SVE containment system was in operation. By 2012, the in-home systems had been removed.

In 2012, USTs were uncovered at AOC 32 during regrading activities at Plant 3. The former PCE tanks were found to contain VOC-impacted soil and water. The tanks were emptied out and the interior of the USTs were pressure washed to remove residual solid and liquid wastes and the tanks were transported offsite to a recycling facility.

In 2013, as a part of the 2009 non-time-critical removal action, the Navy installed additional SVPMs in the residential neighborhood abutting the NWIRP Bethpage. SVE containment system operation and monitoring continue to be conducted to ensure that the SVE containment system remains protective of human health.

In 2015, an RI Addendum documented the need to address select impacted media and pathways that were not included in the 1995 ROD. The selected media and pathways included deep PCB-contaminated soil, PCB- and metal-contaminated groundwater, and VOC-contaminated soil vapor at Site 1.

In 2016, based on data and evaluations presented in the RI Addendum, an FS Addendum was developed to identify and evaluate remedial action alternatives to address the PCB impacts to the deep soil and groundwater at the site that were not known at the time of the 1995 OU 1 ROD. In addition, the FS addresses residual VOCs in site soil and metals in site groundwater.

In 2017, a supplement to the 2016 FS Addendum was prepared in response to NYSDEC request for alternatives that are consistent with the remedial action (excavation of soil) established for nearby Bethpage Community Park. The supplement to the FS Addendum included the addition of two new soil alternatives for consideration.

In November 2017, the Navy issued a Proposed Plan for Site 1 that identified the preferred remedial alternative for cleaning up the contaminated soil, soil vapor and groundwater at Site 1.

No enforcement activities have been recorded at Site 1.

## 2.3 Community Participation

The Navy and NYSDEC provide information regarding cleanup of NWIRP Bethpage to the public through the Navy's community relations programs, which include Restoration Advisory Board (RAB) meetings, public meetings, the Administrative Record for the Site, and announcements published in the local newspaper (Bethpage Tribune).

The RAB was established for NWIRP Bethpage in 1998. RAB meetings continue to be held to provide an information exchange among community members, the Navy, NYSDOH, NYSDEC, and Nassau County. RAB meetings are held two times per year (April and November).

The Navy maintains a public repository, which includes supporting technical documents and correspondence related to the site and NWIRP Bethpage, at the Bethpage Public Library, 47 Powell Avenue, Bethpage, New York 11714, (516) 931-3907. A public web site with the Administrative Record can be accessed at the following web page: http://go.usa.gov/DyXF.

The Proposed Plan was made available to the public for public comment in November 2017. The notice of the availability of the Proposed Plan and the time and date of a public meeting about the Proposed Plan were published in Farmingdale Observer, Hicksville News, Levittown Tribune, Massapequa Observer, and Plainview-Old Bethpage Herald on November 22, 2017. A public comment period was held from November 22, 2017 to January 22, 2018. The Proposed Plan was discussed during the December 12, 2017 public meeting that was held at Bethpage Senior Community Center.

As indicated in the Responsiveness Summary (Section 3) of this ROD, comments were received from NYSDEC, a local business, and a community member. The comments did not result in the need to modify the proposed remedy.

## 2.4 Scope and Role of Response Action

The Navy has organized the response actions at NWIRP Bethpage into four OUs:

| | |
|---|---|
| NWIRP OU 1: | Contamination of soil at Sites 1, 2, and 3 and shallow groundwater at Site 1 |
| NWIRP OU 2: | Contamination of regional groundwater |
| NWIRP OU 3: | Contamination of soil and groundwater at Site 4 |
| NWIRP OU 4: | Contamination of soil, soil vapor, and groundwater at Site 1 |

The Navy NWIRP OU 1 ROD was signed on July 5, 1995. The major components of the selected remedy for these sites included further delineation of COCs in soil, soil excavation, and the construction, operation, and maintenance of an AS/SVE system. In accordance with the ROD, PCB-contaminated soil at Site 2 was excavated and disposed off NWIRP and a permeable cover was installed throughout Site 2 to act as a barrier to residual contamination. For Site 3, test data documented that scrapping activities conducted by NG during facility shutdown activities achieved similar results. Construction activities at Sites 2 and 3 in accordance with the OU 1 ROD were completed in 2002. The AS/SVE system treated VOC contamination in soil and shallow groundwater at Site 1. Additional investigations were conducted at Site 1 to support the OU 1 ROD. Due to the increased volume of PCB-impacted soil at Site 1, this portion of the OU 1 ROD was not implemented.

In 2001, NYSDEC issued a ROD for OU 2 that addressed VOC-and metal-contaminated groundwater from NG and NWIRP Bethpage facilities. In 2003, because of multiple sources of regional groundwater contamination, including non-Navy sources, a separate Navy-specific ROD was issued to address the Navy's contribution to onsite and offsite groundwater contamination.

The Navy's third operable unit (NWIRP OU 3), which was issued in 2015, addresses the contamination of soil and groundwater at Site 4. The primary risk pathways at Site 4 are through potential direct contact to PAH-contaminated soil and potential ingestion of PAH-, metal-, and VOC-contaminated groundwater.

This OU 4 ROD is to address PCB impacts to soil and groundwater at Site 1 that were not known at the time of the 1995 OU 1 ROD and that were found during supplemental investigations. In addition, this ROD addresses residual VOCs in site soil vapor and metals in the on-NWIRP groundwater. This ROD specifically addresses the following:

- PCBs, VOCs, SVOCs, metals (arsenic, chromium, and hexavalent chromium), and pesticides in soils from ground surface to 65 feet bgs;
- Residual PCB-contaminated soil associated with Dry Wells 20-08 and 34-07, which were added to Site 1 because of proximity and similarity in COC, concentrations, and depth;
- PCB- and metal (total chromium and hexavalent chromium)-contaminated groundwater associated with Site 1, which was not addressed in the 1995 OU 1 ROD, the 2001 NYSDEC OU 2 ROD, or the Navy 2003 OU 2 ROD;
- VOCs in Site 1 soil vapor that could result in vapor intrusion. The 1995 ROD did not address soil vapor intrusion as a pathway.

These contaminated media represent potential threats to human health through ingestion, dermal contact, and dust inhalation of contaminated soils; inhalation of soil vapor; and inhalation of volatiles

and ingestion of groundwater. This ROD is the final response action for Site 1 soil and PCB- and metal-impacted groundwater.

## 2.5 Site Characteristics

A Conceptual Site Model (CSM) conveys what is known or suspected about contamination sources, release mechanisms, and the transport and fate of those COCs. It provides the basis for understanding contaminant fate and transport issues and assessing potential remedial technologies at the site. The CSM for Site 1 is derived from available data and accepted principles of contaminant fate and transport, which is detailed in the 2015 RI Addendum. Figure 2-1 shows a three-dimensional CSM interpretation of Site 1.

Covering approximately 5.5 acres, Site 1 is mostly an open and relatively flat lightly vegetated area with a 4-foot high windrow located along the eastern end of the site. At the northern end of the Site, the grade is mounded in the area of the abandoned sanitary settling tank. Initially, the tank sidewalls used mounded soil as insulation. Later, the top of the tank was collapsed and the remnants were covered with soil. The southern portion of the site is covered in asphalt and gravel and is used to store miscellaneous equipment and for vehicle parking. Except for the asphalt and gravel area modification in 2012, the site is enclosed by a facility perimeter fence on the east and interior fencing on the north, west, and south.

NWIRP Bethpage is underlain by approximately 1,100 feet of unconsolidated sediments that overlie crystalline bedrock. The unconsolidated sediments consist of four distinct geologic units: the Upper Glacial Formation; Magothy Formation; Raritan Clay; and Lloyd Sand Formations. The Upper Glacial Formation consists primarily of coarse sands and gravels, and is approximately 30 to 45 feet thick. The Upper Magothy Formation consists primarily of coarse sands to a depth of approximately 100 feet, below which finer sands, silts, and clay predominate. The 100- to 150-foot thick Raritan Clay Formation underlies the Magothy Formation at a depth of approximately 700 to 800 feet bgs. The underlying Lloyd Sand Formation is approximately 300 feet thick.

Groundwater in the Magothy Formation is considered a sole source aquifer (NYSDEC Class GA), and is the primary source of potable water for Nassau County. Groundwater is encountered at a depth of approximately 50 feet bgs at the NWIRP Bethpage. In the past, due to pumping via deep production wells at the facility, and recharge, groundwater has been measured at depths from 40 to 60 feet bgs. Groundwater beneath the NWIRP flows in a general southerly direction toward the Atlantic Ocean and deeper. Across the facility the average horizontal hydraulic gradient and groundwater velocity of the unconfined aquifer are 5.3 feet per mile and 0.3 foot per day, respectively.

From the 1960s to the 1990s, there were 16 deep production wells in operation (7 on NWIRP Bethpage and 9 on Grumman property). The wells extracted water from the Magothy Formation and each yielded approximately 1,200 gallons per minute (gpm). The production wells extracted groundwater from depths of approximately 280 to 500 feet bgs. All of the production wells on the NWIRP Bethpage and most of the production wells on the NG property have been decommissioned. Extracted water was used primarily for non-contact single pass cooling for operations on the NWIRP Bethpage and NG properties, and water was discharged into nearby surficial recharge basins. The influence from these production wells altered the local groundwater flow from southeast to southwest and west. The extraction from the production wells and near surface recharge resulted in vertical gradients across the NWIRP Bethpage and NG properties that would enhance the downward migration of COCs.

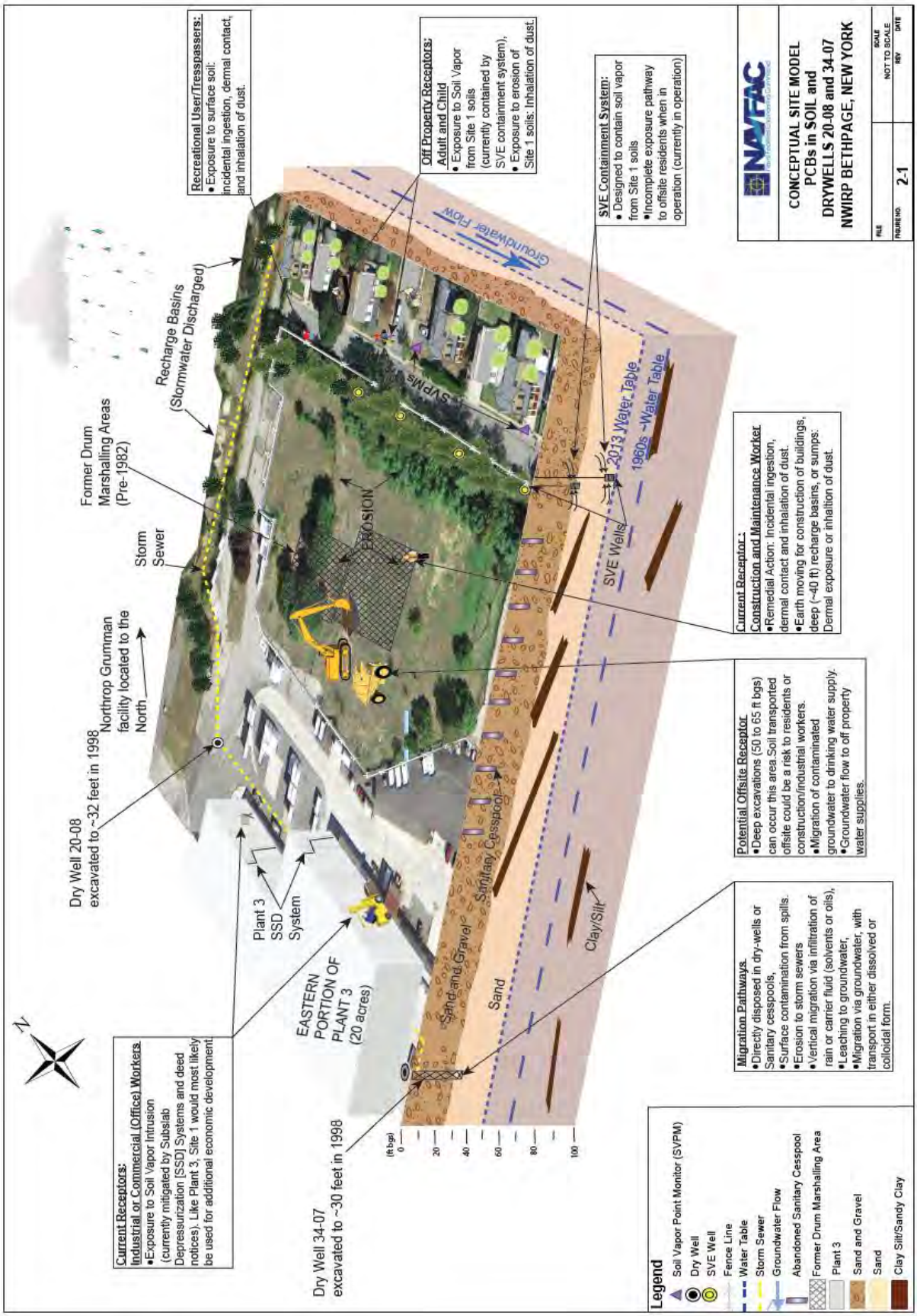


**Figure 2-1 – CSM for Site 1 and Dry Wells 20-08 and 34-07**

In 1996, most of the on-property production wells were shutdown. Based on water level measurements in 2010 to 2013, groundwater across Site 1 flows to the south-southeast and the water table elevation ranges from approximately 73 to 70 feet above mean sea level.

Currently, two of the NG production wells and three containment wells operate with a combined flow rate of approximately 3,800 gpm or 5.5 million gallons per day (ONCT System). This system would limit the migration of COCs south of these extraction wells.

PCBs and VOCs in soil represent the primary COCs at Site 1. Other contaminants, including metals, SVOCs, and pesticides are also present, but are generally co-located with the PCBs. The 1995 ROD for Site 1 estimated that PCB-contaminated soil would be limited to a depth to approximately 7 feet bgs and would not impact groundwater. Subsequent groundwater, soil, and soil vapor sampling were performed during various field investigations conducted between 1996 and 2013 to further delineate the extents of contaminants.

Soil data are compared to criteria ranging from unrestricted use to industrial use scenarios. Since the affected groundwater is part of a sole source drinking water aquifer, associated data are compared to tap water risk screening levels, groundwater standards, and drinking water standards.

**Soil**

Surface soil throughout Site 1 contains PCBs and SVOCs at concentrations that exceed risk-based levels. The maximum detection of PCBs in surface soil was 3,800 mg/kg (pre-1993 removal action) after which a soil cover was applied to the area). Under current conditions, the maximum concentration of PCBs in the surface soil is 88 mg/kg. The maximum individual SVOCs concentrations are 1.1 to 4.6 mg/kg. In addition, several metals including arsenic at 55.8 J mg/kg, cadmium at 74.9 mg/kg, and chromium at 69.5 mg/kg exceed NYSDEC or USEPA screening levels. Arsenic and cadmium each exceed the state risk-based levels at two locations and are co-located with PCB-contaminated soil. The area with residual metals and PCBs above screening levels is surrounded by fencing to prevent direct contact exposure to the contaminants. Vegetation at the site would limit erosion and dust migration of PCB-impacted soil. For the portions of Site 1 that are outside of the fenced area, gravel, concrete, or asphalt covers are used to prevent direct contact exposure. In addition, surface and subsurface activities at Site 1 are currently restricted through land use controls in the 2008 lease to Nassau County. This lease prohibits any construction or alteration of the property without prior approval of the Navy.

The estimated areal extent of PCB-contaminated surface soil (0 to 2 feet bgs, with PCBs greater than 1 mg/kg) is approximately 4.5 acres and totals 14,500 cubic yards. The conceptual site model for PCB-contaminated soil is presented on Figure 2-2. Based on the presence of gravel or concrete, there is no surface soil at Dry Wells 20-08 or 34-07.

Subsurface soil at Site 1 contains PCBs, cadmium, and chromium at concentrations that exceed Federal and/or state risk-based screening levels

The maximum detection of PCBs in unsaturated subsurface soils (2 to 50 feet bgs) is 3,500 mg/kg at 8 to 10 feet bgs; the maximum detection of cadmium is 3,260 mg/kg at 10 to 12 feet bgs; and the maximum detection of chromium is 1,000 mg/kg at 10 to 13 feet bgs. These locations and depths generally correspond to the bottoms of the cesspools. Subsurface soil was sampled for total chromium. Since hexavalent chromium was used in plating operations at the site and was detected in on-property groundwater, some of the residual chromium in soil is likely in the hexavalent form and would exceed the state risk-based screening level.

The PCBs are widespread throughout Site 1 and in some locations are found throughout the soil column (maximum depth of 65 feet bgs), whereas the maximum cadmium and chromium detections and frequency of detection are generally associated with the former cesspools. Arsenic exceeds risk-based screening levels at several locations at a maximum concentration of 150 mg/kg at 6 to 8 feet bgs. Also, SVOCs, VOCs, and metals were identified in the 1995 ROD and were retained as COCs. These COCs are generally co-located with PCB-contaminated soil. For COCs that are not fully co-located with the PCBs (horizontally and vertically), the COC-impacted soil is within the foot print of the PCB-impacted soil.

Saturated subsurface soils at this site contain detections of PCBs, and to a lesser extent, cadmium and chromium. The detections of PCBs exceed the Federal and/or State screening levels, with the maximum detection of PCBs in saturated subsurface soils (50 to 65 feet bgs) of 310 mg/kg at 60 to 62 feet bgs. The maximum detection of cadmium is 8.2 mg/kg at 58 to 60 feet bgs and the maximum detection of chromium is 21 mg/kg at 50 to 52 feet bgs, both of which only slightly exceed state screening levels.

The areal extent of sub-surface PCB-contaminated soil is approximately 3 acres and the volume of PCB-contaminated soil is approximately 130,000 cubic yards of soil (excluding the dry wells).

The areal extent of soil contamination at Dry Well 20-08 is approximately 0.38 acre and affects approximately 12,800 cubic yards. The areal extent of soil contamination at Dry Well 34-07 is approximately 0.02 acre, and affects 1,200 cubic yards. The conceptual site model for PCB-contaminated subsurface soil is presented on Figure 2-2.

**Groundwater**

Groundwater flows to the south southeast at Site 1 and the water table elevation ranges from approximately 73 to 70 feet above mean sea level.

Shallow (40 to 67 feet bgs), intermediate-depth (95 to 200 feet bgs), and deep groundwater (180 to 294 feet bgs) at this site contain VOCs, PCBs, hexavalent chromium, total chromium, and arsenic. On-NWIRP groundwater is captured and treated by NG's ONCT system. VOCs in regional groundwater are being addressed by NG and the Navy under the States 2001 OU 2 ROD, including capture of on-NWIRP groundwater by NG's ONCT system, and the Navy's 2003 OU 2 CERCLA ROD. Residual concentrations of PCBs, hexavalent chromium, and total chromium in on-NWIRP groundwater, which exceeded Federal and NYSDOH Maximum Contaminant Levels (MCLs) and NYSDEC Groundwater Quality Standards, are being addressed under this OU 4 ROD. The conceptual site model for PCB-impacted groundwater is presented on Figure 2-3.

The maximum detection of PCBs in shallow groundwater is 24 micrograms per liter (µg/L), the maximum detection of PCBs in intermediate-depth groundwater is 6.9 µg/L, and the maximum detection of PCBs in deep groundwater is 8.2 µg/L. The NYSDOH MCL for PCBs is 0.5 µg/L and the NYSDEC Groundwater Quality Standard for PCBs is 0.09 µg/L. MCL exceedances of PCBs extend from Site 1 to the south and southwest to the property line of the former NWIRP Bethpage. NYSDEC PCB Groundwater Quality Standard exceedances extend from the northern property line to the southern property line. The presence of PCBs in upgradient monitoring wells (i.e. representative of groundwater flowing onto NWIRP), suggests that at least a portion of the PCBs originated from a source upgradient of the NWIRP Bethpage.

The maximum detection of hexavalent chromium in shallow groundwater is 158 µg/L, the maximum detection of hexavalent chromium in intermediate-depth groundwater is 200 µg/L, and the maximum detection of hexavalent chromium in deep groundwater is 86 µg/L. Hexavalent chromium in shallow and intermediate-depth groundwater exceeded Federal and NYSDOH MCLs. The chromium/

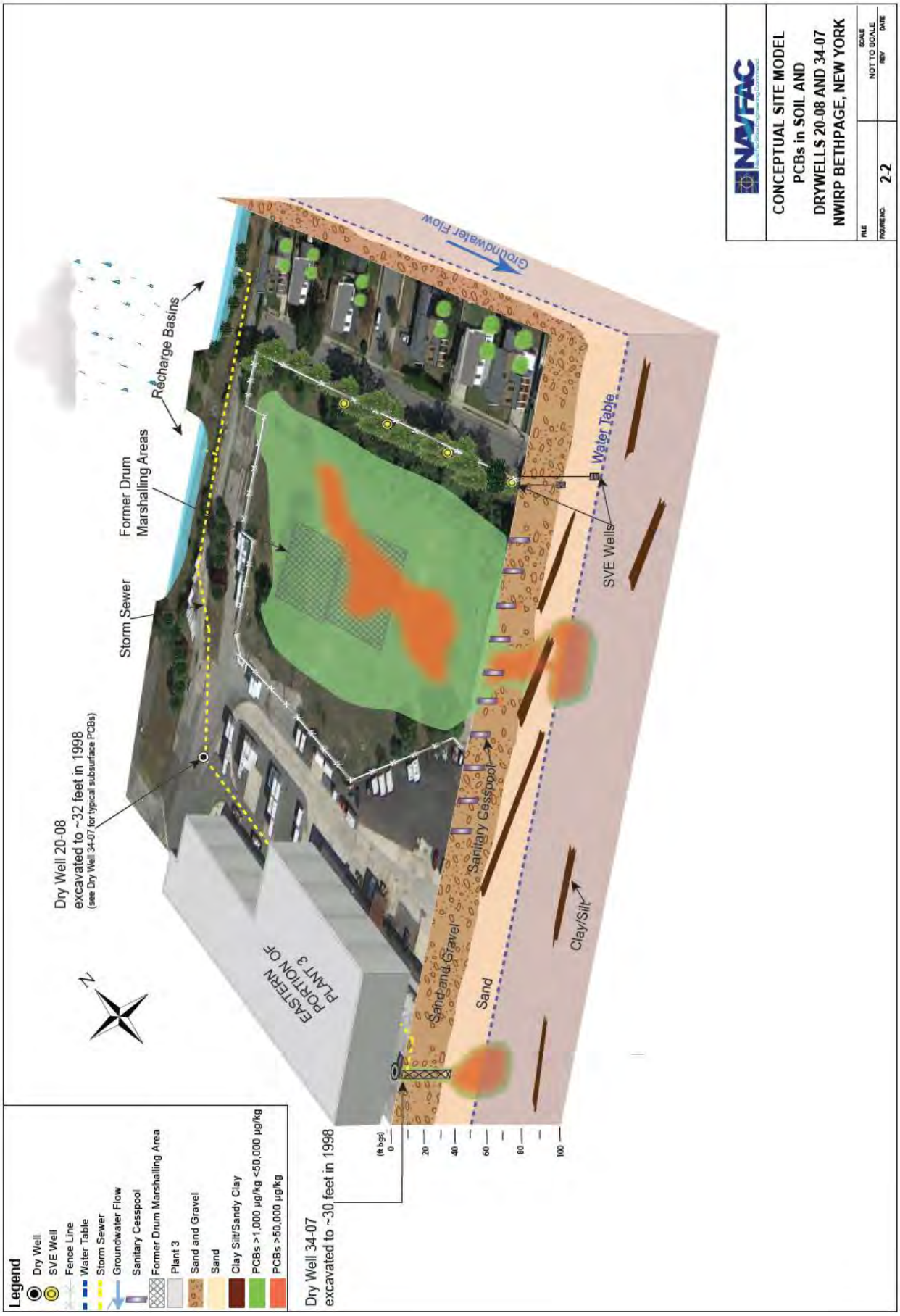


**Figure 2-2 – CSM for PCBs in Soil**

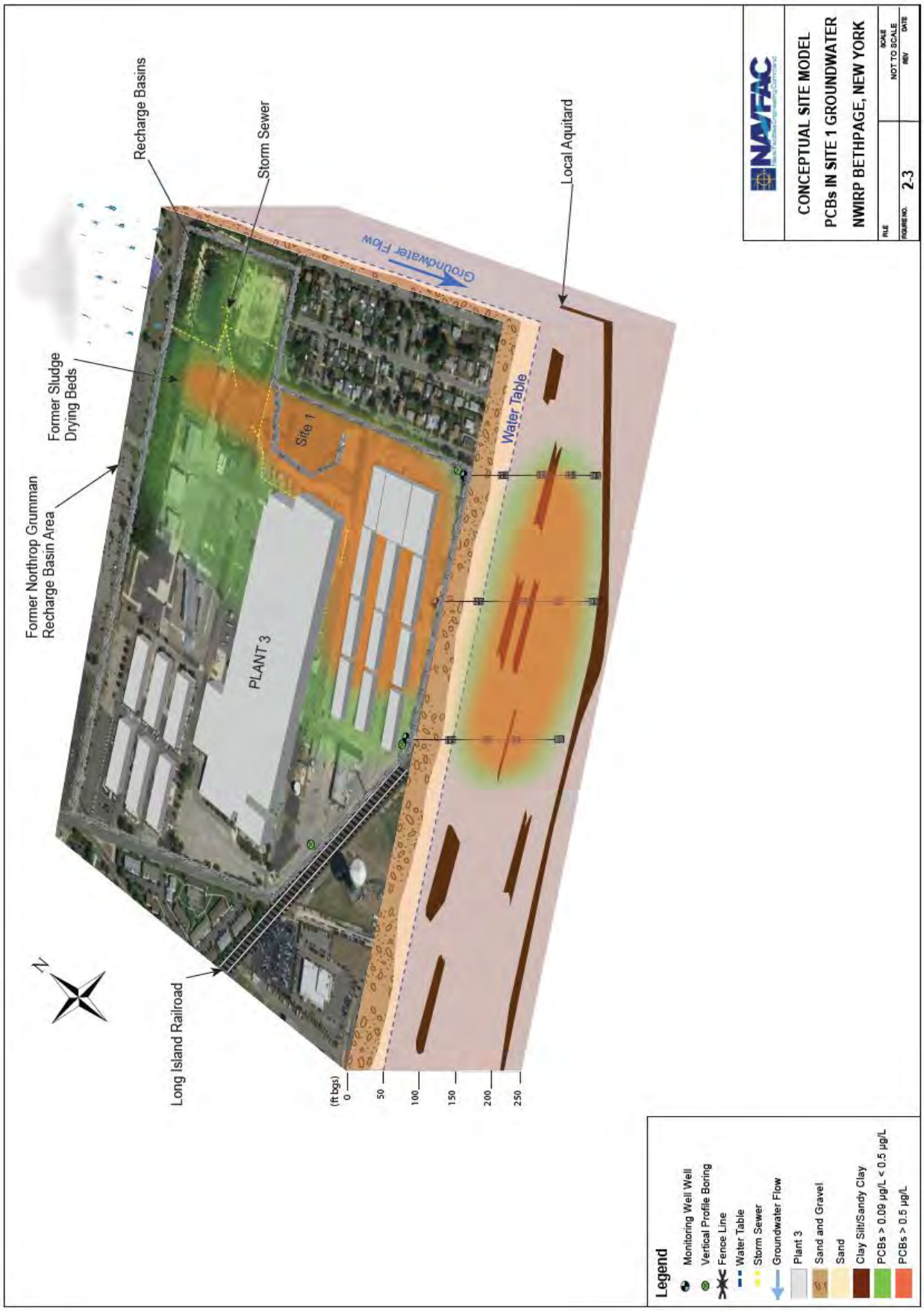


**Figure 2-3 – CSM for PCBs in Groundwater**

hexavalent chromium Federal MCL is 100 µg/L and the NYSDEC Groundwater Quality Standard is 50 µg/L. The chromium exceedances are present sporadically throughout the former NWIRP Bethpage property, with no apparent single source.

The maximum detection of arsenic in groundwater is 5.2 µg/L. The arsenic concentrations do not exceed Federal or NYSDOH MCL of 10 µg/L.

The estimated volume of PCB-contaminated groundwater above MCLs is approximately 550 million gallons, and extends south and southwest of Site 1 for at least 800 feet. Based on the concentration and volume, the groundwater contains approximately 4 pounds of soluble PCBs. The volume of groundwater contaminated with hexavalent chromium and the corresponding mass of hexavalent chromium in groundwater at concentrations above the MCL are estimated to be 6.4 million gallons and 7 soluble pounds, respectively.

**Soil Vapor/Indoor Air**

Carbon tetrachloride, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, PCE, 1,2,4-trichlorobenzene, and TCE were identified in soil vapor at concentrations that if they migrated to indoor air without sufficient attenuation, could adversely impact the indoor air (Figure 2-1). There are industrial/commercial buildings west and south of Site 1, and a residential neighborhood is located east of Site 1. An SVE containment system, operating as a removal action, is used to control VOC soil vapor migration into off-property residential homes. The source of the VOCs is believed to be soils located at variable depths throughout Site 1. An SSD system operates to control vapor intrusion into the former Plant 3 industrial building.

## 2.6 Current and Potential Future Land and Water Uses

The land surrounding the former NWIRP Bethpage is primarily commercial. A residential neighborhood is present to the east of NWIRP Bethpage and is adjacent to Site 1.

Prior to 1996, NWIRP Bethpage was mostly surrounded by the NG complex of research and development centers, manufacturing and assembly plants, test facilities, and corporate headquarters. Densely-populated suburban housing surrounded much of the former NG land and included developments with the hamlets of Bethpage, Levittown, Hicksville, and Plainview.

In 2008, 96 acres of the Navy-owned property at the former NWIRP Bethpage was transferred to Nassau County. In 2011, Steel-Los III bought the majority of the property and has renovated the property to maintain or attract new commercial tenants. Plant 3 (the former manufacturing plant located west of Site 1) and the South Warehouses located south of Site 1 are leased out for economic redevelopment. Except for vehicle parking and equipment storage outside the fenced area, Site 1 remains unused and the portion of Site 1 with exposed surface soil is surrounded by a fence. Vegetation at Site 1 limits erosion and dust migration. Operations within the fenced area are currently limited to environmental investigations, control of vegetation, fence repair, security patrols, and fire watch and/or suppression.

Upon successful remediation, Site 1 will be transferred to Nassau County. Reasonably anticipated future land use for the site is for commercial and/or industrial purposes. Because of the limited free space available at Site 1 and potential for future expansion needs, excavation and/or use of site soil is deemed possible, requiring consideration of land use controls.

Onsite groundwater is currently not used as a potable water supply. Because of the presence of chlorinated VOCs in deep groundwater, groundwater use restrictions are currently in place for the former NWIRP Bethpage. As identified in 2008 Finding of Suitability to Transfer, extraction of groundwater from within the boundaries of the 105-Acre parcel is prohibited without permission from NYSDEC.

## 2.7 Summary of Site Risks

A quantitative risk assessment was conducted for Site 1 using both risk-based soil and groundwater screening values in the 2015 RI Addendum.

### Identification of COCs

During the Remedial Investigation, the maximum detections of chemicals in media (soil, soil vapor, and groundwater) at Site 1 were compared to applicable Federal and State screening levels such as USEPA Regional Screening Levels (RSLs), USEPA Soil Screening Levels (SSLs), NYSDEC Unrestricted Use SCOs, and NYSDEC SCOs for the Protection of Groundwater for soil; NYSDOH Soil Vapor Intrusion Guidance - subslab values, NYSDOH Air Guideline Values for TCE and PCE, NYSDEC Ambient Air Guidelines, USEPA Indoor Air – Residential RSLs for soil vapor; and NYSDOH MCLs for groundwater. This evaluation identifies chemicals of potential concern. Based on this screening, a more detailed risk assessment was then conducted for Site 1 to determine COCs for soil, soil vapor, and groundwater.

This OU 4 ROD also retains most of the COCs identified in the OU 1 ROD for Site 1. The OU 1 ROD soil COCs consist of PAHs, VOCs, PCBs, a pesticide, and metals (arsenic and manganese). The data for these COCs were compared to current screening values. Except for manganese, each of these COCs remains a COC for the OU 4 ROD. Manganese was identified as a soil COC in the 1995 OU 1 ROD; however, based on state screening levels and revised EPA RSLs updated as of 2017, the maximum site concentrations of manganese do not exceed screening criteria and therefore manganese is no longer being identified as a COC in soil for Site 1.

In 2015, analytical data from 2009 to 2013 was evaluated in the 2015 RI Addendum. This evaluation again identified PCBs (Aroclor 1248, Aroclor 1254, and Aroclor 1262) and arsenic as COCs for soil. In addition, two metals (cadmium, and chromium) exceeded Federal and/or State screening levels for soil and were added as soil COCs. Since hexavalent chromium was used in plating operations at the NWIRP Bethpage and was detected in site groundwater, some of the residual chromium in soil is likely in the hexavalent form and would exceed the Federal and State screening levels. The 2015 RI Addendum also identified PCBs (Aroclor 1242 and Aroclor 1248), arsenic, and hexavalent chromium as COCs in groundwater and VOCs (PCE and TCE) as COCs in soil vapor. The 2009 to 2013 testing did not evaluate the presence of SVOCs, VOCs, or pesticides in soil, and therefore, these chemicals were retained as COCs because there is no more current data indicating that they have attenuated. Several chemicals were evaluated in the risk assessment (e.g., aluminum, iron, and thallium), but were not retained as COCs, because they were not identified as significant contributors to risk.

Table 2-1 presents COCs and exposure point concentration for each of the COCs detected in 2009 to 2013 soil investigations (i.e. the concentration that will be used to estimate the exposure and risk from each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that PCBs were detected for both soil and groundwater. The 95% Upper Confidence Level on the arithmetic mean was used as the EPC for the COCs.

Note that the 2009 to 2013 sample locations were primarily selected for the purpose of defining clean end points for excavation. As a result, the calculated EPC used in the 2015 risk assessment does not include some of the higher PCB values detected in previous sampling events, which would result in higher EPCs and associated risks. The overall risk assessment for the site accounts for this bias. However, in the mass and volume calculations presented later, all of the available PCB data is used.

## Exposure Assessment

Current and potential future exposure pathways through which humans might encounter the COCs identified in the RI Addendum were evaluated. The results of the exposure assessment were used to refine the Human Health Risk Assessment CSM (Figure 2-4), which identifies potential contaminant sources, contaminant release mechanisms, transport routes, and receptors under current and future land use scenarios.

## Risk Characterization

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

Risk = CDI x SF

Where: risk = a unitless probability (e.g., 2 x $10^{-5}$) of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

Subsurface soil, soil vapor, and groundwater were identified as the media of concern for the COCs. Receptor exposure was considered under nonresidential land use (construction, maintenance, and industrial workers and trespassers) and future hypothetical residential land use. Groundwater is currently not in use at Site 1. An SVE containment system, operating as a removal action, is used to control VOC migration into residences located to the east of Site 1. As such, soil vapor intrusion to the west of Site 1 is an incomplete exposure pathway (i.e., no risk). Current and hypothetical future exposure pathways at Site 1 are summarized in Table 2-2.

### 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 exposure and the severity of adverse effects for each COC. Toxicity values for both cancer and non-cancer effects were considered during the risk assessment. Cancer and non-cancer toxicity data is presented in Tables 2-3 and 2-4.

These risks are probabilities that usually are expressed in scientific notation (e.g., $1X10^{-6}$). An excess lifetime cancer risk of $1X10^{-6}$ indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as 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's developing cancer from all other causes has been estimated to be as high as one in three. USEPA's generally acceptable risk range for site-related exposures is $10^{-4}$ to $10^{-6}$ incremental lifetime cancer risk (ILCR).

**Table 2-1 – Summary of COCs and Medium Specific Exposure Point Concentrations**

| Exposure Point | Chemical of Concern | Concentration of | | Units | Frequency of Detection | Exposure Point Concentration | Exposure Point Concentration Units | Statistical Measure |
|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | | | | | |
| **Scenario Timeframe:** | | Current | | | | | | |
| **Medium:** | | Surface Soil | | | | | | |
| **Exposure Medium:** | | Surface Soil | | | | | | |
| Site 1 - Direct Contact | Aroclor 1248 | 0.024 J | 150 | mg/kg | 39/39 | 30 | mg/kg | 95% UCL |
| | Aroclor 1254 | 0.011 J | 28 | mg/kg | 29/39 | 9.12 | mg/kg | 99% UCL |
| **Scenario Timeframe:** | | Future | | | | | | |
| **Medium:** | | Shallow Subsurface Soil (2-15 feet bgs) | | | | | | |
| **Exposure Medium:** | | Shallow Subsurface Soil (2-15 feet bgs) | | | | | | |
| Site 1 - Direct Contact | Aroclor 1242 | 0.56 | 0.56 | mg/kg | 1/53 | 0.56(1) | mg/kg | Maximum |
| | Aroclor 1248 | 0.0038 J | 21 | mg/kg | 28/53 | 3.41 | mg/kg | 97.5% UCL |
| | Aroclor 1254 | 0.0038 J | 13 | mg/kg | 23/53 | 1.39 | mg/kg | 95% UCL |
| **Scenario Timeframe:** | | Current | | | | | | |
| **Medium:** | | Shallow Subsurface Soil (2-15 feet bgs) | | | | | | |
| **Exposure Medium:** | | Shallow Subsurface Soil (2-15 feet bgs) | | | | | | |
| Dry Well 34-07 - Direct Contact | Aroclor 1248 | 0.12 J | 0.83 | mg/kg | 4/4 | 0.83(2) | mg/kg | Maximum |
| **Scenario Timeframe:** | | Current/Future | | | | | | |
| **Medium:** | | Groundwater | | | | | | |
| **Exposure Medium:** | | Groundwater | | | | | | |
| Site 1 - Direct Contact | Aroclor 1242 | 0.052 J | 4 J | µg/L | 36/84 | 0.913 | µg/L | 95% UCL |
| | Aroclor 1248 | 0.81 J | 4.2 | µg/L | 37/84 | 0.775 | µg/L | 95% UCL |
| | Arsenic | 0.3 J | 5.2 | µg/L | 3/7 | 2.6 | µg/L | 95% UCL |
| | Hexavalent | 0.4 J | 182 | µg/L | 13/29 | 38.8 | µg/L | 95% UCL |
| **Scenario Timeframe:** | | Current/Future | | | | | | |
| **Medium:** | | Soil Vapor | | | | | | |
| **Exposure Medium:** | | Indoor Air Via Vapor Intrusion | | | | | | |
| Inhalation | Trichloroethene(3) | 645 | 1,350 | µg/m$^3$ | 13/13 | 98.2 | µg/m$^3$ | 95% UCL |
| | Tetrachloroethane(3) | 515 | 925 | µg/m$^3$ | 13/13 | 70.8 | µg/m$^3$ | 95% UCL |

UCL - Upper confidence limit on the mean. mg/kg - milligram per kilogram.

µg/L - Microgram per liter. µg/m$^3$ - microgram per cubic meter.

J - estimated. bgs - below ground surface.

(1) There are less than 4 detected concentrations for Aroclor 1242 in shallow subsurface soil. Therefore, the maximum concentration was used as the EPC.

(2) There are only 4 detected concentrations for Aroclor 1248 in shallow subsurface soil. Therefore, the maximum concentration was used as the EPC.

(3) The exposure point concentration is calculated using an estimated attenuation factor of 0.1 from soil vapor and indoor air.

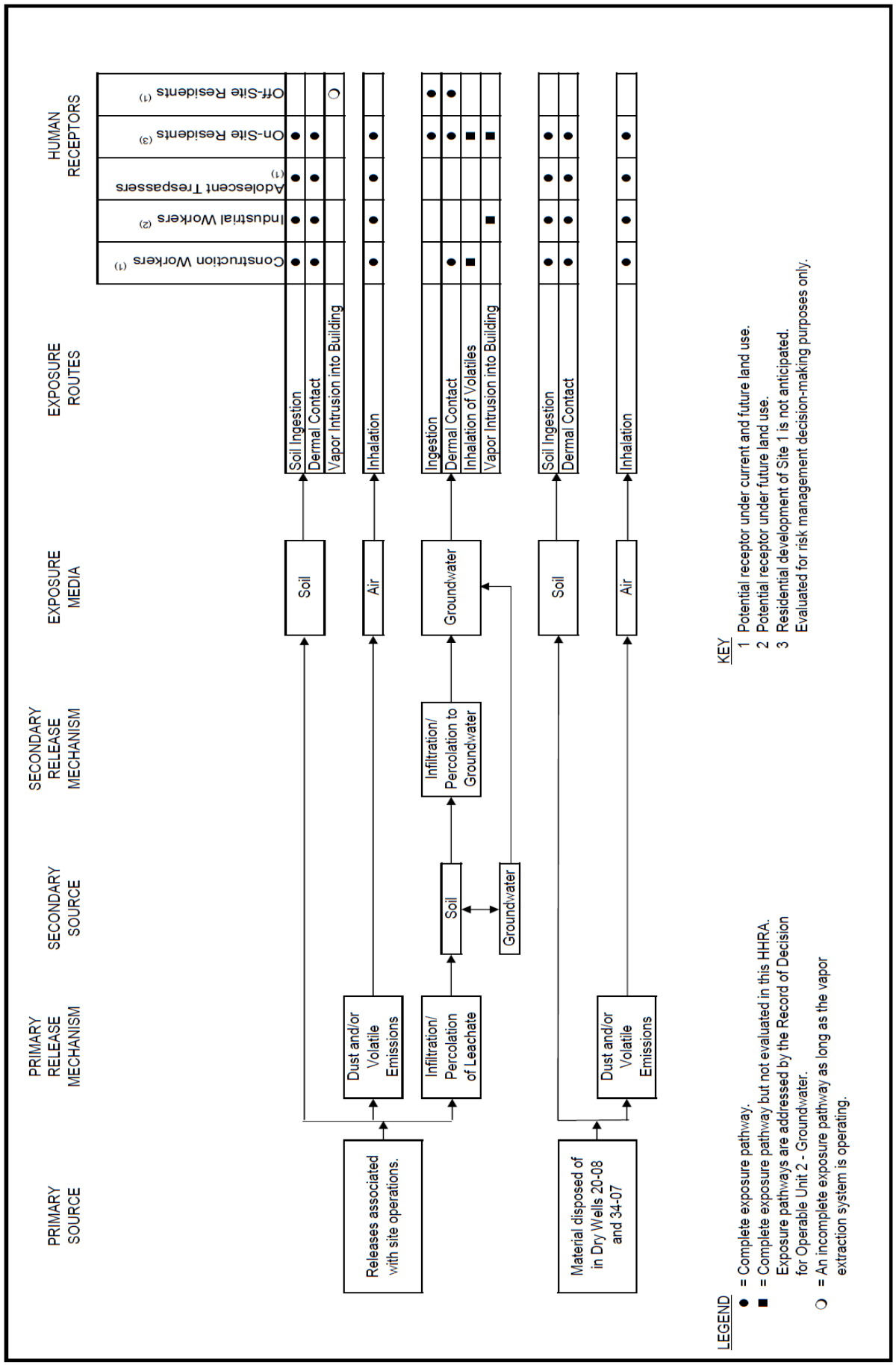


**Figure 2-4 Human Health Risk Assessment CSM**

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a reference does (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect during a lifetime. 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 COCs 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 reasonably be exposed.

**Table 2-2 – Receptors and Exposure Routes**

| Receptor | Exposure Route |
|---|---|
| Construction/Excavation Workers (Future) | Surface and subsurface soil/groundwater incidental ingestion<br>Surface and subsurface soil/groundwater dermal contact<br>Inhalation of air/dust emissions |
| Maintenance/Industrial Workers (Current/Future) | Surface and subsurface soil/groundwater incidental ingestion<br>Surface and subsurface soil/groundwater incidental dermal contact<br>Inhalation of air/dust emissions |
| Trespassers (Adolescent and Adult) (Current/Future) | Surface and subsurface soil/groundwater incidental ingestion<br>Surface and subsurface soil/groundwater dermal contact<br>Inhalation of air/dust emissions |
| Residents (Children/Adult)<br><br>(Hypothetical Future) | Surface and subsurface soil (up to 65 feet below ground surface)/groundwater incidental ingestion<br>Surface and subsurface soil (up to 65 feet below ground surface)/groundwater dermal contact<br>Inhalation of air/dust/emissions<br>Direct ingestion of groundwater<br>Groundwater dermal contact (showering/bathing) |
| Off-Site Residents (Children/Adult) (Current/Future) | Inhalation of soil vapors intruding into a building<br>Inhalation of air/dust emissions from dust migration |

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:

Non-cancer HQ = CDI/RfD

Where:

CDI = Chronic daily intake
RfD = Reference dose.

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

## 2.7.1 Summary of Human Health Risk Assessment

The baseline 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 baseline risk assessment for this site. Additional backup on risk assessment calculations are provided in Appendix B.

The results of this risk assessment did not indicate unacceptable risk to construction or maintenance workers or trespassers. The risk assessment estimated that there would be an ILCR for a potential future onsite resident of $2X10^{-4}$ and the HI was 8 under a reasonable maximum exposure duration of 26 years. The exposure duration is based on the 2014 USEPA Human Health Evaluation Manual, Supplemental Guidance, Update of Standard Default Exposure Factors. An ILCR greater than $1X10^{-4}$ to $1X10^{-6}$ or a HI greater than 1 is considered to be unacceptable under CERCLA. PCBs and select VOCs and metals were the primary contributor to the ILCR and HI for the potential future resident (see Appendix B). Excavation of subsurface soil at Site 1 is currently restricted to prevent exposure.

**Table 2-3 – Cancer Toxicity Data Summary**
**For Soil and Groundwater**
**(Page 1 of 2)**

| Chemical of Concern | Oral Cancer Slope Factor | Oral Cancer Slope Factor Units | Dermal Cancer Slope Factor | Dermal Slope Factor Units[1] | Weight of Evidence/Cancer Guideline Description | Source | Date (MM/DD/YYYY) |
|---|---|---|---|---|---|---|---|
| **Pathway: Oral/Dermal** | | | | | | | |
| Aroclor-1242 (Soil) | 2.00E+00 | $(mg/kg/day)^{-1}$ | 2.00E+00 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aroclor-1242 (Water) | 4.00E-01 | $(mg/kg/day)^{-1}$ | 4.00E-01 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aroclor-1248 (Soil) | 2.00E+00 | $(mg/kg/day)^{-1}$ | 2.00E+00 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aroclor-1248 (Water) | 4.00E-01 | $(mg/kg/day)^{-1}$ | 4.00E-01 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aroclor-1254 | 2.00E+00 | $(mg/kg/day)^{-1}$ | 2.00E+00 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aroclor-1260 | 2.00E+00 | $(mg/kg/day)^{-1}$ | 2.00E+00 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aluminum | NA | NA | NA | NA | NA | NA | NA |
| Arsenic | 1.50E+00 | $(mg/kg/day)^{-1}$ | 1.50E+00 | $(mg/kg/day)^{-1}$ | A / human carcinogen | IRIS | 11/10/2014 |
| Chromium[3,4] | 5.00E-01 | $(mg/kg/day)^{-1}$ | 2.00E+01 | $(mg/kg/day)^{-1}$ | Carcinogenic potential cannot be determined (Oral route) | NJDEP | 4/8/2009 |
| Cobalt | NA | NA | NA | NA | NA | NA | NA |
| Iron | NA | NA | NA | NA | NA | NA | NA |
| Thallium | NA | NA | NA | NA | NA | NA | NA |

**Table 2-3 – Cancer Toxicity Data Summary**
**For Soil and Groundwater**
**(Page 2 of 2)**

| Chemical of Concern | Unit Risk - Value | Unit Risk - Units | Inhalation Cancer Slope Factor Value | Inhalation Cancer Slope Factor - Units[6] | Weight of Evidence/Cancer Guideline Description | Source | Date (MM/DD/YYYY) |
|---|---|---|---|---|---|---|---|
| **Pathway: Inhalation** | | | | | | | |
| Aroclor-1242 | 5.70E-04 | $(ug/m^3)^{-1}$ | 2.00E+00 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aroclor-1248 | 5.70E-04 | $(ug/m^3)^{-1}$ | 2.00E+00 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aroclor-1254 | 5.70E-04 | $(ug/m^3)^{-1}$ | 2.00E+00 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aroclor-1260 | 5.70E-04 | $(ug/m^3)^{-1}$ | 2.00E+00 | $(mg/kg/day)^{-1}$ | B2 / Probable human carcinogen | USEPA[2] | 9/1996 |
| Aluminum | NA | NA | NA | NA | NA | NA | NA |
| Arsenic | 4.30E-03 | $(ug/m^3)^{-1}$ | 1.50E+01 | $(mg/kg/day)^{-1}$ | A / Known human carcinogen | IRIS | 11/10/2014 |
| Chromium[3,4] | 8.40E-02 | $(ug/m^3)^{-1}$ | 2.90E+02 | $(mg/kg/day)^{-1}$ | Known/likely human carcinogen (Inhalation route) | IRIS | 11/10/2014 |
| Cobalt | 9.00E-03 | $(ug/m^3)^{-1}$ | 3.20E+01 | $(mg/kg/day)^{-1}$ | NA | PPRTV | 8/25/2008 |
| Iron | NA | NA | NA | NA | NA | NA | NA |
| Thallium | NA | NA | NA | NA | NA | NA | NA |

1 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.
2 - USEPA(1) = USEPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.
3 - Values are for hexavalent chromium.
4 - Hexavalent chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).
5 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

IRIS = Integrated Risk Information System
NA = Not Available.
PPRTV = Provisional Peer Reviewed Toxicity Value.
NJDEP = New Jersey Department of Environmental Protection.
USEPA = USEPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.
$ug/m^3$ = microgram per cubic meter.
NA = Not applicable.
mg/kg/day = milligram per kilogram per day.

For groundwater, the maximum detections of chemicals were used to establish COCs and develop site-specific risk calculations. The COCs were Aroclor-1242, -1248, and -1254, hexavalent chromium, arsenic, and VOCs (carbon tetrachloride, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, tetrachloroethane, 1,2,4-trichlorobenzene, and trichloroethene). Under the reasonable maximum exposure duration of 26 years, the calculated ILCR for a potential future resident was $1X10^{-3}$ and the HI was less than the acceptable threshold of 1. In addition, because the groundwater is classified as a GA-drinking water aquifer, VOCs in groundwater were compared to USEPA MCLs and NYSDOH MCLs. These criteria are considered to be Applicable or Relevant and Appropriate Requirements (ARARs). PCBs, VOCs, and metals with concentrations exceeding MCLs are also considered COCs and pose a potential unacceptable risk for residential exposure to groundwater through potential ingestion, dermal contact, and inhalation via showering. Subsurface activities at Site 1 are currently restricted through covenants in the property transfer documents to prevent residential use of groundwater.

**Table 2-4 – Noncancer Toxicity Data Summary**

| Chemical of Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Dermal RfD Value (1) | Dermal RfD Units | Primary Target Organ | Combined Uncertainty/ Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (MM/DD/YYYY) |
|---|---|---|---|---|---|---|---|---|---|
| **Pathway: Oral/Dermal** | | | | | | | | | |
| Arochlor-1242 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Arochlor-1248 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Arochlor-1254 | Subchronic | 3.00E-05 | mg/kg/day | 3.00E-05 | mg/kg/day | Central Nervous System | 300/1 | ATSDR | 11/2000 |
| | Chronic | 2.00E-05 | mg/kg/day | 2.00E-05 | mg/kg/day | Immune System | 300/1 | IRIS | 11/10/2014 |
| Arochlor-1260 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aluminum | Subchronic | 1.00E+00 | mg/kg/day | 1.00E+00 | mg/kg/day | Central Nervous System | 30/1 | ATSDR | 9/2008 |
| | Chronic | 1.00E+00 | mg/kg/day | 1.00E+00 | mg/kg/day | Central Nervous System | 100 | PPRTV | 10/23/2006 |
| Arsenic | Chronic | 3.00E-04 | mg/kg/day | 3.00E-04 | mg/kg/day | Skin, Cardiovascular System | 3/1 | IRIS | 11/10/2014 |
| Chromium(2) | Subchronic | 5.00E-03 | mg/kg/day | 1.30E-04 | mg/kg/day | Kidney | 100/1 | ATSDR | 9/2012 |
| | Chronic | 3.00E-03 | mg/kg/day | 7.50E-05 | mg/kg/day | None Reported | 300/3 | IRIS | 11/10/2014 |
| Cobalt | Subchronic | 3.00E-03 | mg/kg/day | 3.00E-03 | mg/kg/day | Thyroid | 300/1 | PPRTV | 8/25/2008 |
| | Chronic | 3.00E-04 | mg/kg/day | 3.00E-04 | mg/kg/day | Thyroid | 3000/1 | PPRTV | 8/25/2008 |
| Iron | Subchronic | 7.00E-01 | mg/kg/day | 7.00E-01 | mg/kg/day | Gastrointestinal System | 1.5 | PPRTV | 9/11/2006 |
| | Chronic | 7.00E-01 | mg/kg/day | 7.00E-01 | mg/kg/day | Gastrointestinal System | 1.5 | PPRTV | 9/11/2006 |
| Thallium (3) | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Pathway: Inhalation** | | | | | | | | | |
| Aroclor-1242 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aroclor-1248 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aroclor-1254 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aroclor-1260 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Aluminum | Chronic | 5.00E-03 | $mg/m^3$ | -- | -- | Central Nervous System | 300/1 | PPRTV | 10/23/2006 |
| Arsenic | Chronic | 1.50E-05 | $mg/m^3$ | -- | -- | Skin, Cardiovascular System | NA | Cal EPA(4) | 9/2009 |
| Chromium(2) | Subchronic | 3.00E-04 | $mg/m^3$ | -- | -- | Respiratory | 30/1 | ATSDR | 9/2012 |
| | Chronic | 1.00E-04 | $mg/m^3$ | -- | -- | Respiratory | 300/1 | IRIS | 11/10/2014 |
| Cobalt | Subchronic | 2.00E-05 | $mg/m^3$ | -- | -- | Respiratory | 100/1 | PPRTV | 8/25/2008 |
| | Chronic | 6.00E-06 | $mg/m^3$ | -- | -- | Respiratory | 300/1 | PPRTV | 8/25/2008 |
| Iron | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Thallium | NA | NA | NA | NA | NA | NA | NA | NA | NA |

1 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.
2 - Values are for hexavalent chromium.
3 - Toxicity criteria used to derive the RSLs is only suitable for screening and is not to be used for quantifying risks.
4 - Extrapolated RfD = RfC *$20m^3$/day / 70 kg

ATSDR = Agency for Toxic Substances and Disease Registry.
IRIS = Integrated Risk Information System
NA = Not Available.
PPRTV = Provisional Peer Reviewed Toxicity Value.
Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

VOCs retained in the RI Addendum were considered as potential COCs for vapor intrusion. An SVE containment system, operating under a time-critical removal action, is used to control soil vapor intrusion (VOC) off-property and potentially into residential homes located to the east of Site 1. Use of this system as a final remedy was considered in the FS.

In the event that the SVE containment system is no longer operating, the Human Health Risk Assessment identified potential vapor intrusion issues with carbon tetrachloride, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, tetrachloroethene, 1,2,4-trichloro-benzene, and trichloroethene under the reasonable maximum exposure duration of 26 years. Based on modeling, the calculated ILCR ranged from $1X10^{-4}$ to $3X10^{-4}$. Calculated HIs ranged from 20 to 67. Industrial buildings are present west and south of Site 1. A residential neighborhood is located east of Site 1 and soil vapor could migrate to this area. Uncontrolled migration of VOCs could result in unacceptable risk to commercial and residential receptors.

### 2.7.2 Summary of Ecological Risk Assessment

Over 90 percent of NWIRP Bethpage is covered by buildings, impermeable parking areas, roadways, and other development. No natural aquatic habitats exist on the NWIRP Bethpage. Since the areas surrounding Site 1 have been developed for industrial use, there are no noted risks to ecological receptors.

### 2.7.3 Basis for Action

Based on the unacceptable risks described in Section 2.7.1, the response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

## 2.8 Remedial Action Objectives

The Remedial Action Objectives (RAOs) are statements that define the extent to which sites require cleanup to protect human health and the environment and comply with ARARs. Each RAO identifies a medium, pathway, receptor, and a chemical-specific concentration-based Cleanup Level. The basis for the medium-specific Cleanup Levels for soil, groundwater, and soil vapor are presented in Tables 2-5, 2-6, and 2-7, respectively. The media-specific Cleanup Levels are presented in Table 2-8. The RAOs for Site 1 soil, groundwater, and vapor intrusion are as follows:

- Prevent human exposures (ingestion, dermal contact, and dust inhalation) to soil contaminated at concentrations greater than Cleanup Levels presented in Table 2-8.
- Prevent leaching COCs from soil to groundwater that would impact groundwater in excess of Cleanup Levels presented in Table 2-8.
- Prevent Human exposures (inhalation and ingestion) to groundwater contaminated at concentrations greater than Cleanup Levels presented in Table 2-8.
- Prevent human exposure to soil vapors contaminated at concentrations greater than Cleanup Levels in Table 2-8.
- Prevent offsite migration of contaminated soil via erosion to surface water and sediment in recharge basins.

These RAOs are based on risks associated with current and potential future land use, including excavation of subsurface soils for expansion activities and use of groundwater as a drinking water supply, and nearby residences subject to vapor intrusion.

To address these risks, Cleanup Levels were developed based on the following:

- Cleanup Levels for soil were developed based on Federal and/or State screening levels and the former 1995 ROD Cleanup Levels (Table 2-5);
- Cleanup Levels for groundwater were developed based on USEPA MCLs, USEPA National Recommended Water Quality Criteria, NYSDOH MCLs, and NYSDEC Groundwater Quality Standards (Table 2-6); and
- Cleanup Levels for soil vapor are based on USEPA carcinogenic values ($1x10^{-6}$ ICLR). The fence line soil vapor remediation goal is based on the USEPA Guidance attenuation factor for soil vapor to indoor air value of 0.03 (Table 2-7).

A comparison of the soil Cleanup Levels between the 1995 OU 1 ROD and this OU 4 ROD shows that the Cleanup Levels for several chemicals have changed. These changes result from the use of updated factors to calculate risk-based values, including exposure duration and toxicity data, as well as revised state guidance.

## Table 2-5 - Basis of Cleanup Levels for Soil (Milligrams per Kilogram)

| Chemical | Protection of Public Health Commercial Use [1] | Protection of Public Health Industrial Use [1] | Restricted Use for the Protection of GW [1] | Unrestricted Use Soil Cleanup Objectives [2] | USEPA Regional Screening Levels Res./ Ind. Soil [2] | 1995 OU 1 Record of Decision (ROD) Cleanup Levels |
|---|---|---|---|---|---|---|
| **METALS** | | | | | | |
| Arsenic | 16 [5] | 16 [6] | 16 [5] | 13 [6] | 0.67/3.0 | 5.4 |
| Cadmium | 9.3 | 60 | 7.5 | 2.5 | 70/980 | -- |
| Chromium, hexavalent | 400 | 800 [8] | 19 | 1.0 [10] | 0.3/6.3 | -- |
| **PESTICIDES** | | | | | | |
| Chlordane | 24 | 47 | 2.9 | 0.094 | 1.8/8.0 | 0.206 |
| **SVOCs** | | | | | | |
| Benzo(a)anthracene | 5.6 | 11 | 1.0 [5] | 1.0 [6] | 0.15/2.9 | 0.330 |
| Benzo(a)pyrene | 1.0 [5] | 1.1 | 22 | 1.0 [6] | 0.015/0.29 | 0.330 |
| Benzo(b)fluoranthene | 5.6 | 11 | 1.7 | 1.0 [6] | 0.15/2.9 | 0.330 |
| Benzo(k)fluoranthene | 56 | 110 | 1.7 | 0.8 [6] | 1.5/29 | 0.330 |
| Chrysene | 56 | 110 | 1.0 [5] | 1.0 [6] | 15/290 | 0.330 |
| Dibenz(a,h)anthracene | 0.56 | 1.1 | 1,000 [7] | 0.33 [10] | 0.015/0.29 | 0.330 |
| Indeno(1,2,3-cd)pyrene | 5.6 | 11 | 8.2 | 0.5 [6] | 0.15/2.9 | 0.330 |
| **VOCs** | | | | | | |
| 1,1,1-Trichloroethane | 500 [6] | 1,000 [9] | 0.68 | 0.68 | 8,100/36,000 | 0.01 |
| Trichloroethene | 200 | 400 | 0.47 | 0.47 | 0.94/6.0 | 0.01 |
| Tetrachloroethene | 150 | 300 | 1.3 | 1.3 | 24/100 | 0.027 |
| **PCBs** | 1.0 | 25 | 3.2 | 0.1 | --/-- | 1 to 10 |

1 - Soil Screening Objective: New York State Department of Environmental Conservation (NYSDEC) Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for Commercial, Industrial, and for the Protection of Groundwater (GW). DAF = 100 based on a total organic carbon (TOC) content of 1%. Non-cancer values (non-carcinogenic) are developed from USEPA and ATSDR reference doses. Cancer values (carcinogenic) are based on a risk value of 1 X $10^{-6}$.

2 - Environmental Protection Agency (EPA) Regional Screening Levels - Residential (Res)/ Industrial (Ind). Carcinogenic risks are for a risk value of 1 X $10^{-6}$. Non-carcinogenic risks are calculated for a Hazard Index equal to 1. November 2014 values.

3 - NYSDEC Part 375-6.8 (b), Restricted Use for the Protection of Public Health Commercial Use values were used for surface soils because of future site use.

4 - NYSDEC Part 375-6.8(b), Restricted Use for the Protection of Groundwater Soil Screening Objectives were used as PRGs for saturated site soils. Based on New York State Department of Health (NYSDOH) Maximum Contaminant Limits (MCLs) for GA groundwater standards, with a DAF = 1 and a TOC = 1%.

5 - If value is less than the rural soil background concentration as determined by the Department of Health rural soil survey, the rural soil background concentration will be used as the soil screening objective value.

6 - This value is capped at a maximum of 500 ppm or 500 mg/kg.

7 - This value is capped at a maximum of 1,000 ppm or 1,000 mg/kg.

## Table 2-6 - Basis of Cleanup Levels for Groundwater (Micrograms per Liter)

| Chemical | Carcinogenic (C)/ Non-carcinogenic (N) | USEPA Regional Screening Level (1) | USEPA MCLs (2) | NYSDOH MCLs (3) | NYSDEC Groundwater Quality Standards (4) |
|---|---|---|---|---|---|
| **METALS** | | | | | |
| Chromium, total | N | 22,000 | 100 (5) | 100 (5) | 50 |
| Chromium, hexavalent | C | 0.035 | 100 (5) | 100 (5) | 50 |
| **POLYCHLORINATED BIPHENYLS (PCBs)** | C | 0.17 | 0.5 | 0.5 | 0.09 |

1 - United States Environmental Protection Agency (USEPA) Regional Screening Levels. Values are based on a target carinogenic risk of 1 X $10^{-6}$ and a Hazard Index of 1.

2 - USEPA Maximum Contaminant Levels (MCLs).

3 - New York State Department of Health (NYSDOH) Maximum Contaminant Limits (MCLs).

4 - New York State Department of Environmental Conservation (NYSDEC) Part 703.5 Table 1 Water Quality Standards Class GA groundwater.

5 - Value is for total chromium.

## Table 2-7 - Basis of Cleanup Levels for Soil Vapor (Micrograms per Cubic Meter)

| Chemical | Carcinogenic (C)/Non-carcinogenic (N) | Indoor Air - USEPA Regional Screening Level (1) | NYSDEC Ambient Air Annual Guideline Concentration (2) | NYSDOH Indoor and Outdoor Air Guidance (3) | Selected Air Concentration for Soil Vapor Cleanup Level |
|---|---|---|---|---|---|
| **Volatile Organics** | | | | | |
| Trichloroethene | C (N) | 0.48 (2.1) | 0.2 | 2 | 2 |
| Tetrachloroethene | C (N) | 11 (42) | 4 | 30 | 30 |

1 - United States Environmental Protection Agency (USEPA) Regional Screening Levels. Values are based on a target carinogenic risk of 1 x $10^{-6}$ (and a Hazard Index of 1).

2 - New York State Department of Environmental Conservation (NYSDEC), 6 NYCRR Part 212 with DAR-1 Tables, updated 08/10/2016.

3 - NYSDOH Indoor and Outdoor Fact Sheets for Trichloroethene (August 2015) and Tetrachloroethene (September 2013). NYSDOH also uses Soil Vapor Intrusion Guidence (2006) with May 2017 updates that reference Trichloroethene indoor air concentrations of 0.2 to 1 µg/$m^3$ and subslab concentrations of 6 to 60 µg/$m^3$ in Matrix A and Tetrachloroethene indoor air concentrations of 3 to 10 ug/$m^3$ and subslab concentrations of 100 to 1,000 µg/$m^3$ in Matrix B.

**Table 2-8 - OU4 ROD Cleanup Levels for Soil, Groundwater, and Soil Vapor**

| Chemical | Soil (milligrams per kilogram) | | Groundwater (micrograms per liter) | Soil Vapor (micrograms per cubic meter)[1,2] |
|---|---|---|---|---|
| | (0 to 50 Feet) | (50 to 70 feet) | | |
| **METALS** | | | | |
| Arsenic | 16 | 16 | NA | NA |
| Cadmium | 9.3 | 7.5 | NA | NA |
| Chromium | NA | NA | 100 | NA |
| Chromium, hexavalent | 400 | 19 | 100 | NA |
| **PESTICIDES** | | | | |
| Chlordane | 24 | 2.9 | NA | NA |
| **SVOCs** | | | | |
| Benzo(a)anthracene | 5.6 | 1 | NA | NA |
| Benzo(a)pyrene | 1 | 22 | NA | NA |
| Benzo(b)fluoranthene | 5.6 | 1.7 | NA | NA |
| Benzo(k)fluoranthene | 56 | 1.7 | NA | NA |
| Chrysene | 56 | 1 | NA | NA |
| Dibenz(a,h)anthracene | 0.56 | 1,000 | NA | NA |
| Indeno(1,2,3-cd)pyrene | 5.6 | 8.2 | NA | NA |
| **VOCs** | | | | |
| 1,1,1-Trichloroethane | 500 | 0.68 | NA | NA |
| Trichloroethene | 200 | 0.47 | NA | 67 |
| Tetrachloroethene | 150 | 1.3 | NA | 100 |
| **PCBs** | 1.0 | 3.2 | 0.5 | NA |

NA - Not applicable.

1 - Based on USEPA Vapor Intrusion Guidance, a soil gas to indoor air value of 33 to 1 is used.

2 - During the design and implementation of the soil vapor monitoring program and during the Five-Year Reviews, the NYSDOH Soil Vapor Intrusion Guidance, including current revisions will be considered in evaluating the need to take additional action or shutting down the remedial system.

## 2.9 Description of Alternatives

Remedial alternatives to address soil, groundwater, and soil vapor at Site 1 were developed and detailed in the 2016 FS Addendum and Supplement to the FS Addendum, and the 2017 Proposed Plan. Based on screening technologies, ten soil ("S"), three soil vapor ("SV"), and three groundwater ("G") remedial alternatives were retained for detailed comparative analysis. Descriptions of the alternatives identified for each medium are provided in Tables 2-9 through 2-11.

**Table 2-9 - Description of Remedial Alternatives for Soil**
**Page 1 of 2**

| Alternative | Components | Details | Cost/Time Frame | |
|---|---|---|---|---|
| S-1: No Action | None | Allow the COCs to breakdown naturally over time. | Capital Cost<br>Annual O&M<br>Present Value<br>Time Frame | $0<br>$0<br>$0<br>Not applicable |
| S-2: Permeable Cover, Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 10mg/kg), and LUCs | Excavation and Off-Site Disposal | Excavation and off-site disposal of soil with PCB concentrations greater than 10 mg/kg to 9 feet bgs. | Capital Cost | $12,900,000 |
| | Permeable Cover | Installation of a soil/gravel/asphalt permeable cover in areas over the residual PCBs and other COCs greater than the Cleanup Levels. | Annual O&M | $12,800 to $43,000 |
| | LUCs | LUCs protect the cover and limit future activities. Restrictions include the installation or use of public water supply wells and construction activities until cleanup levels are achieved. | Present Value<br>Time Frame | $13,400,000<br>5 years |
| | Fencing | Fencing restricts access to contaminated surface soil. | | |
| S-3: Alternative S-3: RCRA Cap, Limited Excavation & Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), and LUCs | Excavation and Off-Site Disposal | Excavation and off-site disposal of soil with PCB concentrations greater than 25 mg/kg to 9 feet bgs. | Capital Cost | $14,600,000 |
| | RCRA Cap | Installation of a RCRA Cap in areas over the residual PCBs and other COCs greater than the Cleanup Levels. | Annual O&M<br>Present Value<br>Time Frame | $12,800 to $43,000<br>$15,000,000<br>6 years |
| S-4: Alternative S-4: Same as Alternative S-3 plus a Vertical Barrier | Excavation and Off-Site Disposal | Excavation and off-site disposal of soil with PCB concentrations greater than 25 mg/kg to 9 feet bgs. | Capital Cost | $24,000,000 |
| | RCRA Cap | Installation of a RCRA Cap in areas over the residual PCBs and other COCs greater than the Cleanup Levels. | Annual O&M | $12,800 to $43,000 |
| | LUCs | LUCs protect the cover and limit future activities. Restrictions include the installation or use of public water supply wells and construction activities until cleanup levels are achieved. | Present Value<br>Time Frame | $24,500,000<br>7 years |
| | Vertical Barrier | Vertical Barrier installed to approximately 80 feet bgs (15 feet below the bottom of the soil contamination) to control migration of PCBs from saturated soil and soil vapor. | | |
| S-5A: Alternative S-5A: Same as Alternative S-3 Plus In-situ Solidification of PCB-Contaminated Soil (Greater than 50 mg/kg) | Excavation and Off-Site Disposal | Excavation and off-site disposal of soil with PCB concentrations greater than 25 mg/kg to 9 feet bgs. | Capital Cost | $23,600,000 |
| | RCRA Cap | Installation of a RCRA Cap in areas over the residual PCBs and other COCs greater than the Cleanup Levels. | Annual O&M | $12,800 to $43,000 |
| | LUCs | LUCs protect the cover and limit future activities. Restrictions include the installation or use of public water supply wells and construction activities until cleanup levels are achieved. | Present Value<br>Time Frame | $24,000,000<br>8 years |
| | In-Situ Solidification | In-situ solidification of PCB-contaminated soil containing greater than 50 mg/kg of PCBs, using a cement/bentonite or similar matrix. | | |
| Alternative S-5B: Same as Alternative S-4 Plus In-situ Solvent Extraction of PCB-Contaminated Soil (Greater than 50 mg/kg), and LUCs | Excavation and Off-Site Disposal | Excavation and off-site disposal of soil with PCB concentrations greater than 25 mg/kg to 9 feet bgs. | Capital Cost | $41,900,000 |
| | RCRA Cap | Installation of a RCRA Cap in areas over the residual PCBs and other COCs greater than the Cleanup Levels. | Annual O&M | $12,800 to $90,300 |
| | LUCs | LUCs protect the cover and limit future activities. Restrictions include the installation or use of public water supply wells and construction activities until cleanup levels are achieved. | Present Value<br>Time Frame | $42,800,000<br>11 years |
| | Vertical Barrier | Vertical Barrier installed to approximately 80 feet bgs (15 feet below the bottom of the soil contamination) to control migration of PCBs from saturated soil and soil vapor. | | |
| | In-Situ Solvent Extraction | In-situ solvent extraction of PCB-contaminated soil, containing greater than 50 mg/kg PCBs. | | |
| | Supplemental Treatment | Supplemental technology, such as biosparging, following in-situ solvent extration to treat residual solvent. | | |

**Table 2-9 - Description of Remedial Alternatives for Soil**
**Page 2 of 2**

| Alternative | Components | Details | Cost/Time Frame | |
|---|---|---|---|---|
| Alternative S-6: Excavation and Disposal of PCB-Contaminated Soil (Greater than a Depth- Dependent 10 mg/kg or 50 mg/kg), Soil Cover, & LUCs | Excavation and Off-Site Disposal | Excavation and offsite disposal of PCB-contaminated soils with concentrations greater than 10 mg/kg to a depth of 10 feet bgs, and 50 mg/kg at depths over 10 feet bgs. Includes saturated soil. Other COCs co-located with PCBs removed as a result of excavation. | Capital Cost | $55,400,000 |
| | Soil Cover | Installation of a soil cover in areas over the residual PCBs and other COCs greater than the Cleanup Levels. Consolidation of PCB-contaminated soils with 1 to 10 or 50 mg/kg PCBs under the cover. | Annual O&M | $12,800 to $43,000 |
| | LUCs | LUCs protect the cover and limit future activities. Restrictions include the installation or use of public water supply wells and construction activities until cleanup levels are achieved. | Present Value | $55,400,000 |
| | | | Time Frame | 7 years |
| S-6A: Reduced Permeability Cover, Limited Excavation & Offsite Disposal of PCB-Contaminated Soil (Greater than a Depth-Dependent 10 mg/kg [Max 10 ft] or 50 mg/kg [Max 20 or 30 ft] ), and LUCs | Excavation and Off-Site Disposal | Excavation and offsite disposal of PCB-contaminated soils with concentrations greater than 10 mg/kg to a depth of 10 feet bgs; and 50 mg/kg to a depth of 20 feet bgs at Site 1 and 30 feet bgs at Dry Well 20-08. Other COCs co-located with PCBs removed as a result of excavation. | Capital Cost | $25,600,000 |
| | Reduced Permeability Cover | Installation of a reduced permeability cover in areas over the residual PCBs and other COCs greater than the Cleanup Levels. | Annual O&M | $12,800 to $43,000 |
| | LUCs | LUCs protect the cover and limit future activities. Restrictions include the installation or use of public water supply wells and construction activities until cleanup levels are achieved. | Present Value | $26,000,000 |
| | | | Time Frame | 7 years |
| Alternative S-6B: Same as S-6A Plus In-situ Solidifications of PCB Contaminated Soil (Greater than 50 mg/kg) | Excavation and Off-Site Disposal | Excavation and offsite disposal of PCB-contaminated soils with concentrations greater than 10 mg/kg to a depth of 10 feet bgs; and 50 mg/kg to a depth of 20 feet bgs at Site 1 and 30 feet bgs at Dry Well 20-08. Other COCs co-located with PCBs removed as a result of excavation. | Capital Cost | $30,500,000 |
| | Reduced Permeability Cover | Installation of a reduced permeability cover in areas over the residual PCBs and other COCs greater than the Cleanup Levels. | Annual O&M | $12,800 to $43,000 |
| | LUCs | LUCs protect the cover and limit future activities. Restrictions include the installation or use of public water supply wells and construction activities until cleanup levels are achieved. | Present Value | $31,000,000 |
| | | | Time Frame | 8 years |
| | In-Situ Solidification | In-situ solidification of deep PCB-contaminated soil (20 to 65 feet bgs) containing greater than 50 mg/kg of PCBs, using a cement/bentonite or similar matrix. | | |
| S-7: Excavation and Offsite Disposal of PCB-contaminated Soil (Greater than 1 mg/kg) | Excavation and Off-Site Disposal | Excavation and offsite disposal of PCB-contaminated soils with concentrations greater than 1 mg/kg . Other COCs co-located with PCBs removed as a result of excavation. | Capital Cost | $99,700,000 |
| | | | Annual O&M | $0 |
| | | | Present Value | $99,700,000 |
| | | | Time Frame | 10 years |

**Table 2-10 - Description of Remedial Alternatives for Soil Vapor**

| Alternative | Components | Details | Cost | |
|---|---|---|---|---|
| SV-1: No Action | None | Allow the COCs to breakdown naturally over time. Under this alternative, the existing SVE Containment System no longer operates. | Capital Cost<br>Annual O&M<br>Present Value<br>Time Frame | $0<br>$0<br>$0<br>Not applicable |
| SV-2: Soil Vapor Monitoring, LUCs, and Continued Operation of the SVE Containment System | Continued O&M of SVE Containment System | Continuing operation and maintenance of the existing SVE Containment System. The existing system would continue to use the 12 existing vapor extraction wells and the existing SVPMs. The existing vapor phase GAC would continue to be used to remove the VOCs prior to discharge as required by state air discharge requirements. | Capital Cost | $0 |
| | Soil Vapor Monitoring | Continuing monitoring of the existing SVE Containment System. | Annual O&M | $100,000 to $115,000 |
| | LUCs | LUCs to control potential vapor intrusion exposure for any newly constructed structures on the site. | Present Value<br>Time Frame | $2,600,000<br>30 years |
| SV-3: Same as Alternative SV-2 Plus Enhanced Soil Vapor Extraction at Site 1 | Continued O&M of SVE Containment System | Continuing operation and maintenance of the existing SVE Containment System. The existing system would continue to use the 12 existing vapor extraction wells and the existing SVPMs. The existing vapor phase GAC would continue to be used to remove the VOCs prior to discharge as required by state air discharge requirements. | Capital Cost | $220,000 |
| | Soil Vapor Monitoring | Continuing monitoring of the existing SVE Containment System. | Annual O&M | $100,000 to $115,000 |
| | LUCs | LUCs to provide notice of residual VOC contamination and control potential vapor intrusion exposure for any newly constructed structures on the site. | Present Value<br>Time Frame | $1,700,000<br>15 years |
| | Enhanced SVE | Up to six additional SVE wells and passive air injection wells installed in the source area.<br>Targets soil vapor near the potential residual reservoirs of the VOCs. | | |

**Table 2-11 - Description of Remedial Alternatives for Groundwater**

| Alternative | Components | Details | Cost | |
|---|---|---|---|---|
| G-1: No Action | None | Allow the COCs to breakdown naturally over time. | Capital Cost<br>Annual O&M<br>Present Value<br>Time Frame | $0<br>$0<br>$0<br>Not applicable |
| G-2: Monitoring and LUCs | Monitoring | Monitoring of COCs (PCBs, arsenic, hexavalent chromium, and total chromium) to track the migration and attenuation of the COCs over time. | Capital Cost | $230,000 |
| | LUCs | LUCs to control exposure to impacted groundwater. These LUCs would be in addition to the current restrictions for VOCs in groundwater. | Annual O&M<br>Present Value<br>Time Frame | $96,000 to $111,000<br>$2,600,000<br>30 years |
| G-3A: Monitoring, LUCs, and Upgrade of the ONCT System with GAC Treatment | Monitoring | Monitoring of COCs (PCBs, arsenic, hexavalent chromium, and total chromium) to track the migration and attenuation of the COCs over time. | Capital Cost | $3,100,000 |
| | LUCs | LUCs to control exposure to impacted groundwater. These LUCs would be in addition to the current restrictions for VOCs in groundwater. | Annual O&M | $153,000 to $168,000 |
| | GAC Treatment | Adds liquid phase GAC for PCB treatment to the existing ONCT System to meet discharge permit requirements. Northrop Grumman continues to operate the ONCT for VOC treatment. | Present Value<br>Time Frame | $6,900,000<br>30 years |
| G-3B: Monitoring, LUCs, and Upgrade of the ONCT System with Ion Exchange Treatment | Monitoring | Monitoring of COCs (PCBs, arsenic, hexavalent chromium, and total chromium) to track the migration and attenuation of the COCs over time. | Capital Cost | $2,200,000 |
| | LUCs | LUCs to control exposure to impacted groundwater. These LUCs would be in addition to the current restrictions for VOCs in groundwater. | Annual O&M | $550,000 to $565,000 |
| | Ion Exchange Treatment | Adds Ion Exchange metals treatment to the existing ONCT System to meet discharge permit requirements. Northrop Grumman continues to operate the ONCT for VOC treatment. | Present Value<br>Time Frame | $15,800,000<br>30 years |

## 2.10 Comparative Analysis of Alternatives

A comparative analysis of alternatives with respect to the nine evaluation criteria was completed and is provided below. Tables 2-12 through 2-14 depict a relative ranking of the alternatives. Alternatives S-1, SV-1, and G-1 are No Action alternatives which do not achieve RAOs, but were considered for purposes of comparison.

### Threshold Criteria

### Overall Protection of Human Health and the Environment.

This section addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls**.**

*Soil Alternatives*

Alternative S-1 is not protective of human health and the environment, and would not achieve site-specific remedial action objectives. Soil COCs provide a direct contact to contaminated soil, and soil COC could still migrate to groundwater and soil vapor.

In the long term, Alternatives S-2, S-3, S-4, S-5A, S-5B, S-6, S-6A, S-6B, and S-7 would be protective of human health and the environment and achieve the RAOs. Alternative S-7 achieves each of the RAOs through excavation and offsite disposal, whereas the other alternatives achieve the RAOs through various remedial actions, including containment and treatment.

The remedial actions associated with each of the soil alternatives focus on PCBs because they are present throughout much of Site 1, representing the majority of the COC mass, are persistent in the environment, and are detected in groundwater. The pesticide, VOC and SVOC COCs were detected infrequently and sporadically throughout the site and are subject to degradation through natural mechanisms. The action-alternatives address these COCs through containment and natural degradation. The metals are also present infrequently and sporadically throughout the site, but generally do not degrade. One of the metals, hexavalent chromium can degrade to a more stable and less toxic and mobile trivalent chromium. The alternatives address the metals through containment.

Alternatives S-2 through S-6B would prevent human exposure to impacted soil and prevent erosion of impacted soil to surface water and sediment via containment and LUCs. For Alternative S-2, a permeable cover would be used. For Alternatives S-3 through S-5B, an impermeable – RCRA-type cap would be used. For Alternatives S-6A and S-6B, a reduced permeable cover would be used.

Each of the alternatives provides a reduction of COC migration to groundwater. Alternatives S-2 through S-5B use an impermeable cap to effectively eliminate migration of COCs from unsaturated soil to groundwater. Alternatives S-6A and S-6B use a reduced permeability cover to limit migration of COCs from unsaturated soil to groundwater. Alternatives S-5A and S-6B (using solidification) and S-5B (using solvent extraction) would further reduce migration of COCs from unsaturated soil to groundwater and from saturated soil to groundwater through treatment. Alternatives S-4 and S-5B would use vertical barriers to limit migration of COC-impacted groundwater. Alternatives S-6 and S-7 would reduce COC migration by excavation and offsite disposal of the majority or all of the COC-impacted soil, respectively.

**Table 2-12 - Summary of Comparative Analysis of Soil Alternatives**

| Criterion | Alternative S-2: Permeable Cover, Excavation and Offsite Disposal of PCB-Contaminated Soil (Greater than 10mg/kg), and LUCs | Alternative S-3: RCRA Cap, Limited Excavation & Offsite Disposal of PCB-Contaminated Soil (Greater than 25 mg/kg), and LUCs | Alternative S-4: Same as Alternative S-3 plus a Vertical Barrier | Alternative S-5A: Same as Alternative S-3 Plus In-situ Solidification of PCB-Contaminated Soil (Greater than 50 mg/kg) | Alternative S-5B: Same as Alternative S-4 Plus In-situ Solvent Extraction of PCB-Contaminated Soil (Greater than 50 mg/kg), and LUCs | Alternative S-6: Excavation and Disposal of PCB-Contaminated Soil (Greater than a Depth- Dependent 10 mg/kg or 50 mg/kg), Soil Cover, & LUCs | Alternative S-6A: Reduced Permeability Cover, Limited Excavation & Offsite Disposal of PCB-Contaminated Soil (Greater than a Depth-Dependent 10 mg/kg [Max 10 ft] or 50 mg/kg [Max 20 or 30 ft] ), and LUCs | Alternative S-6B: Same as S-6A Plus In-situ Solidifications of PCB Contaminated Soil (Greater than 50 mg/kg) | Alternative S-7: Excavation and Offsite Disposal of PCB-contaminated Soil (Greater than 1 mg/kg) |
|---|---|---|---|---|---|---|---|---|---|
| Overall Protection of Human Health & the Environment | ○ | ● | ◊ | ◊ | ◊ | ◊ | ◊ | ◊ | ◊ |
| Compliance with ARARs | ◊ | ◊ | ◊ | ◊ | ◊ | ◊ | ◊ | ◊ | ◊ |
| Long-Term Effectiveness & Performance | ● | ● | ◊ | ◊ | ◊ | ◊ | ◊ | ● | ◊ |
| Reduction of Toxicity, Mobility, or Volume through Treatment | NA | NA | NA | ● | ● | NA | NA | ○ | NA |
| Short-term Effectiveness | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Implementability | ◊ | ◊ | ● | ● | ◊ | ○ | ◊ | ● | ○ |
| Time to Reach RAO (years) | 5 years | 6 years | 7 years | 8 years | 11 years | 7 years | 7 years | 8 years | 10 years |
| Cost: Capital | $12,900,000 | $14,600,000 | $24,000,000 | $23,600,000 | $41,900,000 | $55,400,000 | $25,600,000 | $30,500,000 | $99,700,000 |
| Cost: O&M | $12,800 to $43,000 per year | $12,800 to $43,000 per year | $12,800 to $43,000 per year | $12,800 to $43,000 per year | $12,800 to $90,300 per year | $12,800 to $43,000 per year | $12,800 to $43,000 per year | $12,800 to $43,000 per year | $0 |
| Net Present Value | $13,400,000 | $15,000,000 | $24,500,000 | $24,000,000 | $42,800,000 | $55,400,000 | $26,000,000 | $31,000,000 | $99,700,000 |

NA = Not Achieved ○ = Low Ranking ● = Moderate Ranking ◊ = High Ranking

## Table 2-13 - Summary of Comparative Analysis of Soil Vapor Alternatives

| Criterion | Alternative SV-2: Soil Vapor Monitoring, LUCs, and Continued Operation of the SVE Containment System | Alternative SV-3: Same as Alternative SV-2 Plus Enhanced Soil Vapor Extraction at Site 1 |
|---|---|---|
| Overall Protection of Human Health and the Environment | ● | ◊ |
| Compliance with ARARs | ◊ | ◊ |
| Long-Term Effectiveness and Performance | ● | ● |
| Reduction of Toxicity, Mobility, or Volume through Treatment | ● | ◊ |
| Short-term Effectiveness | ● | ◊ |
| Implementability | ◊ | ◊ |
| Time to Reach RAO (years) | 30 years | 15 years |
| Capital Cost | $0 | $220,000 |
| O&M Cost | $100,000 to $115,000 per year | $110,000 to $125,000 per year |
| Net Present Value | $2,600,000 | $1,700,000 |

NA = Not Achieved ○ = Low Ranking ● = Moderate Ranking ◊ = High Ranking

## Table 2-14 - Summary of Comparative Analysis of Groundwater Alternatives

| Criterion | Alternative G-2: Monitoring and LUCs | Alternative G-3A: Monitoring, LUCs, and Upgrade of the ONCT System with GAC Treatment | Alternative G-3B: Monitoring, LUCs, and Upgrade of the ONCT System with Ion Exchange Treatment |
|---|---|---|---|
| Overall Protection of Human Health and the Environment | ● | ◊ | ◊ |
| Compliance with ARARs | ◊ | ◊ | ◊ |
| Long-Term Effectiveness and Performance | ● | ◊ | ◊ |
| Reduction of Toxicity, Mobility, or Volume through Treatment | NA | ◊ | ◊ |
| Short-term Effectiveness | ● | ● | ● |
| Implementability | ◊ | ◊ | ◊ |
| Time to Reach RAO (years) | 30 Years | 30 Years | 30 Years |
| Cost | | | |
| Capital Cost | $230,000 | $3,100,00 | $2,200,000 |
| O&M Cost | $96,000 to $111,000 per year | $153,000 to $168,000 per year | $550,000 to $565,000 per year |
| Net Present Value | $2,600,000 | $6,900,000 | $15,800,000 |

NA = Not Achieved ○ = Low Ranking ● = Moderate Ranking ◊ = High Ranking

*Soil Vapor Alternatives*

Alternative SV-1 is not protective of human health and the environment, and would not meet the RAOs because no actions would be taken to eliminate risks from remaining contamination. The SVE Containment System was installed as a removal action. Under Alternative SV-1, this system would be shut down, and contaminated vapors could again migrate off property and impact residential housing.

Alternatives SV-2 and SV-3 are expected to be protective of human health and the environment because the direct contact risk (exposure to contaminated vapors) would be mitigated via continued operation of the SVE Containment System. LUCs would be in place while contamination remains. Additional treatment under Alternative SV-3 would shorten the duration of operation of the SVE Containment System.

*Groundwater Alternatives*

Alternative G-1 is not protective of human health and the environment, and would not meet the RAOs because no actions would be taken to eliminate risks from remaining contamination. The ONCT provides treatment for VOCs in groundwater from the NWIRP Bethpage; however, it does not address metals and PCBs.

Alternative G-2 would be protective of human health and the environment. While groundwater will be monitored for COCs and treated for VOCs, and LUCs would be in place to be protective while contamination remains, groundwater contaminated with PCBs and metals could still continue to migrate and may impact the ONCT system. If the PCB or metal concentrations exceed discharge standards for the ONCT System (e.g., MCLs), the system would need to be upgraded to be maintain compliance with the discharge permit.

Alternatives G-3A and G-3B would be protective of human health and the environment. If groundwater monitoring shows that PCB- or metal-contaminated groundwater has migrated to and affected the operation of the ONCT system, the system could be upgraded to provide treatment to be protective.

## Compliance with ARARs.

Section 121(d) of CERCLA and subsection §300.430(f)(1)(ii)(B) of the NCP require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as “ARARs,” unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not “applicable” to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those promulgated State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking waiver.

Alternative-specific ARARs for the Site 1 soil, soil vapor, and groundwater are provided in the 2015 Feasibility Study Addendum and 2017 Supplement to the Feasibility Addendum.

*Soil Alternatives*

Alternative S-1 would not comply with ARARs. Soils contain PCBs greater than New York State SCOs (10 NYCRR Part 375) and there would be no action taken to isolate them from human contact or the environment. In addition, these soils would continue to leach and result in groundwater with PCBs at greater than New York State Public Water Supply Regulations (10 NYCRR Part 5-1) and New York State Water Classification and Quality Standards (6 NYCRR 701 and 702).

Alternatives S-2, S-3, S-6, S-6A, and S-7 would comply with the chemical-specific ARARs for soil (NYSDEC SCO for Commercial Use, 10 NYCRR Part 375-6b), the location-specific ARAR for management of a contaminated site (6 NYCRR 375 Parts 1.1 to 1.12), and the action-specific ARAR for characterization and identification of wastes (6 NYCRR 371.3, 372.2, and 373-1.1).

Alternatives S-4, S-5A, S-5B, and S-6B would also comply with action-specific ARARs for federal requirements for UIC (40 C.F.R. 144.81 and 0.82). Additionally, because of the use of a solvent, Alternative S-5B would comply with action-specific ARARs for federal and State requirements for management of fuels and oil (40 C.F.R. 112.3-.6 and 6 NYCRR Parts 615.8 – 0.14).

*Soil Vapor Alternatives*

Alternative SV-1 would not comply with ARARs.

Alternatives SV-2 and SV-3 would comply with NYSDOH Air Guideline Values, NYSDOH Soil Vapor Intrusion Guidance [2006] with May 2017 Matrix Updates, NYSDEC Air Toxics Control Program (6 NYCRR Part 212 DAR-1 AGC/SGC Tables), and action-specific ARARs for the control and prevention of air pollutants (6 NYCRR 212.9).

*Groundwater Alternatives*

Alternative G-1 would not comply with the chemical-specific ARARs for state or federal criteria.

Alternatives G-2, G-3A and G-3B would comply with the chemical-specific ARAR, NYSDOH MCLs for drinking water (equivalent to USEPA Safe Drinking Water Act MCLs) (10 NYCRR Part 5-1: 5-1.52), state regulations for a sole-source drinking water aquifer (6 NYCRR Parts 701.15 and 702.3) and location-specific ARAR for the Safe Drinking Water Act sole-source drinking water aquifer (40 C.F.R. 149.).

### Long-term Effectiveness and Permanence.

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

*Soil Alternatives*

Alternative S-1 is not effective in the long-term. Receptors could be exposed to impacted soil via direct contact. Impacted soil would also continue to leach to groundwater and erode to surface water and sediment in the recharge basins. In addition, VOCs in soil would continue to impact soil vapor and result in vapor intrusion issues for an extended period of time.

Alternatives S-2, S-3, S-4, S-5A, S-5B, S-6, S-6A, and S-6B would be effective and reliable in the long term because of the containment of impacted soil and LUCs that would reduce or eliminate potential exposure to COCs and migration of COCs to groundwater. Alternative S-2 provides the least reduction in potential COC migration to groundwater. Alternatives S-3 and S-4 are more effective then Alternative S-2, because of the use of impermeable barriers to further limit COC migration from soil to groundwater. Alternatives S-5A, S-5B, and S-6B are more effective than Alternatives S-2 through S-4 due to the use of treatment to immobilize the PCBs and other COCs (Alternative S-5A and S-6B) and solvent extraction (Alternative S-5B) to remove PCBs and other COCs from soil. Alternative S-6A and S-6B are more effective because more than half of the PCBs and other COCs are removed from the site. Alternatives S-6 and S-7 are more effective, because the majority or all of the PCBs and other COCs are removed from the site, respectively.

Alternatives S-2, S-3, and S-4, would leave PCB-impacted soil at concentrations over 1,000 mg/kg, but generally at depths greater than 10 feet bgs. Under Alternative S-5A, similar concentrations would remain, but soil with PCBs greater than 50 mg/kg would be solidified to immobilize the PCBs. Under Alternative S-5B, soil with PCBs greater than 50 mg/kg would be treated with solvent extraction to remove approximately 88 percent of the COC mass. Under Alternative S-6, soils with PCBs greater than 10 mg/kg to a depth of 10 feet bgs and 50 mg/kg at depths over 10 feet bgs would be excavated and disposed off site. Under Alternatives S-6A and S-6B, soils with PCBs greater than 10 mg/kg to a depth of 10 feet bgs and 50 mg/kg at depths over 20 or 30 feet bgs would be excavated and disposed off site. Additionally, under Alternative S-6B, residual soil with PCBs greater than 50 mg/kg would be solidified to immobilize PCBs. Under Alternative S-7, soil with PCBs greater than 1 mg/kg, would be excavated and disposed off site.

*Soil Vapor Alternatives*

Alternative SV-1 is not effective in the long-term. Soils contaminated with VOCs could take an extended period of time to attenuate, providing a continuing source of contaminated vapors. Alternatives SV-2 and SV-3 would be effective in the long term. Contaminated vapors would be contained by the existing SVE Containment System to prevent migration of VOCs into surrounding buildings or neighborhoods.

*Groundwater Alternatives*

Alternative G-1 is not effective in the long-term. Contaminated groundwater would take an extended time period to attenuate, especially for COCs such as PCBs. VOCs, metals, and PCBs in groundwater exceed Cleanup Levels and pose a risk to human health. There would be no controls in place to monitor groundwater use or migration of contaminated groundwater. Alternatives G-2, G-3A, and G-3B would be effective in the long term. At completion of the remedy, Site 1 COCs would be below Cleanup Levels, which are based on USEPA MCLs and NYSDOH MCLs for a sole-source drinking water aquifer.

### Reduction of Toxicity, Mobility, or Volume through Treatment.

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

*Soil Alternatives*

There would be no reduction of toxicity, mobility, or volume through treatment on NWIRP under Alternatives S-1, S-2, S-3, S-4, S-6, S-6A, or S-7. Under Alternative S-5A, approximately 3,300 pounds of PCBs in 16,000 cubic yards of soil would be treated with in-situ solidification. Under Alternative S-5B, approximately 4,200 pounds of PCBs would be removed from approximately 76,000 cubic yards of soil via solvent extraction and then thermally or chemically treated to permanently destroy the PCBs.

Under Alternative S-6B, approximately 400 pounds of PCBs in 13,000 cubic yards of soil would be treated with in-situ solidification.

In addition, Alternatives S-2, S-3, S-4, S-5A, and S-5B would excavate and dispose offsite 1,100 to 1,400 pounds of PCBs in 7,200 to 14,500 cubic yards of soil. Alternatives S-6 and S-7 would excavate and dispose offsite 4,600 pounds of PCBs in 65,000 cubic yards of soil and 7,500 pounds of PCBs in 144,000 cubic yards of soil, respectively. Alternatives S-6A and S-6B would excavate and dispose offsite 4,100 pounds of PCBs in 30,000 cubic yards of soil. PCBs would be treated off property (e.g., incineration) as needed to comply with disposal requirements (PCBs greater than 500 mg/kg).

*Soil Vapor Alternatives*

There would be no reduction of toxicity, mobility, or volume through treatment with Alternative SV-1. Alternatives SV-2 and SV-3 would reduce the toxicity by removing VOC-contaminated soil vapor and treating it with granular activated carbon (GAC). The current mass loading of TCE and PCE is approximately 12 pounds per year (SV-2). Under Alternative SV-3, the loading of VOCs would be expected to increase initially, but over the long term, the total mass of VOCs removed under Alternative SV-3 is expected to be similar to SV-2.

*Groundwater Alternatives*

There would be no reduction of toxicity, mobility, or volume through treatment with Alternatives G-1 or G-2. Residual groundwater contamination would degrade through natural attenuation processes including adsorption, precipitation, and for hexavalent chromium, chemical reduction. Alternatives G-3A and G-3B would provide treatment of either PCBs or metals (e.g., hexavalent chromium) in groundwater, respectively. GAC and ion exchange resin would be taken off site for regeneration, treatment, or disposal. Low-volume, non-hazardous purge water would be generated during implementation of monitoring in this remedy, or in association with groundwater monitoring conducted under Alternatives G-2, G-3A and G-3B.

### Short-term Effectiveness.

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until Cleanup Levels are achieved.

*Soil Alternatives*

Alternative S-1 is not effective in the short-term. Impacted soils will remain, local receptors could be exposed to impacted soil, and COC leaching to groundwater would continue. Alternatives S-2 through S-7 would be effective in the short term. Each of these remedial alternatives could expose workers to contaminated material. Safe work practices and personal protective equipment would be used to protect site workers during implementation of the activities.

The time required to implement each alternative is dependent on the level of effort to be expended. Alternative S-2 could be fully implemented within 5 years after signing of the ROD. Alternatives S-3 and S-4, which are containment alternatives, could be fully implemented within 6 to 7 years after signing of the ROD. Alternatives S-5A and S-5B, which are treatment alternatives, could be fully implemented within 8 years to 11 after signing of the ROD. Alternatives S-6, S-6A, S-6B, and S-7, which involve extensive excavation and offsite disposal, would require 7 to 10 years to implement after signing of the ROD.

*Soil Vapor Alternatives*

Alternative SV-1 is not effective in the short term. The SVE Containment System would no longer operate, and contaminated vapors could migrate to the nearby neighborhood unmitigated. Alternatives SV-2 and SV-3 would provide for continued operation of the existing SVE Containment System, which would effectively control COC migration. Ultimately the SVE Containment System could be shut down, although the timing is uncertain. Since Alternative SV-3 provides treatment at the source of the VOCs, it would be expected to operate for a shorter period of time (e.g., 15 years) than Alternative SV-2 (e.g., 30 years). LUCs would be in place while COCs at concentrations greater than Cleanup Levels remain.

*Groundwater Alternatives*

Alternative G-1 would not be effective in the short term.

For Alternative G-2, activities are limited to administrative actions and groundwater monitoring activities and there would be no significant risk to human health or the environment during implementation of this alternative. LUCs would be protective while contamination remains. Groundwater contaminated with PCBs or hexavalent chromium could migrate to the ONCT system and cause a shut-down of the system.

Alternatives G-3A and G-3B would be protective in the short-term due to implementation of LUCs and monitoring of migration of contamination. If contaminated groundwater does migrate to the ONCT system, the Navy would work with NG to upgrade the system.

### Implementability.

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

*Soil Alternatives*

Each of the alternatives are implementable. Since there is no action, Alternative S-1 requires no activities to implement. Alternatives S-2, S-3, S-4, S-6A, and S-6B use conventional excavation above the water table, offsite disposal, and covering/capping, and are moderately easy to implement. Alternatives S-6 and S-7 involve excavation below the water table and would be more difficult to implement. Alternative S-5A and S-6B involve treatment would be moderately difficult to implement, whereas Alternative S-5B that involves an innovative technology may be difficult to implement.

Multiple vendors, equipment, and offsite landfills are available for the excavation, capping, transportation, and disposal aspects of each of the alternatives. Vendors and equipment are available for installation of a vertical barrier or solidification; however, specialized equipment would be required for solidification of soils to a depth of 65 feet bgs. The availability of vendors to conduct the solvent/air sparging system, which is part of Alternative S-5B, is very limited.

*Soil Vapor Alternatives*

Each of the alternatives is implementable. Alternatives SV-1 and SV-2 can be easily implemented, with resources readily available for a monitoring program under Alternative SV-2. The infrastructure for the SVE Containment System is already in place; therefore, additional actions would consist of continued operation and maintenance activities. Alternative SV-3 would require the installation of additional wells. Vendors and equipment are readily available to conduct this work.

*Groundwater Alternatives*

Each of the alternatives is implementable. Alternatives G-1 and G-2 are easy to implement, with readily available resources for Alternative G-2.

Alternatives G-3A and G-3B are only slightly more difficult to implement. Vendors that provide GAC and ion exchange resin are available. The majority of the infrastructure for the ONCT system is already in place; these alternatives would only involve an upgrade to the system.

**Cost.**

The estimated present worth costs for the alternatives, not including the No Action alternatives, range from $13.4M to $99.7M for soil alternatives; $1.7M to $2.6M for soil vapor alternatives; and $2.6M to $15.8M for groundwater alternatives. Cost summaries can be found in Tables 2-12 through 2-14 and in Appendix D

*Soil Alternatives*

There are no costs associated with Alternative S-1. Alternative S-7 is the most expensive to implement.

*Soil Vapor Alternatives*

There are no costs associated with implementing Alternative SV-1. Alternative SV-3 is the most expensive to implement, with the addition of source area treatment.

*Groundwater Alternatives*

There are no costs associated with Alternative G-1. Alternatives G-3A and G-3B would be the most expensive to implement with the addition of treatment for metals and/or PCBs.

**State Acceptance.**

State involvement has been solicited through the CERCLA process. NYSDEC concurs with the Selected Remedy.

**Community Acceptance.**

A public comment period was held from November 22, 2017 through January 22, 2018. The Proposed Plan was discussed during the December 12, 2017 public meeting held at Bethpage Senior Community Center. No comments requiring amendment to the Proposed Plan were received from the public during the meeting and public comment period.

## 2.11 Principal Threat Waste

Based on site history, the contamination resulted from multiple releases during surface storage and maintenance activities conducted at Site 1. The shallow high concentration PCB-contaminated soil is considered to be “principal threat wastes” because it is found at concentrations that pose a significant risk if an exposure scenario exists.

As per the NCP, treatment should be used to address principal threats at a site wherever practicable and engineering controls can be used for wastes that pose a relatively low long-term threat or where treatment is impracticable. Alternatives S-5A, S-5B, and S-6B for soil address the principal threat wastes through onsite treatment and Alternatives S-2, S-3, S-4, S-6, S-6A, and S-7 address principal threat wastes through offsite treatment (incineration) as needed to comply with land disposal requirements.

Under Alternatives S-5A and S-6B, soil would be treated with in-situ solidification. Under Alternative S-5B, PCBs would be removed from soil via solvent extraction and then thermally or chemically treated to permanently destroy the PCBs.

## 2.12 Selected Remedy

### Summary of the Rationale for the Selected Remedy

Based on the information currently available, the Navy believes the Selected Remedy meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the nine criteria outlined in Section 2.10. The Navy expects the Selected Remedy to satisfy the following statutory requirements of CERCLA § 121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; and 5) satisfy the preference of treatment as a principal element.

### Description of the Selected Remedy

*Selected Remedy for Soil*

The selected remedy for soil is Alternative S-6A (Figure 2-5). For Alternative S-6A, a limited excavation would be conducted to remove PCB-impacted soil with concentrations greater than 1 mg/kg to a depth of 2 feet bgs and 10 mg/kg to a depth of 10 feet bgs; and excavation of PCB-impacted soil with concentrations greater than 50 mg/kg to a depth of 20 feet bgs at Site 1 and to a depth of 30 feet bgs at Dry Well 20-08. Impacted soil would be consolidated onsite or disposed offsite. Excavated soil would be characterized for PCBs and the other COCs. Soil with less than 10 mg/kg PCBs (to a depth of 10 feet) or 50 mg/kg (at depths over 10 feet) and other COCs less than Cleanup Levels would be reused and/or consolidated onsite at depths consistent with the excavation guidance. Approximately 4,100 pounds of PCBs in 30,000 cubic yards of impacted soil would be removed from the site and disposed of in an offsite landfill and/or consolidated onsite for reuse. The soil for off-site disposal would also be treated as required to comply with landfill requirements.

At Site 1 and Dry Well 20-08, a one-foot thick reduced permeable cover would be constructed at approximately 5 to 10 feet bgs over the area with residual PCBs. The cover would consist of a clay or cement modified soil to achieve the reduced permeability cover. The total volume of cover materials is approximately 3,000 cubic yards. At Dry Well 34-07, the existing reduced permeability cover would be maintained. LUCs would be implemented at Site 1, Dry Well 20-08, and Dry Well 34-07. The total volume of the cover materials is approximately 3,000 cubic yards. LUCs would be in place to prevent future damage to the cover and/or use of remaining contaminated subsurface soil.

The estimated capital cost of the Preferred Alternative for soil is $25,600,000. Annual costs vary, based on the activity being conducted in each year and range from cover maintenance costs of $12,800 per year to 5-year review and LUCs costs of approximately $30,000 per every 5 years (30 years). The estimated present value of the capital and annual costs for the Preferred Alternative for soil is $26,000,000.

*Selected Remedy for Soil Vapor*

The selected remedy for soil vapor is Alternative SV-3. For Alternative SV-3, potential vapor intrusion would be addressed by supplementing the existing SVE Containment System, monitoring, and LUCs. The operation of the SVE Containment System would be continued and additional SVE wells would be installed to target soil vapor near the potential residual reservoirs of the VOCs. Soil vapor extraction

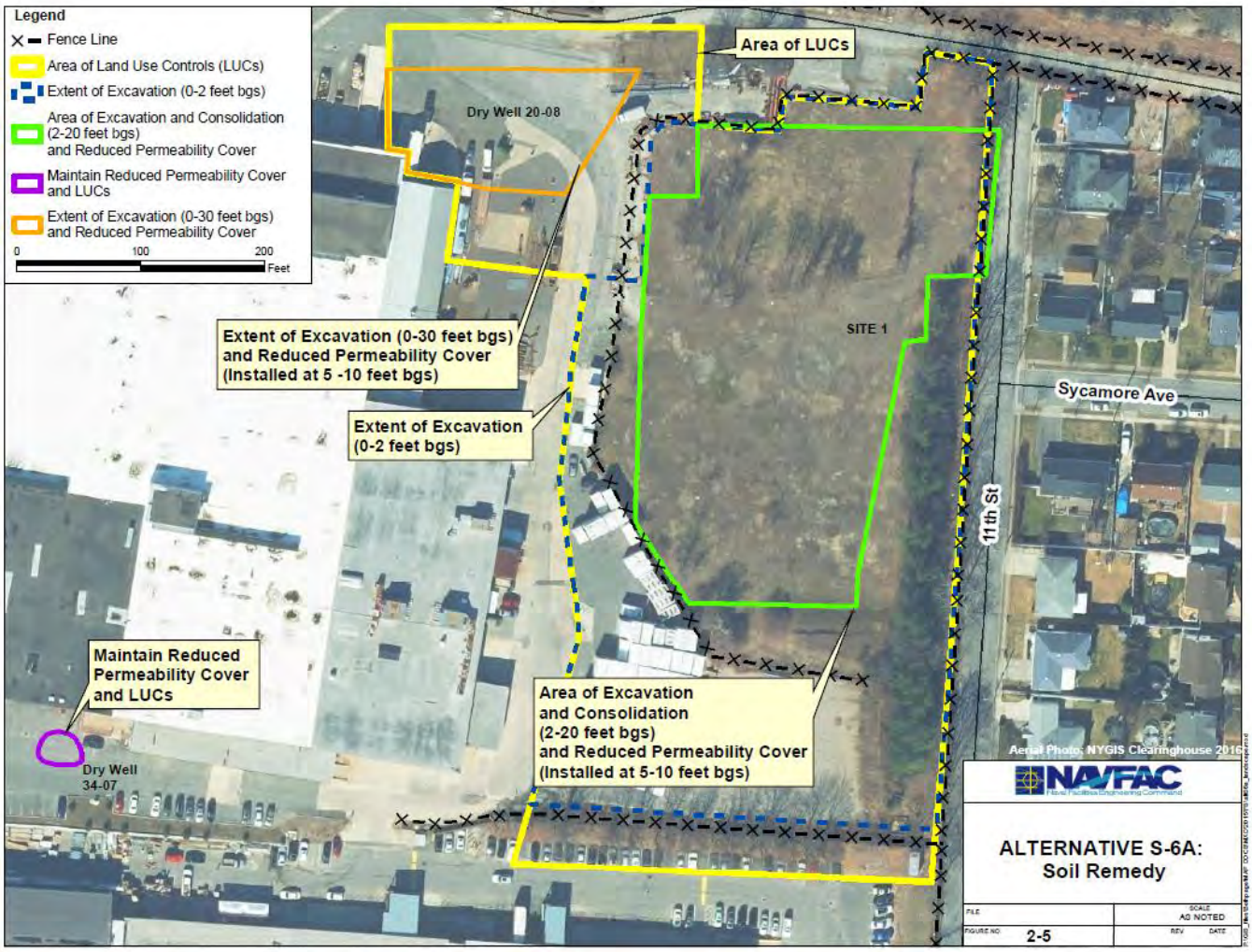


**Figure 2-5 Selected Soil Alternative (S-6A)**

would remove COCs adsorbed to soils in the unsaturated (vadose) zone. Vapors extracted from the subsurface would be treated by GAC as needed to comply with state air discharge standards.

Monitoring would include sampling of already present off-property SVPMs, sampling of SVE wells, air sampling for regulatory compliance, and O&M for the existing SVE Containment System. O&M activities include system maintenance and potential replacement of GAC treatment. LUCs would be used to provide notice of residual VOC contamination and the need to take appropriate actions to control the potential for vapor intrusion.

The estimated capital cost of the Preferred Alternative for soil vapor is $220,000. Annual costs vary, based on the activity being conducted in each year and range in cost from $110,000 to $125,000 per year (30 years) for reporting, electricity, telemetry, 5-year review, and LUCs. The estimated present value of the capital and annual costs of the Preferred Alternative for soil vapor is $1,700,000.

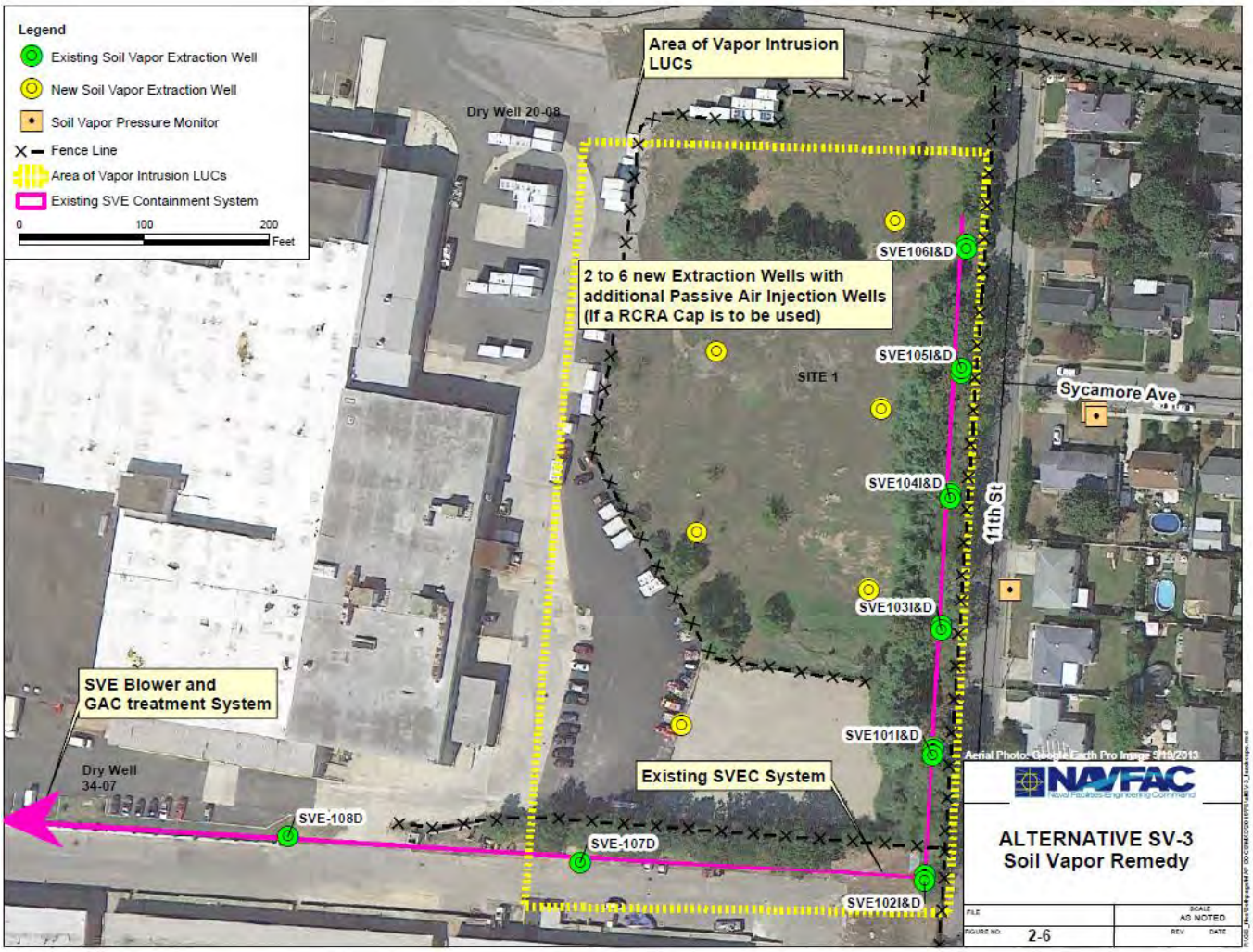


**Figure 2-6 Selected Soil Vapor Alternative (SV-3)**

*Selected Remedy for Groundwater*

The selected remedy for groundwater is Alternative G-2.

For Alternative G-2, groundwater would be addressed by monitoring and LUCs. Monitoring would be conducted to track the migration and attenuation of the COCs over time. Monitoring for Alternative G-2 would consist of using existing and new wells. The existing monitoring wells are presented on Figure 2-7. The exact number and location of new wells will be identified in a post-ROD design. Groundwater samples would be collected until Cleanup Levels are achieved. The samples would be analyzed for metals and PCBs. During the monitoring program, optimization activities to modify the number of wells, sampling frequency, and chemicals would be conducted.

LUCs would be used to control exposure to impacted groundwater. The LUCs would consist of limiting the installation of groundwater extraction wells and/or the use of contaminated groundwater. Groundwater monitoring would be conducted to evaluate groundwater migration and the potential effects of soil remediation on groundwater, and the potential need to take additional actions.

The Navy recognizes that continued operation of the ONCT system is paramount to ensuring that the Navy's selected remedy for Navy's onsite groundwater remains protective of human health and the environment. In the event that the ONCT system is unable to treat Navy's onsite groundwater, the remedy would no longer be protective of human health or the environment. In this case, the Navy will

reevaluate the protectiveness of the Navy's onsite groundwater remedy and implement all requisite measures as determined by the Navy in consultation with NYSDEC and NYSDOH to ensure the continued protection of human health and the environment.

The estimated capital cost of the Preferred Alternative for groundwater is $230,000. Annual costs vary, based on the activity being conducted in each year and range from groundwater sampling, O&M management, reporting, 5-year review, and LUCs costs of $110,000 to $125,000 per year (30 years). The estimated present value cost of the capital and annual costs of the Preferred Alternative for groundwater is $2,600,000.

### Summary of Estimated Remedy Costs

The information in the cost estimate summary table (Appendix D) is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record File, an Explanation of Significant Differences, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within + 50 to -30 percent of the actual project cost.

The estimated total capital cost of the selected remedy is $26,050,000. Annual costs vary significantly based on the activity being conducted each year and range from operation, monitoring, maintenance, and inspection of $218,800 per year to proximately $279,000. The estimated present value of total capital and annual costs of the selected remedy is $30,300,000.

Appendix D contains a detailed cost estimate of the Selected Remedy.

### Expected Outcomes of the Selected Remedy

The selected soil remedy for soil will achieve RAOs in 7 years under Alternative S-6A. The selected soil vapor remedy will achieve RAOs in 15 years under Alternative SV-3. The selected groundwater remedy will achieve RAOs in 30 years. Final Cleanup Levels for each medium are presented in Table 2-8.

Future land use is anticipated to be consistent with current land use, which is primarily commercial and industrial development. The effectiveness of the remedy on the cleanup of soil COCs will be evaluated twice over ten years and prior to property transfer. The effectiveness of the remedy on the cleanup of groundwater COCs will be evaluated annually. In accordance with LUCs, the use of groundwater will be restricted to monitoring or remedial purposes.

When all of the COCs have achieved their Cleanup Levels, site closure will be initiated. Site 1 is expected to be transferred to Nassau County and utilized for economic redevelopment. The Navy and NYSDEC will evaluate the soil and groundwater LUC component of the Selected Remedy for termination at site closeout.

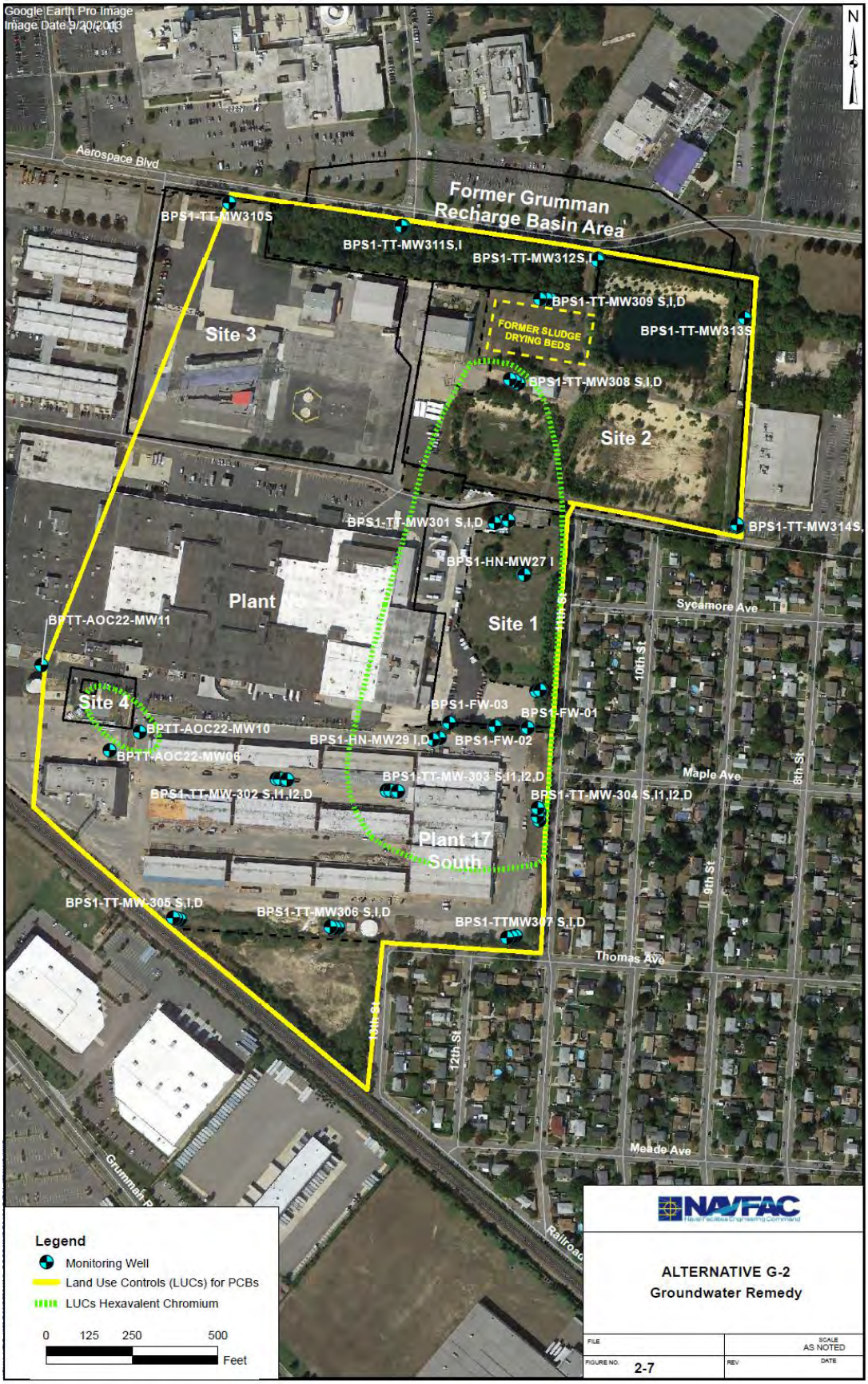


**Figure 2-7 Selected Groundwater Alternative (G-2)**

The Selected Remedy is expected to remove the bulk of contamination through soil excavation and continued operation of the SVE Containment System to achieve the final Cleanup Levels. Monitoring of soil vapor and groundwater, and LUCs will be used to track the remediation and to limit activities until the Cleanup Levels are achieved. Although COCs will remain at concentrations that would not allow unrestricted use, the Selected Remedy would effectively minimize the potential for risk to human health.

## 2.13 Statutory Determinations

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

**Protection of Human Health and the Environment-** The selected remedy will protect human health and the environment through excavation and offsite disposal, containment, LUCs, and a reduction of COC migration to groundwater under Alternative S-6A; through mitigation of exposure to contaminated vapors with continued operation and enhancement of the SVE system under Alternative SV-3; and through groundwater monitoring and LUCs under Alternative G-2. During implementation, monitoring and treatment of remediation wastes will be conducted to ensure that protection of the community and surrounding areas are not effected.

**Compliance with ARARs and To Be Considered (TBC) Criteria-** Section 121(d) of CERCLA, as amended, specifies, in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site or obtain a waiver [40 CFR § 300.430(f)(1)(ii)(B)]. ARARs include only federal and state environmental or facility siting laws/regulations. In addition to ARARs, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The TBC category consists of advisories, criteria, or guidance that were developed by USEPA, other federal agencies, or states that may be useful in developing CERCLA remedies [40 CFR §300.400(g)(3)]. In accordance with 40 CFR §300.400(g), the Navy identified the ARARs and TBCs for the selected remedy. Appendix C lists the chemical-, location-, and action-specific ARARs and TBCs.

**Cost-Effectiveness-** The Selected Remedy is cost-effective and represented a reasonable value for the money to be spent. The following definition was used to determine cost effectiveness, “A remedy shall be cost-effective if its costs are proportional to its overall effectiveness.” [NCP § 300.430(f)(1)(ii)(D)]. This analysis was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria. The costs are proportional to overall effectiveness by achieving long-term effectiveness and permanence within a reasonable timeframe.

The estimated present worth value of the Selected Remedy for soil is $26,000,000. This cost falls mid-range as compared to other soil alternatives evaluated, which range between $13,400,000 and $99,700,000. The present worth cost of the Selected Remedy for soil vapor is $1,700,000 to provide enhancements to the current SVE system. The present worth cost of the Selected Remedy for groundwater is $2,600,000 for monitoring and LUCs.

**Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable-** The Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at Site 1. COCs are either removed through excavation, soil vapor extraction, or destroyed in-situ using enhanced and natural biodegradation. Because long-term effectiveness and permanence along with reduced toxicity and volume are achieved in the shortest timeframe with the Selected Remedy, the Navy and NYSDEC determined that the Selected Remedy provides the best balance of tradeoffs in terms of the balancing criteria, while also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

**Preference for Treatment as a Principal Element-** The Selected Remedy uses treatment as an element through the SVE system, and therefore satisfies the statutory preference for treatment.

Shallow high concentration PCB-contaminated soil (greater than 500 mg/kg) is considered principal threat wastes and will be treated as required by off-property landfill regulations.

**Five-year Review Requirements-** Until Cleanup Levels are achieved, hazardous substances, pollutants, or COCs remain above levels that allow for unlimited use and unrestricted exposure; therefore, in accordance with CERCLA Section 121(c) and the NCP at 40 CFR § 300.430 (f)(4)(ii), a statutory review will be conducted by the Navy within 5 years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment. If the remedy is determined to no longer be protective of human health and the environment because, for example, LUCs have failed or long-term treatment objectives are not being met, then additional remedial actions would be evaluated by the Navy and the Navy may be required to undertake additional remedial action. Once the Cleanup Levels are achieved, five- year reviews will no longer be required.

## 2.14 Documentation of Significant Changes

CERCLA Section 117(b) and NCP Sections 300.430(f)(5)(iii)(B) and 300.430(f)(3)(ii)(A) require that an explanation be provided for any significant change(s) to the preferred remedy presented in the Proposed Plan that was published for public comment. There was no significant change to the proposed remedy.

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# 3.0 RESPONSIVENESS SUMMARY

## 3.1 Stakeholder Comments and Lead Agency Responses

The public comment period was held from November 22, 2017 to January 22, 2018. Comments were requested from the general public, current RAB members, and representatives from NYSDEC and NYSDOH. The Proposed Plan was public noticed in the Farmingdale Observer, Hicksville News, Levittown Tribune, Massapequa Observer, and Plainview-Old Bethpage Herald on November 22, 2017 and discussed during the December 12, 2017 public meeting, at which participants included representatives of the Navy, NYSDOH, NYSDEC, and over 14 community members attended the meeting. There were several comments on the Proposed Plan/proposed alternatives, none of which resulted in a modification of the actions presented in the Proposed Plan. Comments and responses are provided in Appendix E.

## 3.2 Technical and Legal Issues

No technical or legal issues with OU 4 Site 1 Record of Decision were identified.

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# REFERENCES

| Reference Number | Reference Phrase in ROD | Location in ROD | Identification of Referenced Document Available in the Administration Record |
|---|---|---|---|
| 1 | OU 1 ROD | Section 2.2 | Naval Facilities Engineering Command (NAVFAC). *Final Record of Decision. Naval Weapons Industrial Reserve Plant, Bethpage, New York, Sites 1, 2, and 3, NYS Registry: 1-30-003B.* Engineering Field Activity, Northeast Naval Facilities Engineering Command and New York Department of Environmental Conservation. May 1995. |
| 2 | RI Addendum | Section 2.2 | Remedial Investigation Addendum – Soil, Groundwater, and Soil Vapor Site 1 – Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant, Bethpage, New York. November 2015. |
| 3 | Feasibility Study Addendum | Section 2.2 | Feasibility Study Addendum. Revision 1, Site 1 – Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant, Bethpage, New York. August 2016. |
| 4 | Supplement to the Feasibility Addendum | Section 2.2 | May 2017 Supplement to the Feasibility Study Addendum (Revision 1, August 2016) Development of Alternatives S-6A and S-6B, Site 1 – Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant, Bethpage, New York. May 2017. |
| 5 | Conceptual Site Model (CSM) | Section 2.5 | Remedial Investigation Addendum – Soil, Groundwater, and Soil Vapor Site 1 – Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant, Bethpage, New York. November 2015. |
| 6 | Chemical of Concern (COC) | Section 2.7 | Remedial Investigation Addendum – Soil, Groundwater, and Soil Vapor Site 1 – Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant, Bethpage, New York. Section 4.0. Tetra Tech. November 2015. |
| 7 | USEPA Regional Screening Levels (RSL) | Section 2.7 | USEPA Regional Screening Levels (updated November 2014). Accessed January 2015 http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm. |
| 8 | USEPA Soil Screening Levels (SSL) | Section 2.7 | USEPA Regional Screening Levels (updated November 2014). Soil Screening Levels. Accessed January 2015. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm |
| 9 | NYSDEC Unrestricted Use SCOs | Section 2.7 | NYSDEC, 6 NYCRR Part 375 Environmental Remediation Programs, Subparts 375-1 to 375-4 & 6. December 2006. http://www.dec.ny.gov/regs/15507.html |
| 10 | NYSDEC SCO for the Protection of Groundwater | Section 2.7 | NYSDEC, 6 NYCRR Part 375 Environmental Remediation Programs, Subparts 375-1 to 375-4 & 6. December 2006. http://www.dec.ny.gov/regs/15507.html |
| 11 | USEPA Maximum Contaminant Level (MCL) | Section 2.7 | USEPA National Primary Drinking Water Regulations; List of Contaminants and their MCLs (2009) Regional Screening Levels (updated November 2014). http://water.epa.gov/drink/contaminants/#List, May. |

| Reference Number | Reference Phrase in ROD | Location in ROD | Identification of Referenced Document Available in the Administration Record |
|---|---|---|---|
| 12 | NYSDOH MCL | Section 2.7 | New York State Department of Health (NYSDOH) Maximum Contaminant Level (MCL). 10 NYCRR, Part 5, Subpart 5-1 Public Water Systems, Tables 1 through 3. http://www.health.ny.gov/regulations/nycrr/title_10/part_5/subpart_5-1_tables.htm#table1. |
| 13 | Applicable or Relevant and Appropriate Requirements (ARARs) | Section 2.8 | Feasibility Study Addendum. Revision 1, Site 1 – Former Drum Marshalling Area, Naval Weapons Industrial Reserve Plant, Bethpage, New York. November 2015. |

Detailed site information in this ROD in blue text is contained in the Administrative Record and Naval Installation Restoration Information Solution (NIRIS).

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| µg/L | Microgram per Liter |
| µg/$m^3$ | Microgram per Cubic Meter |
| AOC | Area of Concern |
| ARAR | Applicable or Relevant and Appropriate Requirements |
| AS/SVE | Air Sparge/Soil Vapor Extraction |
| ASTDR | Agency for Toxic Substances and Disease Registry |
| AST | Aboveground Storage Tank |
| bgs | Below Ground Surface |
| CDI | Chronic Daily Intake |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| CFR | Code of Federal Regulations |
| COC | Chemical of Concern |
| CSF | Cancer Slope Factor |
| CSM | Conceptual Site Model |
| DAF | Dilution Attenuation Factor |
| EPC | Exposure Point Concentration |
| ERP | Environmental Restoration Program |
| FS | Feasibility Study |
| GAC | Granular Activated Carbon |
| gpm | Gallons Per Minute |
| HHRA | Human Health Risk Assessment |
| HI | Hazard Index |
| HQ | Hazard Quotient |
| IAS | Initial Assessment Study |
| ILCR | Incremental Lifetime Cancer Risk |
| IRIS | Integrated Risk Information System |
| LUC | Land Use Control |
| MCL | Maximum Contaminant Level |
| mg/kg | Milligram per Kilogram |
| mg/kg/day | Milligram per Kilogram per day |
| NCP | National Oil and Hazardous Substance Pollution Contingency Plan |
| NG | Northrop Grumman |

## ACRONYMS AND ABBREVIATIONS (Continued)

| | |
|---|---|
| NJDEP | New Jersey Department of Environmental Protection |
| NWIRP | Naval Weapons Industrial Reserve Plant |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| OM&M | Operation, Maintenance, and Monitoring |
| ONCT | On-site Containment |
| OU | Operable Unit |
| PAH | Polynuclear Aromatic Hydrocarbon |
| PCB | Polychlorinated Biphenyl |
| PCE | Tetrachloroethene |
| RAB | Restoration Advisory Board |
| RAO | Remedial Action Objective |
| RCRA | Resource Conservation and Recovery Act |
| RfD | Reference Dose |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| RSL | Regional Screening Level |
| SCO | Soil Cleanup Objective |
| SSD | Sub-Slab Depressurization |
| SSL | Soil Screening Level |
| SVE | Soil Vapor Extraction |
| SVOC | Semi-volatile Organic Compound |
| SVPM | Soil Vapor Pressure Monitor |
| TCE | Trichloroethene |
| UIC | Underground Injection Control |
| U.S.C. | United States Code |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tank |
| VOC | Volatile Organic Compound |

# APPENDIX A
## NYSDEC Concurrence with Selected Remedy

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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Office of the Director
625 Broadway, 12th Floor, Albany, New York 12233-7011
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October 22, 2018

Ms. Lora Fly
Project Manager
Naval Facilities Engineering Command Northeast
9742 Maryland Avenue
Norfolk, VA 23511-3095

Dear Ms. Fly:

**Re: Naval Weapons Industrial Reserve Plant Site**
**Operable Unit 4 Site 1 - Former Drum Marshalling Area**
**NYSDEC Site ID No.130003B**

The New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH) have reviewed the revised draft-final Record of Decision (ROD). We understand that this is a supplement to Site 1 activities in the 1995 OU 1 ROD and identifies, as the selected remedy, the combination of Soils Alternative S-6A, Soil Vapor Alternative SV-3 and Groundwater Alternative G-2.

The major components of the selected remedy, which comprises several alternatives identified in the Proposed Plan (November 2017), are as follows:

Soil - Alternative S-6A

- Limited excavation and onsite consolidation or offsite disposal of PCB-contaminated soil
- Installation of a reduced permeability cover
- Land Use Controls (LUCs) to protect the cover and limit future activities

Soil Vapor - Alternative SV-3

- Continued operation of the Soil Vapor Extraction (SVE) Containment System
- Installation of additional SVE wells to accelerate source area control
- Continued monitoring of on-property SVE wells and on- and off-property Soil Vapor Pressure Monitors (SVPMs)
- LUCs to identify future actions needed to control the potential for vapor intrusion

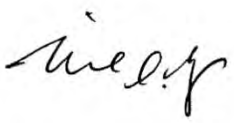
Groundwater - Alternative G-2

- Monitoring
- LUCs limiting the installation of groundwater extraction wells and/or use of contaminated groundwater

Based on this information, DEC and DOH concur with the remedial alternative selected in the Record of Decision for NWIRP Site 1, OU4. The NYSDEC also requests that the Navy, to the extent possible, work to shorten the project schedule time frame detailed in "Expected Outcomes of the Selected Remedy" subsection of the overall section 2.12, Selected Remedy section of the Record of Decision (ROD).

If you have any questions, please contact Mr. Eric Obrecht, of my staff, at (518) 402-9625.

Sincerely,



Michael J. Ryan, P.E.
Director
Division of Environmental Remediation

ec: G. Heitzman DEC
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C. Bethoney, NYSDOH
S. Karpinski, NYSDOH

# APPENDIX B
## Human Health Risk Assessment Tables

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**TABLE 6-24**
**SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES**
**NWIRP BETHPAGE, NEW YORK**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil - Site 1 | Incidental Ingestion | 3E-06 | -- | -- | Aroclor-1248 | 0.9 | -- |
| | | Dermal Contact | 1E-06 | -- | -- | -- | 0.4 | -- |
| | | Inhalation | 5E-08 | -- | -- | -- | -- | -- |
| | | Total | 5E-06 | -- | -- | Aroclor-1248 | 1 | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 4E-07 | -- | -- | -- | 0.1 | -- |
| | | Dermal Contact | 2E-07 | -- | -- | -- | 0.06 | -- |
| | | Inhalation | 7E-09 | -- | -- | -- | -- | -- |
| | | Total | 6E-07 | -- | -- | -- | 0.2 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 7E-08 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 3E-08 | -- | -- | -- | -- | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | -- | -- |
| | | Total | 1E-07 | -- | -- | -- | -- | -- |
| Industrial Workers | Surface Soil - Site 1 | Incidental Ingestion | 2E-05 | -- | Aroclor-1248 | Aroclor-1254 | 0.4 | -- |
| | | Dermal Contact | 1E-05 | -- | -- | Aroclor-1248, Aroclor-1254 | 0.2 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | -- | -- |
| | | Total | 4E-05 | -- | Aroclor-1248 | Aroclor-1254 | 0.6 | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 3E-06 | -- | -- | Aroclor-1248 | 0.06 | -- |
| | | Dermal Contact | 2E-06 | -- | -- | -- | 0.03 | -- |
| | | Inhalation | 2E-10 | -- | -- | -- | -- | -- |
| | | Total | 5E-06 | -- | -- | Aroclor-1248 | 0.09 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 5E-07 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 3E-07 | -- | -- | -- | -- | -- |
| | | Inhalation | 3E-11 | -- | -- | -- | -- | -- |
| | | Total | 8E-07 | -- | -- | -- | -- | -- |
| Adolescent Trespassers | Surface Soil - Site 1 | Incidental Ingestion | 2E-06 | -- | -- | -- | 0.07 | -- |
| | | Dermal Contact | 2E-06 | -- | -- | -- | 0.08 | -- |
| | | Inhalation | 3E-11 | -- | -- | -- | -- | -- |
| | | Total | 4E-06 | -- | -- | Aroclor-1248 | 0.1 | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 2E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 3E-07 | -- | -- | -- | 0.01 | -- |
| | | Inhalation | 4E-12 | -- | -- | -- | -- | -- |
| | | Total | 5E-07 | -- | -- | -- | 0.02 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 4E-08 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 4E-08 | -- | -- | -- | -- | -- |
| | | Inhalation | 6E-13 | -- | -- | -- | -- | -- |
| | | Total | 8E-08 | -- | -- | -- | -- | -- |
| Child Residents | Surface Soil - Site 1 | Incidental Ingestion | 9E-05 | -- | Aroclor-1248, Aroclor-1254 | -- | 6 | Aroclor-1254 |
| | | Dermal Contact | 3E-05 | -- | Aroclor-1248 | Aroclor-1254 | 2 | Aroclor-1254 |
| | | Inhalation | 1E-09 | -- | -- | -- | -- | -- |
| | | Total | 1E-04 | -- | Aroclor-1248, Aroclor-1254 | -- | 8 | Aroclor-1254 |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 1E-05 | -- | -- | Aroclor-1248, Aroclor-1254 | 0.9 | -- |
| | | Dermal Contact | 4E-06 | -- | -- | Aroclor-1248 | 0.3 | -- |
| | | Inhalation | 2E-10 | -- | -- | -- | -- | -- |
| | | Total | 2E-05 | -- | -- | Aroclor-1242, Aroclor-1248, Aroclor-1254 | 1 | -- |
| | Groundwater | Incidental Ingestion | 5E-04 | Hexavalent Chromium | Arsenic | Aroclor-1242 | 1 | -- |
| | | Dermal Contact | 2E-04 | Hexavalent Chromium | -- | -- | 0.2 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | -- | -- |
| | | Total | 6E-04 | Hexavalent Chromium | Arsenic | Aroclor-1242 | 2 | Target Organs HI < 1 |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 2E-06 | -- | -- | Aroclor-1248 | -- | -- |
| | | Dermal Contact | 7E-07 | -- | -- | -- | -- | -- |
| | | Inhalation | 3E-11 | -- | -- | -- | -- | -- |
| | | Total | 3E-06 | -- | -- | Aroclor-1248 | -- | -- |

**TABLE 6-24**
**SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES**
**NWIRP BETHPAGE, NEW YORK**
**PAGE 2 OF 2**

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil - Site 1 | Incidental Ingestion | 3E-05 | -- | Aroclor-1248 | Aroclor-1254 | 0.5 | -- |
| | | Dermal Contact | 2E-05 | -- | -- | Aroclor-1248, Aroclor-1254 | 0.3 | -- |
| | | Inhalation | 4E-09 | -- | -- | -- | -- | -- |
| | | Total | 4E-05 | -- | Aroclor-1248 | Aroclor-1254 | 0.9 | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 4E-06 | -- | -- | Aroclor-1248 | 0.08 | -- |
| | | Dermal Contact | 2E-06 | -- | -- | -- | 0.05 | -- |
| | | Inhalation | 6E-10 | -- | -- | -- | -- | -- |
| | | Total | 6E-06 | -- | -- | Aroclor-1248, Aroclor-1254 | 0.1 | -- |
| | Groundwater | Incidental Ingestion | 4E-04 | Hexavalent Chromium | Arsenic | Aroclor-1242, Aroclor-1248 | 0.9 | -- |
| | | Dermal Contact | 2E-04 | Hexavalent Chromium | -- | -- | 0.2 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | -- | -- |
| | | Total | 5E-04 | Hexavalent Chromium | Arsenic | Aroclor-1242, Aroclor-1248 | 1 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 6E-07 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 3E-07 | -- | -- | -- | -- | -- |
| | | Inhalation | 1E-10 | -- | -- | -- | -- | -- |
| | | Total | 9E-07 | -- | -- | -- | -- | -- |
| Lifelong (Child and Adult) | Surface Soil - Site 1 | Incidental Ingestion | 1E-04 | -- | Aroclor-1248, Aroclor-1254 | -- | NA | -- |
| | | Dermal Contact | 5E-05 | -- | Aroclor-1248 | Aroclor-1254 | NA | -- |
| | | Inhalation | 6E-09 | -- | -- | -- | NA | -- |
| | | Total | 2E-04 | -- | Aroclor-1248, Aroclor-1254 | -- | NA | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 2E-05 | -- | -- | Aroclor-1242, Aroclor-1248, Aroclor-1254 | NA | -- |
| | | Dermal Contact | 7E-06 | -- | -- | Aroclor-1248, Aroclor-1254 | NA | -- |
| | | Inhalation | 8E-10 | -- | -- | -- | NA | -- |
| | | Total | 2E-05 | -- | Aroclor-1248 | Aroclor-1242, Aroclor-1254 | NA | -- |
| | Groundwater | Incidental Ingestion | 8E-04 | Hexavalent Chromium | Arsenic | Aroclor-1242, Aroclor-1248 | NA | -- |
| | | Dermal Contact | 3E-04 | Hexavalent Chromium | -- | -- | NA | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | NA | -- |
| | | Total | 1E-03 | Hexavalent Chromium | Arsenic | Aroclor-1242, Aroclor-1248 | NA | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 2E-06 | -- | -- | Aroclor-1248 | NA | -- |
| | | Dermal Contact | 1E-06 | -- | -- | -- | NA | -- |
| | | Inhalation | 1E-10 | -- | -- | -- | NA | -- |
| | | Total | 3E-06 | -- | -- | Aroclor-1248 | NA | -- |

- No chemical meet this criterion.

**TABLE 6-25**
**SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES**
**NWIRP BETHPAGE, NEW YORK**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil - Site 1 | Incidental Ingestion | 9E-07 | -- | -- | -- | 0.3 | -- |
| | | Dermal Contact | 3E-07 | -- | -- | -- | 0.08 | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | -- | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.3 | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 1E-07 | -- | -- | -- | 0.04 | -- |
| | | Dermal Contact | 4E-08 | -- | -- | -- | 0.01 | -- |
| | | Inhalation | 4E-09 | -- | -- | -- | -- | -- |
| | | Total | 2E-07 | -- | -- | -- | 0.05 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 2E-08 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 6E-09 | -- | -- | -- | -- | -- |
| | | Inhalation | 6E-10 | -- | -- | -- | -- | -- |
| | | Total | 3E-08 | -- | -- | -- | -- | -- |
| Industrial Workers | Surface Soil - Site 1 | Incidental Ingestion | 4E-06 | -- | -- | Aroclor-1248 | 0.2 | -- |
| | | Dermal Contact | 7E-07 | -- | -- | -- | 0.03 | -- |
| | | Inhalation | 4E-10 | -- | -- | -- | -- | -- |
| | | Total | 5E-06 | -- | -- | Aroclor-1248 | 0.2 | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 5E-07 | -- | -- | -- | 0.03 | -- |
| | | Dermal Contact | 1E-07 | -- | -- | -- | 0.005 | -- |
| | | Inhalation | 6E-11 | -- | -- | -- | -- | -- |
| | | Total | 6E-07 | -- | -- | -- | 0.03 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 8E-08 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 2E-08 | -- | -- | -- | -- | -- |
| | | Inhalation | 9E-12 | -- | -- | -- | -- | -- |
| | | Total | 1E-07 | -- | -- | -- | -- | -- |
| Adolescent Trespassers | Surface Soil - Site 1 | Incidental Ingestion | 4E-07 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 2E-07 | -- | -- | -- | 0.008 | -- |
| | | Inhalation | 7E-12 | -- | -- | -- | -- | -- |
| | | Total | 6E-07 | -- | -- | -- | 0.03 | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 6E-08 | -- | -- | -- | 0.003 | -- |
| | | Dermal Contact | 3E-08 | -- | -- | -- | 0.001 | -- |
| | | Inhalation | 1E-12 | -- | -- | -- | -- | -- |
| | | Total | 9E-08 | -- | -- | -- | 0.004 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 9E-09 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 4E-09 | -- | -- | -- | -- | -- |
| | | Inhalation | 1E-13 | -- | -- | -- | -- | -- |
| | | Total | 1E-08 | -- | -- | -- | -- | -- |
| Child Residents | Surface Soil - Site 1 | Incidental Ingestion | 1E-05 | -- | -- | Aroclor-1248, Aroclor-1254 | 2 | Aroclor-1254 |
| | | Dermal Contact | 1E-06 | -- | -- | -- | 0.3 | -- |
| | | Inhalation | 3E-10 | -- | -- | -- | -- | -- |
| | | Total | 1E-05 | -- | -- | Aroclor-1248, Aroclor-1254 | 2 | Aroclor-1254 |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 1E-06 | -- | -- | -- | 0.3 | -- |
| | | Dermal Contact | 2E-07 | -- | -- | -- | 0.04 | -- |
| | | Inhalation | 4E-11 | -- | -- | -- | -- | -- |
| | | Total | 2E-06 | -- | -- | -- | 0.3 | -- |
| | Groundwater | Incidental Ingestion | 3E-04 | Hexavalent Chromium | -- | Arsenic | 0.8 | -- |
| | | Dermal Contact | 6E-05 | -- | Hexavalent Chromium | -- | 0.09 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | -- | -- |
| | | Total | 3E-04 | Hexavalent Chromium | -- | Arsenic | 0.9 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 2E-07 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 3E-08 | -- | -- | -- | -- | -- |
| | | Inhalation | 6E-12 | -- | -- | -- | -- | -- |
| | | Total | 2E-07 | -- | -- | -- | -- | -- |

**TABLE 6-25**
**SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES**
**NWIRP BETHPAGE, NEW YORK**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil - Site 1 | Incidental Ingestion | 3E-06 | -- | -- | Aroclor-1248 | 0.2 | -- |
| | | Dermal Contact | 5E-07 | -- | -- | -- | 0.03 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | -- | -- |
| | | Total | 4E-06 | -- | -- | Aroclor-1248 | 0.2 | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 4E-07 | -- | -- | -- | 0.03 | -- |
| | | Dermal Contact | 7E-08 | -- | -- | -- | 0.005 | -- |
| | | Inhalation | 1E-10 | -- | -- | -- | -- | -- |
| | | Total | 5E-07 | -- | -- | -- | 0.03 | -- |
| | Groundwater | Incidental Ingestion | 4E-05 | -- | Hexavalent Chromium | Arsenic | 0.3 | -- |
| | | Dermal Contact | 1E-05 | -- | -- | Hexavalent Chromium | 0.06 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | -- | -- |
| | | Total | 5E-05 | -- | Hexavalent Chromium | Arsenic | 0.4 | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 7E-08 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 1E-08 | -- | -- | -- | -- | -- |
| | | Inhalation | 2E-11 | -- | -- | -- | -- | -- |
| | | Total | 8E-08 | -- | -- | -- | -- | -- |
| Lifelong (Child and Adult) | Surface Soil - Site 1 | Incidental Ingestion | 1E-05 | -- | -- | Aroclor-1248, Aroclor-1254 | NA | -- |
| | | Dermal Contact | 2E-06 | -- | -- | Aroclor-1248 | NA | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | NA | -- |
| | | Total | 1E-05 | -- | -- | Aroclor-1248, Aroclor-1254 | NA | -- |
| | Subsurface Soil - Site 1 | Incidental Ingestion | 2E-06 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 3E-07 | -- | -- | -- | NA | -- |
| | | Inhalation | 2E-10 | -- | -- | -- | NA | -- |
| | | Total | 2E-06 | -- | -- | -- | NA | -- |
| | Groundwater | Incidental Ingestion | 3E-04 | Hexavalent Chromium | -- | Arsenic | NA | -- |
| | | Dermal Contact | 8E-05 | -- | Hexavalent Chromium | -- | NA | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | NA | -- |
| | | Total | 4E-04 | Hexavalent Chromium | -- | Arsenic | NA | -- |
| | Subsurface Soil - Dry Well 34-07 | Incidental Ingestion | 3E-07 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 4E-08 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-11 | -- | -- | -- | NA | -- |
| | | Total | 3E-07 | -- | -- | -- | NA | -- |

- No chemical meets this criterion.

**TABLE 6-29**
**RISKS BASED ON PREDICTED INDOOR AIR CONCENTRATIONS (ATTENUATION FACTOR = 0.1)**
**NWIRP BETHPAGE**
**BETHPAGE, NEW YORK**

| Compound | Influent Concentration (µg/m$^3$) | | Residential Regional Screening Levels[1] (µg/m3) | | Predicted Indoor Air Concentrations (µg/m3) | | Risks (Maximum Concentrations) | | Risks (Average Concentrations) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Average | Carcinogenic | Noncarcinogenic | Maximum | Average | ILCR | HQ | ILCR | HQ |
| Carbon Tetrachloride | 4.6 | 2.2 | 0.41 | 100 | 0.46 | 0.2 | 1E-06 | 0.005 | 5E-07 | 0.002 |
| Chloroform | 7.7 | 4.7 | 0.11 | 100 | 0.77 | 0.5 | 7E-06 | 0.008 | 4E-06 | 0.005 |
| 1,1-Dichloroethane | 24 | 16.9 | 1.5 | NA | 2.4 | 1.7 | 2E-06 | NA | 1E-06 | NA |
| 1,2-Dichloroethane | 1.5 | 0.8 | 0.094 | 7.3 | 0.15 | 0.1 | 2E-06 | 0.02 | 9E-07 | 0.01 |
| Tetrachloroethene | 925 | 708.5 | 9.4 | 42 | 92.5 | 70.8 | 1E-05 | 2 | 8E-06 | 2 |
| 1,2,4-Trichlorobenzene | 4.3 | 0.5 | NA | 2.1 | 0.43 | 0.1 | NA | 0.2 | NA | 0.02 |
| Trichloroethene | 1,350 | 981.5 | 0.43 | 2.1 | 135 | 98.2 | 3E-04 | 64 | 2E-04 | 47 |
| | | | | | | TOTAL | 3E-04 | 67 | 2E-04 | 48 |

1 - EPA Residential Regional Screening Levels (May 2014)
2 - Predicted Indoor Air Concentration = Influent Concentration x 0.1 (AF = 0.1)
ILCR - Incremental Lifetime Cancer Risk
HQ - Hazard Quotient
NA - Not applicable

**TABLE 6-30**
**RISKS BASED ON PREDICTED INDOOR AIR CONCENTRATIONS (ATTENUATION FACTOR = 0.03)**
**NWIRP BETHPAGE**
**BETHPAGE, NEW YORK**

| Compound | Influent Concentration (µg/m$^3$) | | Residential Regional Screening Levels (µg/m$^3$) | | Predicted Indoor Air Concentrations (µg/m$^3$) | | Risks (Maximum Concentrations) | | Risks (Average Concentrations) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum | Average | Carcinogenic | Noncarcinogenic | Maximum | Average | ILCR | HQ | ILCR | HQ |
| Carbon Tetrachloride | 4.6 | 2.2 | 0.41 | 100 | 0.14 | 0.07 | 3E-07 | 0.001 | 2E-07 | 0.0007 |
| Chloroform | 7.7 | 4.7 | 0.11 | 100 | 0.23 | 0.14 | 2E-06 | 0.002 | 1E-06 | 0.001 |
| 1,1-Dichloroethane | 24 | 16.9 | 1.5 | NA | 0.72 | 0.51 | 5E-07 | NA | 3E-07 | NA |
| 1,2-Dichloroethane | 1.5 | 0.8 | 0.094 | 7.3 | 0.05 | 0.02 | 5E-07 | 0.006 | 3E-07 | 0.003 |
| Tetrachloroethene | 925 | 708.5 | 9.4 | 42 | 27.75 | 21.25 | 3E-06 | 0.7 | 2E-06 | 0.5 |
| 1,2,4-Trichlorobenzene | 4.3 | 0.5 | NA | 2.1 | 0.13 | 0.02 | NA | 0.06 | NA | 0.007 |
| Trichloroethene | 1350 | 981.5 | 0.43 | 2.1 | 40.50 | 29.45 | 9E-05 | 19 | 7E-05 | 14 |
| | | | | | | TOTAL | 1E-04 | 20 | 7E-05 | 15 |

[1] EPA Residential Regional Screening Levels (May 2014)
[2] Predicted Indoor Air Concentration = Influent Concentration x 0.03 (AF = 0.03)
ILCR - Incremental Lifetime Cancer Risk
HQ - Hazard Quotient
NA - Not applicable.

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

**Table No.**

**Reasonable Maximum Exposures**



**Central Tendency Exposures**

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TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
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 | Site 1 | Aroclor-1248 | 2E-06 | -- | 1E-06 | -- | 3E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 7E-07 | -- | 3E-07 | -- | 1E-06 | CNS | 0.9 | -- | 0.4 | 1 |
| | | | Chemical Total | 3E-06 | -- | 1E-06 | -- | 5E-06 | | 0.9 | -- | 0.4 | 1 |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | 1 |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | 1 |
| | Air | Site 1 | Aroclor-1248 | -- | 4E-08 | -- | -- | 4E-08 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 1E-08 | -- | -- | 1E-08 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 5E-08 | -- | -- | 5E-08 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 5E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 5E-08 | | | | | -- |
| Medium Total | | | | | | | | 5E-06 | | | | | 1 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 5E-08 | -- | 2E-08 | -- | 7E-08 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 3E-07 | -- | 1E-07 | -- | 4E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 1E-07 | -- | 5E-08 | -- | 2E-07 | CNS | 0.1 | -- | 0.06 | 0.2 |
| | | | Chemical Total | 4E-07 | -- | 2E-07 | -- | 6E-07 | | 0.1 | -- | 0.06 | 0.2 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.2 |
| | Air | Site 1 | Aroclor-1242 | -- | 7E-10 | -- | -- | 7E-10 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 4E-09 | -- | -- | 4E-09 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 2E-09 | -- | -- | 2E-09 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 7E-09 | -- | -- | 7E-09 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 7E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-09 | | | | | -- |
| Medium Total | | | | | | | | 6E-07 | | | | | 0.2 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 7E-08 | -- | 3E-08 | -- | 1E-07 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 7E-08 | -- | 3E-08 | -- | 1E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 1E-09 | -- | -- | 1E-09 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | -- |
| Medium Total | | | | | | | | 1E-07 | | | | | -- |
| Receptor Total | | | | | | | Receptor Risk Total | 5E-06 | | | | Receptor HI Total | 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 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial Workers
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 | Site 1 | Aroclor-1248 | 2E-05 | -- | 1E-05 | -- | 3E-05 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 6E-06 | -- | 3E-06 | -- | 9E-06 | Immune | 0.4 | -- | 0.2 | 0.6 |
| | | | Chemical Total | 2E-05 | -- | 1E-05 | -- | 4E-05 | | 0.4 | -- | 0.2 | 0.6 |
| | | Exposure Point Total | | | | | | 4E-05 | | | | | 0.6 |
| | Exposure Medium Total | | | | | | | 4E-05 | | | | | 0.6 |
| | Air | Site 1 | Aroclor-1248 | -- | 1E-09 | -- | -- | 1E-09 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 3E-10 | -- | -- | 3E-10 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | -- |
| Medium Total | | | | | | | | 4E-05 | | | | | 0.6 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 3E-07 | -- | 2E-07 | -- | 5E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 2E-06 | -- | 1E-06 | -- | 3E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 9E-07 | -- | 5E-07 | -- | 1E-06 | Immune | 0.06 | -- | 0.03 | 0.09 |
| | | | Chemical Total | 3E-06 | -- | 2E-06 | -- | 5E-06 | | 0.06 | -- | 0.03 | 0.09 |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | 0.09 |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | 0.09 |
| | Air | Site 1 | Aroclor-1242 | -- | 2E-11 | -- | -- | 2E-11 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 1E-10 | -- | -- | 1E-10 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 5E-11 | -- | -- | 5E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-10 | -- | -- | 2E-10 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 2E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-10 | | | | | -- |
| Medium Total | | | | | | | | 5E-06 | | | | | 0.09 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 5E-07 | -- | 3E-07 | -- | 8E-07 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 5E-07 | -- | 3E-07 | -- | 8E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 3E-11 | -- | -- | 3E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-11 | -- | -- | 3E-11 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 3E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-11 | | | | | -- |
| Medium Total | | | | | | | | 8E-07 | | | | | -- |

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

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK



Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

| 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 | Site 1 | Aroclor-1248 | 1E-06 | -- | 1E-06 | -- | 3E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 4E-07 | -- | 4E-07 | -- | 8E-07 | Immune | 0.07 | -- | 0.08 | 0.1 |
| | | | Chemical Total | 2E-06 | -- | 2E-06 | -- | 4E-06 | | 0.07 | -- | 0.08 | 0.1 |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | 0.1 |
| | Air | Site 1 | Aroclor-1248 | -- | 2E-11 | -- | -- | 2E-11 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 6E-12 | -- | -- | 6E-12 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-11 | -- | -- | 3E-11 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 3E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-11 | | | | | -- |
| Medium Total | | | | | | | | 4E-06 | | | | | 0.1 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 3E-08 | -- | 3E-08 | -- | 5E-08 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 2E-07 | -- | 2E-07 | -- | 3E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 6E-08 | -- | 7E-08 | -- | 1E-07 | Immune | 0.01 | -- | 0.01 | 0.02 |
| | | | Chemical Total | 2E-07 | -- | 3E-07 | -- | 5E-07 | | 0.01 | -- | 0.01 | 0.02 |
| | | Exposure Point Total | | | | | | 5E-07 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 5E-07 | | | | | 0.02 |
| | Air | Site 1 | Aroclor-1242 | -- | 4E-13 | -- | -- | 4E-13 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 2E-12 | -- | -- | 2E-12 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 1E-12 | -- | -- | 1E-12 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 4E-12 | -- | -- | 4E-12 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 4E-12 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-12 | | | | | -- |
| Medium Total | | | | | | | | 5E-07 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 4E-08 | -- | 4E-08 | -- | 8E-08 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 4E-08 | -- | 4E-08 | -- | 8E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-08 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 6E-13 | -- | -- | 6E-13 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-13 | -- | -- | 6E-13 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 6E-13 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-13 | | | | | -- |
| Medium Total | | | | | | | | 8E-08 | | | | | -- |

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

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Hypothetical
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 | Site 1 | Aroclor-1248 | 7E-05 | -- | 2E-05 | -- | 9E-05 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 2E-05 | -- | 8E-06 | -- | 3E-05 | Immune | 6 | -- | 2 | 8 |
| | | | Chemical Total | 9E-05 | -- | 3E-05 | -- | 1E-04 | | 6 | -- | 2 | 8 |
| | | Exposure Point Total | | | | | | 1E-04 | | | | | 8 |
| | Exposure Medium Total | | | | | | | 1E-04 | | | | | 8 |
| | Air | Site 1 | Aroclor-1248 | -- | 1E-09 | -- | -- | 1E-09 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 3E-10 | -- | -- | 3E-10 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | -- |
| Medium Total | | | | | | | | 1E-04 | | | | | 8 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 1E-06 | -- | 5E-07 | -- | 2E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 7E-06 | -- | 3E-06 | -- | 1E-05 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 3E-06 | -- | 1E-06 | -- | 4E-06 | Immune | 0.9 | -- | 0.3 | 1 |
| | | | Chemical Total | 1E-05 | -- | 4E-06 | -- | 2E-05 | | 0.9 | -- | 0.3 | 1 |
| | | Exposure Point Total | | | | | | 2E-05 | | | | | 1 |
| | Exposure Medium Total | | | | | | | 2E-05 | | | | | 1 |
| | Air | Site 1 | Aroclor-1242 | -- | 2E-11 | -- | -- | 2E-11 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 1E-10 | -- | -- | 1E-10 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 5E-11 | -- | -- | 5E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-10 | -- | -- | 2E-10 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 2E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-10 | | | | | -- |
| Medium Total | | | | | | | | 2E-05 | | | | | 1 |
| Groundwater | Groundwater | Site 1 | Aroclor-1242 | 2E-06 | -- | - - | -- | 2E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 1E-06 | -- | - - | -- | 1E-06 | NA | -- | -- | -- | -- |
| | | | Aluminum | - - | -- | - - | -- | - - | CNS | 0.1 | -- | 0.0006 | 0.1 |
| | | | Arsenic | 2E-05 | -- | 7E-08 | -- | 2E-05 | Skin, CVS | 0.4 | -- | 0.002 | 0.4 |
| | | | Hexavalent Chromium | 4E-04 | -- | 2E-04 | -- | 6E-04 | None Specified | 0.6 | -- | 0.2 | 0.9 |
| | | | Cobalt | - - | -- | - - | -- | - - | Thyroid | 0.2 | -- | 0.0003 | 0.2 |
| | | | Iron | - - | -- | - - | -- | - - | GS | 0.08 | -- | 0.0003 | 0.08 |
| | | | Thallium | - - | -- | - - | -- | - - | Skin | -- | -- | -- | -- |
| | | | Chemical Total | 5E-04 | -- | 2E-04 | -- | 6E-04 | | 1 | -- | 0.2 | 2 |
| | | Exposure Point Total | | | | | | 6E-04 | | | | | 2 |
| | Exposure Medium Total | | | | | | | 6E-04 | | | | | 2 |
| Medium Total | | | | | | | | 6E-04 | | | | | 2 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 2E-06 | -- | 7E-07 | -- | 3E-06 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 2E-06 | -- | 7E-07 | -- | 3E-06 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 3E-11 | -- | -- | 3E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-11 | -- | -- | 3E-11 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 3E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-11 | | | | | -- |
| Medium Total | | | | | | | | 3E-06 | | | | | -- |

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

| Total Surface Soil HI | |
|---|---|
| Total Immune HI | 8 |

| Total Subsurface Soil HI | |
|---|---|
| Total Immune HI | 1 |

| Total Groundwater Soil HI | |
|---|---|
| Total CNS HI | 0.1 |
| Total CVS HI | 0.4 |
| Total GS HI | 0.08 |
| Total None Specified HI | 0.9 |
| Total Skin HI | 0.4 |
| Total Thyroid HI | 0.2 |

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Hypothetical
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 | Site 1 | Aroclor-1248 | 2E-05 | -- | 1E-05 | -- | 3E-05 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 6E-06 | -- | 4E-06 | -- | 1E-05 | Immune | 0.5 | -- | 0.3 | 0.9 |
| | | | Chemical Total | 3E-05 | -- | 2E-05 | -- | 4E-05 | | 0.5 | -- | 0.3 | 0.9 |
| | | Exposure Point Total | | | | | | 4E-05 | | | | | 0.9 |
| | Exposure Medium Total | | | | | | | 4E-05 | | | | | 0.9 |
| | Air | Site 1 | Aroclor-1248 | -- | 3E-09 | -- | -- | 3E-09 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 1E-09 | -- | -- | 1E-09 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 4E-09 | -- | -- | 4E-09 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 4E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-09 | | | | | -- |
| Medium Total | | | | | | | | 4E-05 | | | | | 0.9 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 4E-07 | -- | 2E-07 | -- | 6E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 2E-06 | -- | 1E-06 | -- | 4E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 1E-06 | -- | 6E-07 | -- | 2E-06 | Immune | 0.08 | -- | 0.05 | 0.1 |
| | | | Chemical Total | 4E-06 | -- | 2E-06 | -- | 6E-06 | | 0.08 | -- | 0.05 | 0.1 |
| | | Exposure Point Total | | | | | | 6E-06 | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | 6E-06 | | | | | 0.1 |
| | Air | Site 1 | Aroclor-1242 | -- | 6E-11 | -- | -- | 6E-11 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 4E-10 | -- | -- | 4E-10 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 2E-10 | -- | -- | 2E-10 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-10 | -- | -- | 6E-10 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 6E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-10 | | | | | -- |
| Medium Total | | | | | | | | 6E-06 | | | | | 0.1 |
| Groundwater | Groundwater | Site 1 | Aroclor-1242 (Water) | 3E-06 | -- | - - | -- | 3E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 (Water) | 3E-06 | -- | - - | -- | 3E-06 | NA | -- | -- | -- | -- |
| | | | Aluminum | - - | -- | - - | -- | - - | CNS | 0.08 | -- | 0.0005 | 0.08 |
| | | | Arsenic | 3E-05 | -- | 2E-07 | -- | 3E-05 | Skin, CVS | 0.3 | -- | 0.002 | 0.3 |
| | | | Hexavalent Chromium | 3E-04 | -- | 2E-04 | -- | 5E-04 | None Specified | 0.4 | -- | 0.2 | 0.6 |
| | | | Cobalt | - - | -- | - - | -- | - - | Thyroid | 0.1 | -- | 0.0003 | 0.1 |
| | | | Iron | - - | -- | - - | -- | - - | GS | 0.05 | -- | 0.0003 | 0.05 |
| | | | Thallium | - - | -- | - - | -- | - - | Skin | -- | -- | -- | -- |
| | | | Chemical Total | 4E-04 | -- | 2E-04 | -- | 5E-04 | | 0.9 | -- | 0.2 | 1 |
| | | Exposure Point Total | | | | | | 5E-04 | | | | | 1 |
| | Exposure Medium Total | | | | | | | 5E-04 | | | | | 1 |
| Medium Total | | | | | | | | 5E-04 | | | | | 1 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 6E-07 | -- | 3E-07 | -- | 9E-07 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 6E-07 | -- | 3E-07 | -- | 9E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 9E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-07 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 1E-10 | -- | -- | 1E-10 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-10 | -- | -- | 1E-10 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 1E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-10 | | | | | -- |
| Medium Total | | | | | | | | 9E-07 | | | | | -- |

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

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Hypothetical
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 | Site 1 | Aroclor-1248 | 9E-05 | -- | 4E-05 | -- | 1E-04 | | | | | |
| | | | Aroclor-1254 | 3E-05 | -- | 1E-05 | -- | 4E-05 | | | | | |
| | | | Chemical Total | 1E-04 | -- | 5E-05 | -- | 2E-04 | | | | | |
| | | Exposure Point Total | | | | | | 2E-04 | | | | | |
| | Exposure Medium Total | | | | | | | 2E-04 | | | | | |
| | Air | Site 1 | Aroclor-1248 | -- | 4E-09 | -- | -- | 4E-09 | | | | | |
| | | | Aroclor-1254 | -- | 1E-09 | -- | -- | 1E-09 | | | | | |
| | | | Chemical Total | -- | 6E-09 | -- | -- | 6E-09 | | | | | |
| | | Exposure Point Total | | | | | | 6E-09 | | | | | |
| | Exposure Medium Total | | | | | | | 6E-09 | | | | | |
| Medium Total | | | | | | | | 2E-04 | | | | | |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 2E-06 | -- | 7E-07 | -- | 2E-06 | | | | | |
| | | | Aroclor-1248 | 1E-05 | -- | 4E-06 | -- | 1E-05 | | | | | |
| | | | Aroclor-1254 | 4E-06 | -- | 2E-06 | -- | 6E-06 | | | | | |
| | | | Chemical Total | 2E-05 | -- | 7E-06 | -- | 2E-05 | | | | | |
| | | Exposure Point Total | | | | | | 2E-05 | | | | | |
| | Exposure Medium Total | | | | | | | 2E-05 | | | | | |
| | Air | Site 1 | Aroclor-1242 | -- | 8E-11 | -- | -- | 8E-11 | | | | | |
| | | | Aroclor-1248 | -- | 5E-10 | -- | -- | 5E-10 | | | | | |
| | | | Aroclor-1254 | -- | 2E-10 | -- | -- | 2E-10 | | | | | |
| | | | Chemical Total | -- | 8E-10 | -- | -- | 8E-10 | | | | | |
| | | Exposure Point Total | | | | | | 8E-10 | | | | | |
| | Exposure Medium Total | | | | | | | 8E-10 | | | | | |
| Medium Total | | | | | | | | 2E-05 | | | | | |
| Groundwater | Groundwater | Site 1 | Aroclor-1242 (Water) | 5E-06 | -- | - - | -- | 5E-06 | | | | | |
| | | | Aroclor-1248 (Water) | 4E-06 | -- | - - | -- | 4E-06 | | | | | |
| | | | Aluminum | - - | -- | - - | -- | - - | | | | | |
| | | | Arsenic | 5E-05 | -- | 3E-07 | -- | 5E-05 | | | | | |
| | | | Hexavalent Chromium | 8E-04 | -- | 3E-04 | -- | 1E-03 | | | | | |
| | | | Cobalt | - - | -- | - - | -- | - - | | | | | |
| | | | Iron | - - | -- | - - | -- | - - | | | | | |
| | | | Thallium | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 8E-04 | -- | 3E-04 | -- | 1E-03 | | | | | |
| | | Exposure Point Total | | | | | | 1E-03 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-03 | | | | | |
| Medium Total | | | | | | | | 1E-03 | | | | | |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 2E-06 | -- | 1E-06 | -- | 3E-06 | | | | | |
| | | | Chemical Total | 2E-06 | -- | 1E-06 | -- | 3E-06 | | | | | |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 1E-10 | -- | -- | 1E-10 | | | | | |
| | | | Chemical Total | -- | 1E-10 | -- | -- | 1E-10 | | | | | |
| | | Exposure Point Total | | | | | | 1E-10 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-10 | | | | | |
| Medium Total | | | | | | | | 3E-06 | | | | | |

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

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
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 | Site 1 | Aroclor-1248 | 7E-07 | -- | 2E-07 | -- | 9E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 2E-07 | -- | 7E-08 | -- | 3E-07 | CNS | 0.3 | -- | 0.08 | 0.3 |
| | | | Chemical Total | 9E-07 | -- | 3E-07 | -- | 1E-06 | | 0.3 | -- | 0.08 | 0.3 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.3 |
| | Air | Site 1 | Aroclor-1248 | -- | 2E-08 | -- | -- | 2E-08 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 7E-09 | -- | -- | 7E-09 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | -- |
| Medium Total | | | | | | | | 1E-06 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 1E-08 | -- | 4E-09 | -- | 2E-08 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 8E-08 | -- | 2E-08 | -- | 1E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 3E-08 | -- | 1E-08 | -- | 4E-08 | CNS | 0.04 | -- | 0.01 | 0.05 |
| | | | Chemical Total | 1E-07 | -- | 4E-08 | -- | 2E-07 | | 0.04 | -- | 0.01 | 0.05 |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | 0.05 |
| | Air | Site 1 | Aroclor-1242 | -- | 4E-10 | -- | -- | 4E-10 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 3E-09 | -- | -- | 3E-09 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 1E-09 | -- | -- | 1E-09 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 4E-09 | -- | -- | 4E-09 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 4E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-09 | | | | | -- |
| Medium Total | | | | | | | | 2E-07 | | | | | 0.05 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 2E-08 | -- | 6E-09 | -- | 3E-08 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 2E-08 | -- | 6E-09 | -- | 3E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 6E-10 | -- | -- | 6E-10 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-10 | -- | -- | 6E-10 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 6E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-10 | | | | | -- |
| Medium Total | | | | | | | | 3E-08 | | | | | -- |

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

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial Workers
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 | Site 1 | Aroclor-1248 | 3E-06 | -- | 6E-07 | -- | 3E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 9E-07 | -- | 2E-07 | -- | 1E-06 | Immune | 0.2 | -- | 0.03 | 0.2 |
| | | | Chemical Total | 4E-06 | -- | 7E-07 | -- | 5E-06 | | 0.2 | -- | 0.03 | 0.2 |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | 0.2 |
| | Air | Site 1 | Aroclor-1248 | -- | 3E-10 | -- | -- | 3E-10 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 1E-10 | -- | -- | 1E-10 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 4E-10 | -- | -- | 4E-10 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 4E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-10 | | | | | -- |
| Medium Total | | | | | | | | 5E-06 | | | | | 0.2 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 5E-08 | -- | 1E-08 | -- | 6E-08 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 3E-07 | -- | 6E-08 | -- | 4E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 1E-07 | -- | 3E-08 | -- | 2E-07 | Immune | 0.03 | -- | 0.005 | 0.03 |
| | | | Chemical Total | 5E-07 | -- | 1E-07 | -- | 6E-07 | | 0.03 | -- | 0.005 | 0.03 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.03 |
| | Air | Site 1 | Aroclor-1242 | -- | 6E-12 | -- | -- | 6E-12 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 4E-11 | -- | -- | 4E-11 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 2E-11 | -- | -- | 2E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-11 | -- | -- | 6E-11 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 6E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-11 | | | | | -- |
| Medium Total | | | | | | | | 6E-07 | | | | | 0.03 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 8E-08 | -- | 2E-08 | -- | 1E-07 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 8E-08 | -- | 2E-08 | -- | 1E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 9E-12 | -- | -- | 9E-12 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 9E-12 | -- | -- | 9E-12 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 9E-12 | | | | | -- |
| | Exposure Medium Total | | | | | | | 9E-12 | | | | | -- |
| Medium Total | | | | | | | | 1E-07 | | | | | -- |

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

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK



Scenario Timeframe: Current/Future
Receptor Population: Trespassers
Receptor Age: Adolescent

| 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 | Site 1 | Aroclor-1248 | 3E-07 | -- | 1E-07 | -- | 5E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 1E-07 | -- | 4E-08 | -- | 1E-07 | Immune | 0.02 | -- | 0.008 | 0.03 |
| | | | Chemical Total | 4E-07 | -- | 2E-07 | -- | 6E-07 | | 0.02 | -- | 0.008 | 0.03 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.03 |
| | Air | Site 1 | Aroclor-1248 | -- | 5E-12 | -- | -- | 5E-12 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 2E-12 | -- | -- | 2E-12 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 7E-12 | -- | -- | 7E-12 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 7E-12 | | | | | -- |
| | Exposure Medium Total | | | | | | | 7E-12 | | | | | -- |
| Medium Total | | | | | | | | 6E-07 | | | | | 0.03 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 6E-09 | -- | 3E-09 | -- | 9E-09 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 4E-08 | -- | 2E-08 | -- | 5E-08 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 2E-08 | -- | 7E-09 | -- | 2E-08 | Immune | 0.003 | -- | 0.001 | 0.004 |
| | | | Chemical Total | 6E-08 | -- | 3E-08 | -- | 9E-08 | | 0.003 | -- | 0.001 | 0.004 |
| | | Exposure Point Total | | | | | | 9E-08 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | 9E-08 | | | | | 0.004 |
| | Air | Site 1 | Aroclor-1242 | -- | 1E-13 | -- | -- | 1E-13 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 6E-13 | -- | -- | 6E-13 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 2E-13 | -- | -- | 2E-13 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-12 | -- | -- | 1E-12 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 1E-12 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-12 | | | | | -- |
| Medium Total | | | | | | | | 9E-08 | | | | | 0.004 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 9E-09 | -- | 4E-09 | -- | 1E-08 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 9E-09 | -- | 4E-09 | -- | 1E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 1E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-08 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 1E-13 | -- | -- | 1E-13 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-13 | -- | -- | 1E-13 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 1E-13 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-13 | | | | | -- |
| Medium Total | | | | | | | | 1E-08 | | | | | -- |

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

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Hypothetical
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 | Site 1 | Aroclor-1248 | 7E-06 | -- | 1E-06 | -- | 8E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 2E-06 | -- | 3E-07 | -- | 3E-06 | Immune | 2 | -- | 0.3 | 2 |
| | | | Chemical Total | 1E-05 | -- | 1E-06 | -- | 1E-05 | | 2 | -- | 0.3 | 2 |
| | | Exposure Point Total | | | | | | 1E-05 | | | | | 2 |
| | Exposure Medium Total | | | | | | | 1E-05 | | | | | 2 |
| | Air | Site 1 | Aroclor-1248 | -- | 2E-10 | -- | -- | 2E-10 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 7E-11 | -- | -- | 7E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-10 | -- | -- | 3E-10 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 3E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 3E-10 | | | | | -- |
| Medium Total | | | | | | | | 1E-05 | | | | | 2 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 1E-07 | -- | 2E-08 | -- | 2E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 8E-07 | -- | 1E-07 | -- | 1E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 3E-07 | -- | 5E-08 | -- | 4E-07 | Immune | 0.3 | -- | 0.04 | 0.3 |
| | | | Chemical Total | 1E-06 | -- | 2E-07 | -- | 2E-06 | | 0.3 | -- | 0.04 | 0.3 |
| | | Exposure Point Total | | | | | | 2E-06 | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | 2E-06 | | | | | 0.3 |
| | Air | Site 1 | Aroclor-1242 | -- | 4E-12 | -- | -- | 4E-12 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 3E-11 | -- | -- | 3E-11 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 1E-11 | -- | -- | 1E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 4E-11 | -- | -- | 4E-11 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 4E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 4E-11 | | | | | -- |
| Medium Total | | | | | | | | 2E-06 | | | | | 0.3 |
| Groundwater | Groundwater | Site 1 | Aroclor-1242 | 9E-07 | -- | - - | -- | 9E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 7E-07 | -- | - - | -- | 7E-07 | NA | -- | -- | -- | -- |
| | | | Aluminum | - - | -- | - - | -- | - - | CNS | 0.08 | -- | 0.0003 | 0.08 |
| | | | Arsenic | 9E-06 | -- | 3E-08 | -- | 9E-06 | Skin, CVS | 0.2 | -- | 0.0008 | 0.2 |
| | | | Hexavalent Chromium | 3E-04 | -- | 6E-05 | -- | 3E-04 | None Specified | 0.4 | -- | 0.09 | 0.5 |
| | | | Cobalt | - - | -- | - - | -- | - - | Thyroid | 0.1 | -- | 0.0001 | 0.1 |
| | | | Iron | - - | -- | - - | -- | - - | GS | 0.04 | -- | 0.0001 | 0.04 |
| | | | Thallium | - - | -- | - - | -- | - - | Skin | -- | -- | -- | -- |
| | | | Chemical Total | 3E-04 | -- | 6E-05 | -- | 3E-04 | | 0.8 | -- | 0.09 | 0.9 |
| | | Exposure Point Total | | | | | | 3E-04 | | | | | 0.9 |
| | Exposure Medium Total | | | | | | | 3E-04 | | | | | 0.9 |
| Medium Total | | | | | | | | 3E-04 | | | | | 0.9 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 2E-07 | -- | 3E-08 | -- | 2E-07 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 2E-07 | -- | 3E-08 | -- | 2E-07 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 6E-12 | -- | -- | 6E-12 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-12 | -- | -- | 6E-12 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 6E-12 | | | | | -- |
| | Exposure Medium Total | | | | | | | 6E-12 | | | | | -- |
| Medium Total | | | | | | | | 2E-07 | | | | | -- |

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

| Total Surface Soil HI | |
|---|---|
| Total Immune HI | 2 |

| Total Subsurface Soil HI | |
|---|---|
| Total Immune HI | 0.3 |

| Total Groundwater Soil HI | |
|---|---|
| Total CNS HI | 0.08 |
| Total CVS HI | 0.2 |
| Total GS HI | 0.04 |
| Total None Specified HI | 0.5 |
| Total Skin HI | 0.2 |
| Total Thyroid HI | 0.1 |

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Hypothetical
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 | Site 1 | Aroclor-1248 | 2E-06 | -- | 4E-07 | -- | 3E-06 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 7E-07 | -- | 1E-07 | -- | 9E-07 | Immune | 0.2 | -- | 0.03 | 0.2 |
| | | | Chemical Total | 3E-06 | -- | 5E-07 | -- | 4E-06 | | 0.2 | -- | 0.03 | 0.2 |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | 0.2 |
| | Air | Site 1 | Aroclor-1248 | -- | 8E-10 | -- | -- | 8E-10 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 2E-10 | -- | -- | 2E-10 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | -- |
| Medium Total | | | | | | | | 4E-06 | | | | | 0.2 |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 4E-08 | -- | 8E-09 | -- | 5E-08 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | 3E-07 | -- | 5E-08 | -- | 3E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | 1E-07 | -- | 2E-08 | -- | 1E-07 | Immune | 0.03 | -- | 0.005 | 0.03 |
| | | | Chemical Total | 4E-07 | -- | 7E-08 | -- | 5E-07 | | 0.03 | -- | 0.005 | 0.03 |
| | | Exposure Point Total | | | | | | 5E-07 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | 5E-07 | | | | | 0.03 |
| | Air | Site 1 | Aroclor-1242 | -- | 2E-11 | -- | -- | 2E-11 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 | -- | 9E-11 | -- | -- | 9E-11 | NA | -- | -- | -- | -- |
| | | | Aroclor-1254 | -- | 4E-11 | -- | -- | 4E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-10 | -- | -- | 1E-10 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 1E-10 | | | | | -- |
| | Exposure Medium Total | | | | | | | 1E-10 | | | | | -- |
| Medium Total | | | | | | | | 5E-07 | | | | | 0.03 |
| Groundwater | Groundwater | Site 1 | Aroclor-1242 (Water) | 4E-07 | -- | - - | -- | 4E-07 | NA | -- | -- | -- | -- |
| | | | Aroclor-1248 (Water) | 3E-07 | -- | - - | -- | 3E-07 | NA | -- | -- | -- | -- |
| | | | Aluminum | - - | -- | - - | -- | - - | CNS | 0.03 | -- | 0.0002 | 0.03 |
| | | | Arsenic | 4E-06 | -- | 2E-08 | -- | 4E-06 | Skin, CVS | 0.10 | -- | 0.0005 | 0.10 |
| | | | Hexavalent Chromium | 3E-05 | -- | 1E-05 | -- | 5E-05 | None Specified | 0.1 | -- | 0.06 | 0.2 |
| | | | Cobalt | - - | -- | - - | -- | - - | Thyroid | 0.04 | -- | 0.00008 | 0.04 |
| | | | Iron | - - | -- | - - | -- | - - | GS | 0.02 | -- | 0.00009 | 0.02 |
| | | | Thallium | - - | -- | - - | -- | - - | Skin | -- | -- | -- | -- |
| | | | Chemical Total | 4E-05 | -- | 1E-05 | -- | 5E-05 | | 0.3 | -- | 0.06 | 0.4 |
| | | Exposure Point Total | | | | | | 5E-05 | | | | | 0.4 |
| | Exposure Medium Total | | | | | | | 5E-05 | | | | | 0.4 |
| Medium Total | | | | | | | | 5E-05 | | | | | 0.4 |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 7E-08 | -- | 1E-08 | -- | 8E-08 | NA | -- | -- | -- | -- |
| | | | Chemical Total | 7E-08 | -- | 1E-08 | -- | 8E-08 | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | 8E-08 | | | | | -- |
| | Exposure Medium Total | | | | | | | 8E-08 | | | | | -- |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 2E-11 | -- | -- | 2E-11 | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-11 | -- | -- | 2E-11 | | - - | -- | - - | -- |
| | | Exposure Point Total | | | | | | 2E-11 | | | | | -- |
| | Exposure Medium Total | | | | | | | 2E-11 | | | | | -- |
| Medium Total | | | | | | | | 8E-08 | | | | | -- |

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

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NWIRP BETHPAGE, BETHPAGE, NEW YORK

Scenario Timeframe: Hypothetical
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 | Site 1 | Aroclor-1248 | 1E-05 | -- | 2E-06 | -- | 1E-05 | | | | | |
| | | | Aroclor-1254 | 3E-06 | -- | 5E-07 | -- | 3E-06 | | | | | |
| | | | Chemical Total | 1E-05 | -- | 2E-06 | -- | 1E-05 | | | | | |
| | | Exposure Point Total | | | | | | 1E-05 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-05 | | | | | |
| | Air | Site 1 | Aroclor-1248 | -- | 1E-09 | -- | -- | 1E-09 | | | | | |
| | | | Aroclor-1254 | -- | 3E-10 | -- | -- | 3E-10 | | | | | |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | | | | |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | |
| Medium Total | | | | | | | | 1E-05 | | | | | |
| Subsurface Soil | Subsurface Soil | Site 1 | Aroclor-1242 | 2E-07 | -- | 3E-08 | -- | 2E-07 | | | | | |
| | | | Aroclor-1248 | 1E-06 | -- | 2E-07 | -- | 1E-06 | | | | | |
| | | | Aroclor-1254 | 5E-07 | -- | 7E-08 | -- | 5E-07 | | | | | |
| | | | Chemical Total | 2E-06 | -- | 3E-07 | -- | 2E-06 | | | | | |
| | | Exposure Point Total | | | | | | 2E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 2E-06 | | | | | |
| | Air | Site 1 | Aroclor-1242 | -- | 2E-11 | -- | -- | 2E-11 | | | | | |
| | | | Aroclor-1248 | -- | 1E-10 | -- | -- | 1E-10 | | | | | |
| | | | Aroclor-1254 | -- | 5E-11 | -- | -- | 5E-11 | | | | | |
| | | | Chemical Total | -- | 2E-10 | -- | -- | 2E-10 | | | | | |
| | | Exposure Point Total | | | | | | 2E-10 | | | | | |
| | Exposure Medium Total | | | | | | | 2E-10 | | | | | |
| Medium Total | | | | | | | | 2E-06 | | | | | |
| Groundwater | Groundwater | Site 1 | Aroclor-1242 (Water) | 1E-06 | -- | - - | -- | 1E-06 | | | | | |
| | | | Aroclor-1248 (Water) | 1E-06 | -- | - - | -- | 1E-06 | | | | | |
| | | | Aluminum | - - | -- | - - | -- | - - | | | | | |
| | | | Arsenic | 1E-05 | -- | 5E-08 | -- | 1E-05 | | | | | |
| | | | Hexavalent Chromium | 3E-04 | -- | 8E-05 | -- | 4E-04 | | | | | |
| | | | Cobalt | - - | -- | - - | -- | - - | | | | | |
| | | | Iron | - - | -- | - - | -- | - - | | | | | |
| | | | Thallium | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 3E-04 | -- | 8E-05 | -- | 4E-04 | | | | | |
| | | Exposure Point Total | | | | | | 4E-04 | | | | | |
| | Exposure Medium Total | | | | | | | 4E-04 | | | | | |
| Medium Total | | | | | | | | 4E-04 | | | | | |
| Subsurface Soil | Subsurface Soil | Dry Well 34-07 | Aroclor-1248 | 3E-07 | -- | 4E-08 | -- | 3E-07 | | | | | |
| | | | Chemical Total | 3E-07 | -- | 4E-08 | -- | 3E-07 | | | | | |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | |
| | Air | Dry Well 34-07 | Aroclor-1248 | -- | 3E-11 | -- | -- | 3E-11 | | | | | |
| | | | Chemical Total | -- | 3E-11 | -- | -- | 3E-11 | | | | | |
| | | Exposure Point Total | | | | | | 3E-11 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-11 | | | | | |
| Medium Total | | | | | | | | 3E-07 | | | | | |

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
## ARARs

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**APPENDIX C**
**APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)**
**SITE 1 - FORMER DRUM MARSHALLING AREA**
**NWIRP BETHPAGE, NEW YORK**

| MEDIA | REQUIREMENT | DESCRIPTION | PREREQUISITE | CITATION | ARAR DETERMINATION | COMMENT |
|---|---|---|---|---|---|---|
| **FEDERAL CHEMICAL-SPECIFIC ARARs** | | | | | | |
| Groundwater | United States Environmental Protection Agency (USEPA) Maximum Contaminant Limits (MCLs) | These are national primary drinking water regulations that are legally enforceable standards that apply to public water systems. | Standards are used to protect the public health or welfare and enhance water quality. | USEPA National Primary Drinking Water Regulations (NPDWRs)<br>40 Code of Federal Regulations (CFR) 141.61 for PCBs and 141.62 for arsenic and chromium | Relevant and Appropriate | Standards are used during the selection of groundwater remediation goals. |
| Soil | Toxic Substances Control Act (TSCA) | Provides testing requirements and restrictions relating to chemical substances and/or mixtures. TSCA addresses the production, importation, use, and disposal of polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint. | Soils contaminated with PCBs would meet these disposal and remediation requirements. | 40 CFR 761.61(c) for PCBs | Relevant and Appropriate | Would be an used for cleanups involving PCBs. |
| **NEW YORK STATE CHEMICAL-SPECIFIC ARARs** | | | | | | |
| Groundwater | New York State Public Water Supply Regulations | Drinking water quality standards for New York. | Potential site contamination impact on public water supply to be addressed by, or potentially caused by, environmental action. | 10 NYCRR Part 5, Subpart 5-1; 5-1.52 Tables for arsenic, chromium, and PCBs. | Relevant and Appropriate | The aquifer, which is a drinking water source, is impacted by site contamination. New York State Department of Health (NYSDOH) MCLs were selected as Preliminary Remediation Goals (PRGs). |
| Soil | NYSDEC Soil Cleanup Objectives for Industrial Use, Commercial Use, and for the Protection of Groundwater | Provides a basis and procedure to determine soil cleanup levels to protect potential receptors in Industrial and Commercial Use scenarios, and provides guidelines to prevent migration of soil contamination to groundwater in a human health risk scenario. | Contaminated soils can be screened for the risk to future receptors. | 6 NYCRR, Part 375, Subpart 375-6, Table 375-6.8(b) for all soil COCs | Relevant and Appropriate | Soil cleanup standards. |
| **STATE ACTION-SPECIFIC ARARs** | | | | | | |
| Hazardous Waste | New York Identification and Listing of Hazardous Waste Regulations | Characterization, identification, and management of wastes. | Generation of hazardous wastes. | 6 NYCRR 371.3, 371.4, 372.2, 373-1.1 | Applicable | Provides guidance for characterizing and managing waste (soil) prior to offsite disposal |
| Soil | NYSDEC Erosion and Sediment Control | Provides guidance on managing storm water and potential runoff during construction activites to be compliant with the New York Pollution Discharge Elimination System. | Soil disturbances | New York Standards and Specifications for Erosion and Sediment Control, (August 2005) | To Be Considered | Provides guidance for control erosion of contaminated media to the recharge basins during construction. |
| Contaminated Site | NYSDEC Inactive Hazardous Waste Disposal Site Regulations | New York remediation program for sites listed on the New York State Registry or the National Priority List, or being addressed by US Department of Defense (DOD) or Department of Energy. | Navy Environmental Restoration site. | 6 NYCRR 375 Parts 1.1 to 1.12 | Applicable | NWIRP Bethpage is not on the National Priority List, but is listed as a Classification 2 in the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites and is a DOD-owned site. |

CFR - Code of Federal Regulations.
DOD - Department of Defense
NPDWR - National Primary Drinking Water Regulations.
NYSDOH - New York State Department of Health.
NYSDEC - New York State Department of Environmental Conservation.
NYCRR - New York Codes, Rules, and Regulations.
MCLs - Maximum Contaminant Levels.
PRGs - Preliminary Remediation Goals.
TSCA - Toxic Substances Control Act.
PCBs - Polychlorinated biphenyls.

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# APPENDIX D
## Cost Estimates

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## Alternative S-6A - Reduced Permeability Cover, Limited Excavation and Offsite Disposal of PCB-Contaminated Soil (depth dependent 10 mg/kg [10 feet bgs] to 50 mg/kg [20 or 30 feet bgs]), and LUCs

**Capital Cost**

| Item | Description | Quantity | Units | Unit Cost | Extended Cost |
|---|---|---|---|---|---|
| | | | | | |
| **1.** | **Delineation/Waste-Characterization** | | | | |
| 1.1 | Drilling Mob and Demob | 1 | LS | $6,000 | $6,000 |
| 1.2 | Soil borings (driller) | 1,280 | foot | $50 | $64,000 |
| 1.3 | Pre-characterization Analysis (PCBs, VOCs, metals) | 160 | Each | $350 | $56,000 |
| 1.4 | Waste Characterization Analysis (RCRA) | 30 | Each | $900 | $27,000 |
| 1.5 | SVE and Monitoring Well Protection | 16 | Each | $500 | $8,000 |
| 1.6 | Geologist | 2 | Week | $1,500 | $3,000 |
| 1.7 | Reporting (validation, tables, figures) | 1 | LS | $15,000 | $15,000 |
| | Subtotal (Item 1) | | | | **$179,000** |
| | | | | | |
| **2.** | **General Mobilization/Demobilization** | | | | |
| 2.1 | Construction Facilities (trailer, utilities) | 28 | month | $3,000 | $84,000 |
| 2.2 | Utility Clearance | 1 | LS | $15,000 | $15,000 |
| 2.3 | Site Prep (high vis fence, traffic control, E&S controls) | 1 | LS | $30,000 | $30,000 |
| 2.4 | Portable Scale | 28 | Month | $1,000 | $28,000 |
| 2.5 | Material staging area | 28 | Month | $1,000 | $28,000 |
| 2.6 | Heavy Equipment mob/demob | 6 | Each | $5,000 | $30,000 |
| 2.7 | Confirmation Sampling | 80 | Each | $405 | $32,400 |
| | Subtotal (Item 2) | | | | **$247,400** |

| | | | | | |
|---|---|---|---|---|---|
| **3.** | **Excavation and Disposal** | | | | |
| **3a.** | **Site 1 and Dry Well 20-08** | | | | |
| 3.1 | Site Clearing | 1 | Week | $10,000 | $10,000 |
| 3.2 | Removal of Windrow | 1 | Week | $15,000 | $15,000 |
| 3.3 | Demolition Settling Tank, Tops Cesspools | 1,800 | Tons | $160 | $288,000 |
| 3.4 | Sheet Pile Drive and Equipment | 16,700 | CY | $75 | $1,252,500 |
| 3.5 | Excavation (soil and concrete) - Inhole & Lift | 21 | Month | $110,000 | $2,310,000 |
| 3.6 | Soil Transport, and Dispose, Hazardous | 6,000 | Tons | $480 | $2,880,000 |
| 3.7 | Soil Transport, and Dispose, Non-hazardous | 25,000 | Tons | $160 | $4,000,000 |
| 3.8 | De-Watering/Treatment and Discharge to Basins | 0 | LS | $200,000 | $0 |
| 3.9 | Backfill (off-site Source) | 24,000 | Tons | $24.50 | $588,000 |
| 3.10 | Permeable Cap | 5,000 | Tons | $60.00 | $300,000 |
| 3.11 | Equipment (Loader) (2) | 26 | Month | $6,400 | $166,400 |
| 3.12 | Equipment (Dozer/Compactor) | 38 | Month | $2,900 | $110,200 |
| 3.13 | Equipment (Excavator) (2) | 33 | Month | $10,975 | $362,175 |
| 3.14 | Equipment (Truck) (2) | 38 | Month | $6,400 | $243,200 |
| 3.15 | Labor- Operators (3 to 5) | 150 | Person-Month | $11,867 | $1,780,050 |
| 3.16 | Labor-Laborers (1 to 2) | 80 | Person-Month | $9,744 | $779,520 |
| **3b.** | **Dry-Well 34-07** | | | | |
| 3.17 | Parking Lot Removal and Disposal (350 SQ FT) | 0 | week | $15,000 | $0 |
| 3.18 | Sheet Pile Drive and Equipment | 0 | CY | $75 | $0 |
| 3.19 | Excavation (soil and) - Inhole & Lift | 0 | Month | $110,000 | $0 |
| 3.20 | Soil Transport, and Dispose, Hazardous | 0 | Tons | $480 | $0 |
| 3.21 | Soil Transport, and Dispose, Non-hazardous | 0 | Tons | $160 | $0 |
| 3.22 | Backfill (off-site Source) | 0 | Tons | $24.50 | $0 |
| 3.23 | Equipment (Loader) (2) | 0 | Month | $3,200 | $0 |
| 3.24 | Equipment (Dozer/Compactor) | 0 | Month | $2,900 | $0 |
| 3.25 | Equipment (Excavator) | 0 | Month | $10,975 | $0 |
| 3.26 | Equipment (Truck) | 0 | Month | $3,200 | $0 |
| 3.27 | Labor- Operators (4) | 0 | Person-Month | $11,867 | $0 |
| 3.28 | Labor-Laborers (2) | 0 | Person-Month | $9,744 | $0 |
| **3c.** | **General** | | | | |
| 3.29 | Misc Construction Supplies | 27 | Month | $500 | $13,500 |
| 3.30 | Fuel (2,000 gallons a month) | 66,000 | Gallons | $5 | $330,000 |
| 3.31 | Fuel Tank | 27 | Month | $575 | $15,525 |
| | Subtotal (Item 3) | | | | **$15,444,070** |

| | | | | | |
|---|---|---|---|---|---|
| **4.** | **Site Restoration** | | | | |
| **4a.** | **Windrow at Site 1** | | | | |
| 4.1 | Top Soil (off-site Source) (6 inches) | 378 | Tons | $22.50 | $8,505 |
| 4.2 | Fill Material (4.5' high mound, 23' wide, 450' long) | 1,782 | Tons | $24.50 | $43,659 |
| **4c.** | **Parking Lot Repair at Dry Well 34-07** | | | | |
| 4.3 | Grading | 0 | LS | $15,000 | $0 |
| 4.4 | Crushed Concrete (delivered material) | 0 | SQ FT | $10 | $0 |
| 4.5 | Asphalt (material and install) | 0 | SQ FT | $15 | $0 |
| **4b.** | **General** | | | | |
| 4.6 | Landscaping | 1 | LS | $20,000 | $20,000 |
| 4.7 | Material Staging Area Removal | 1 | Week | $18,000 | $18,000 |
| 4.8 | Decon of Equipment | 6 | Each | $5,000 | $30,000 |
| 4.9 | General Construction Debris Removal | 4 | Each | $5,000 | $20,000 |
| 4.10 | Re-install Fence, Eastern Edge | 700 | Foot | $14.00 | $9,800 |
| 4.11 | Establish Vegetation | 16 | Day | $200 | $3,200 |
| 4.12 | Water for Vegetation | 1 | LS | $1,000 | $1,000 |
| 4.13 | Materials for Watering Vegetation | 1 | LS | $5,000 | $5,000 |
| | Subtotal (Item 4) | | | | **$159,164** |
| **5** | **Labor** | | | | |
| 5.1 | Construction Oversight (Supervisor) | 38 | Month | $23,100 | $877,800 |
| 5.2 | Construction Oversight (QA/QC) | 38 | Month | $19,900 | $756,200 |
| 5.3 | Oversight (H&S) | 38 | Month | $19,900 | $756,200 |
| 5.4 | Office Support | 38 | Month | $19,900 | $756,200 |
| | Subtotal (Item 5) | | | | **$3,146,400** |
| | | | | | |
| **6.** | **Construction Close Out Reporting** | 1 | LS | $50,000 | **$50,000** |
| | Capital (Subtotal) | | | | $19,226,034 |
| | Contingency (20%) | | | | $3,845,207 |
| | Design & Engineering (13%) | | | | $2,499,384 |
| | Total Construction Cost | | | | **$25,570,625** |

**Annual O&M Cost (S-6A)**

| Item | Description | Quantity | Units | Unit Cost | Extended Cost |
|---|---|---|---|---|---|
| **7** | **5-Year Review/LUCs** | 1 | Each | $30,000 | **$30,000** |
| | | | | | |
| **8** | **Cover Maintenance** | | | | |
| 8.1 | Gravel | 13.5 | Tons | $44.15 | $596 |
| 8.2 | Mowing | 4.5 | Acre | $1,000 | $4,500 |
| 8.3 | Fence Repair | 50 | Foot | $14.00 | $700 |
| 8.4 | Vegetation Repair | 1 | LS | $2,000 | $2,000 |
| 8.5 | Field Labor | 5 | Day | $995 | $4,975 |
| | Subtotal (Item 2) | | | | **$12,771** |
| | | | | | |

**Cost Summary (without discount factor).**

| | | Capital | O&M | Duration (year) | Total Cost |
|---|---|---|---|---|---|
| 1 | Delineation/Waste-Characterization | $179,000 | | 1 | $179,000 |
| 2 | General Mobilization/Demobilization | $247,400 | | 1 | $247,400 |
| 3 | Excavation and Disposal | $15,444,070 | | 1 | $15,444,070 |
| 4 | Site Restoration | $159,164 | | 1 | $159,164 |
| 5 | Labor | $3,146,400 | | 1 | $3,146,400 |
| 6 | Construction Close Out Reporting | $50,000 | | 1 | $50,000 |
| | Contingency (20%) | $3,845,207 | | 1 | $3,845,207 |
| | Design & Engineering (13%) | $2,499,384 | | 1 | $2,499,384 |
| 7 | 5-Year Review/LUCs | | $30,000 | 6 | $180,000 |
| 8 | Cover Maintenance | | $12,771 | 30 | $383,130.75 |
| | Total Alternative S-6A | $25,570,625 | $42,771 | | $26,133,756 |

**Present Value Calculation**

Dec-15

As of

interest rate (OBM) 1.40%

| | | Capital | Annual Cost | Additional Year Cost | Total Year Cost | Annual Discount Rate - 1.4% | NPW |
|---|---|---|---|---|---|---|---|
| 0 | $ | 25,570,625 | 0 | $ - | $ 25,570,625 | 1 | $25,570,625 |
| 1 | $ | - | $12,771 | - | $12,771 | 0.986 | $12,595 |
| 2 | $ | - | $12,771 | - | $12,771 | 0.973 | $12,421 |
| 3 | $ | - | $12,771 | - | $12,771 | 0.959 | $12,249 |
| 4 | $ | - | $12,771 | - | $12,771 | 0.946 | $12,080 |
| 5 | $ | - | $42,771 | - | $42,771 | 0.933 | $39,899 |
| 6 | $ | - | $12,771 | - | $12,771 | 0.920 | $11,749 |
| 7 | $ | - | $12,771 | - | $12,771 | 0.907 | $11,587 |
| 8 | $ | - | $12,771 | - | $12,771 | 0.895 | $11,427 |
| 9 | $ | - | $12,771 | - | $12,771 | 0.882 | $11,269 |
| 10 | $ | - | $42,771 | - | $42,771 | 0.870 | $37,219 |
| 11 | $ | - | $12,771 | - | $12,771 | 0.858 | $10,960 |
| 12 | $ | - | $12,771 | - | $12,771 | 0.846 | $10,809 |
| 13 | $ | - | $12,771 | - | $12,771 | 0.835 | $10,659 |
| 14 | $ | - | $12,771 | - | $12,771 | 0.823 | $10,512 |
| 15 | $ | - | $42,771 | - | $42,771 | 0.812 | $34,720 |
| 16 | $ | - | $12,771 | - | $12,771 | 0.801 | $10,224 |
| 17 | $ | - | $12,771 | - | $12,771 | 0.790 | $10,083 |
| 18 | $ | - | $12,771 | - | $12,771 | 0.779 | $9,944 |
| 19 | $ | - | $12,771 | - | $12,771 | 0.768 | $9,806 |
| 20 | $ | - | $42,771 | - | $42,771 | 0.757 | $32,388 |
| 21 | $ | - | $12,771 | - | $12,771 | 0.747 | $9,537 |
| 22 | $ | - | $12,771 | - | $12,771 | 0.736 | $9,406 |
| 23 | $ | - | $12,771 | - | $12,771 | 0.726 | $9,276 |
| 24 | $ | - | $12,771 | - | $12,771 | 0.716 | $9,148 |
| 25 | $ | - | $42,771 | - | $42,771 | 0.706 | $30,213 |
| 26 | $ | - | $12,771 | - | $12,771 | 0.697 | $8,897 |
| 27 | $ | - | $12,771 | - | $12,771 | 0.687 | $8,774 |
| 28 | $ | - | $12,771 | - | $12,771 | 0.678 | $8,653 |
| 29 | $ | - | $12,771 | - | $12,771 | 0.668 | $8,533 |
| 30 | $ | - | $42,771 | - | $42,771 | 0.659 | $28,185 |
| | | | | | | Total Present Worth = | $26,023,847 |

# Alternative SV-3
# Site 1 - Former Drum Marshalling Area
# NWIRP Bethpage, New York

## Alternative SV-3 - Soil Vapor Monitoring, Land Use Controls, Continued Operation of the SVE Containment System and Additional Extraction Wells

**Capital Cost**

| | | | | | |
|---|---|---|---|---|---|
| **1.** | **SVEC System Add-On** | | | | |
| 1.1 | Planning Documents/Design | 1 | LS | $35,000 | $35,000 |
| 1.2 | Mobilization | 1 | LS | $10,000 | $10,000 |
| 1.3 | SVEC Wells (6 at 50 feet) | 300 | FT | $65 | $19,500 |
| 1.4 | Piping Misc | 1 | LS | $35,000 | $35,000 |
| 1.5 | Power and Controls | 1 | LS | $25,000 | $25,000 |
| 1.6 | Blower | 1 | Each | $8,000 | $8,000 |
| 1.7 | IDW Management | 1 | LS | $7,500 | $7,500 |
| 1.5 | Labor | 2.0 | Month | $9,744 | $19,488 |
| 1.6 | Construction Oversight (Supervisor,QC/geologist) | 2.0 | Month | $11,550 | $23,100 |
| | Subtotal (Item 1) | | | | $182,588 |
| | Contingency (20%) | | | | $36,518 |
| | Total Capital | | | | **$219,106** |

**Annual O&M Cost**

| Item | Description | Quantity | Units | Unit Cost | Extended Cost |
|---|---|---|---|---|---|
| **2.** | **5-Year Review/LUCs (incremental to the soil remedy)** | 1 | Each | $15,000 | **$15,000** |
| | | | | | |
| **2.** | **Air Sampling, analysis and reporting** | | | | |
| 2.1 | Regulatory Compliance (VOCs) - 3 Per Month | 36 | Each | $320 | $11,520 |
| 2.2 | Pressure Readings SVPMs (Piezometers) | 18 | Each | $0 | $0 |
| 2.3 | SVPM (Piezometer) Sampling - VOCs - Yearly | 22 | Each | $320 | $7,040 |
| 2.4 | SVE Well Sampling - 18 Wells - VOCs - Yearly | 22 | Each | $320 | $7,040 |
| 2.5 | Operator (one day per week) | 52 | Week | $995 | $21,340 |
| 2.6 | Annual Reporting | 1 | Each | $50,000 | $50,000 |
| | Subtotal (Item 2) | | | | **$96,940** |

**Cost Summary (without discount factor).**

| | | Capital | O&M |
|---|---|---|---|
| 1. | SVEC System Add-On | $219,106 | |
| 2. | 5-Year Review/LUCs (incremental to the soil remedy) | | $15,000 |
| 3. | Air Sampling, analysis and reporting | | $96,940 |
| 4. | Electricity | | $11,166 |
| 5. | Telemetry | | $2,400 |
| | Subtotal | $219,106 | $110,506 |

# Alternative SV-3
# Site 1 - Former Drum Marshalling Area
# NWIRP Bethpage, New York

**Present Value Calculation**

| | Capital | Annual Cost | Additional Year Cost | Total Year Cost | Annual Discount Rate - 1.4% | NPW |
|---|---|---|---|---|---|---|
| 0 | $ 219,106 | 0 | $ - | $ 219,106 | 1 | $219,106 |
| 1 | $ - | $110,506 | - | $110,506 | 0.986 | $108,980 |
| 2 | $ - | $110,506 | - | $110,506 | 0.973 | $107,476 |
| 3 | $ - | $110,506 | - | $110,506 | 0.959 | $105,992 |
| 4 | $ - | $110,506 | - | $110,506 | 0.946 | $104,528 |
| 5 | $ - | $110,506 | 15,000 | $125,506 | 0.933 | $117,078 |
| 6 | $ - | $110,506 | - | $110,506 | 0.920 | $101,662 |
| 7 | $ - | $110,506 | - | $110,506 | 0.907 | $100,258 |
| 8 | $ - | $110,506 | - | $110,506 | 0.895 | $98,874 |
| 9 | $ - | $110,506 | - | $110,506 | 0.882 | $97,509 |
| 10 | $ - | $110,506 | 15,000 | $125,506 | 0.870 | $109,216 |
| 11 | $ - | $110,506 | - | $110,506 | 0.858 | $94,835 |
| 12 | $ - | $110,506 | - | $110,506 | 0.846 | $93,526 |
| 13 | $ - | $110,506 | - | $110,506 | 0.835 | $92,234 |
| 14 | $ - | $110,506 | - | $110,506 | 0.823 | $90,961 |
| 15 | $ - | $110,506 | 15,000 | $125,506 | 0.812 | $101,881 |
| | | | | | Total Present Worth = | $1,744,115 |

# Alternative G-2
# Site 1 - Former Drum Marshalling Area
# NWIRP Bethpage, New York

## Alternative G-2 - Annual Monitoring and Installation of Additional Wells

**Capital Cost**

| Item | Description | Quantity | Units | Unit Cost | Extended Cost |
|---|---|---|---|---|---|
| **1.** | **Baseline GW Sampling, analysis and reporting** | | | | |
| 1.1 | Laboratory Analysis (VOCs) | 41 | Each | $120 | $4,920 |
| 1.2 | Laboratory Analysis (PCBs) | 36 | Each | $100 | $3,600 |
| 1.3 | Laboratory Analysis (Chromium) | 36 | Each | $70 | $2,520 |
| 1.4 | Field Labor (1) | 10 | Day | $1,200 | $12,000 |
| 1.5 | UPF-SAP/Work Plan for long term monitoring | 1 | Each | $30,000 | $30,000 |
| 1.6 | Reporting | 1 | Each | $40,000 | $40,000 |
| | Subtotal (Item 1) | | | | **$93,040** |
| | | | | | |
| **2.** | **Install 4 Wells** | | | | |
| 2.1 | Install 4 Wells (3 Intermediate, 1 Deep) | 900 | Foot | $100 | **$90,000** |
| 2.2 | Geologist | 20 | Day | $1,200 | **$24,000** |
| 2.3 | Drilling Mob/Demob | 1 | Each | $6,000 | **$6,000** |
| 2.4 | Reporting | 1 | Each | $15,000 | **$15,000** |
| | Subtotal (Item 2) | | | | **$135,000** |

**Annual O&M Cost**

| Item | Description | Quantity | Units | Unit Cost | Extended Cost |
|---|---|---|---|---|---|
| **3.** | **5-Year Review/LUCs (incremental to the soil remedy)** | 1 | Each | $15,000 | **$15,000** |
| | | | | | |
| **4.** | **GW Sampling, Analysis, and Reporting** | | | | |
| 4.1 | Laboratory Analysis (VOCs) | 41 | Each | $120 | $4,920 |
| 4.2 | Laboratory Analysis (PCBs) | 36 | Each | $100 | $3,600 |
| 4.3 | Laboratory Analysis (Chromium) | 36 | Each | $70 | $2,520 |
| 4.4 | Field Labor | 10 | Day | $1,200 | $12,000 |
| 4.5 | Annual Reporting and Validation | 1 | Each | $15,000 | $15,000 |
| 4.6 | Contingency (20%) | | | | $7,608 |
| | Subtotal (Item 2) | | | | **$45,648** |
| **5.** | **O&M Reporting and Management** | 1 | Each | $50,000 | **$50,000** |

**Cost Summary (without discount factor).**

| | | Capital | O&M |
|---|---|---|---|
| 1 | Sampling and Well Install | $228,040 | |
| 2 | 5-Year Review/LUCs (incremental to the soil remedy) | | $15,000 |
| 3 | GW Sampling, Analysis, and Reporting | | $45,648 |
| 4 | O&M Reporting and Management | | $50,000 |
| | Total | | $95,648 |

# Alternative G-2
# Site 1 - Former Drum Marshalling Area
# NWIRP Bethpage, New York

**Present Value Calculation**

| | Capital | Annual Cost | Additional Year Cost | Total Year Cost | Annual Discount Rate - 1.4% | NPW |
|---|---|---|---|---|---|---|
| 0 | $ 228,040 | 0 | $ - | $ 228,040 | 1 | $228,040 |
| 1 | $ - | $95,648 | - | $95,648 | 0.986 | $94,327 |
| 2 | $ - | $95,648 | - | $95,648 | 0.973 | $93,025 |
| 3 | $ - | $95,648 | - | $95,648 | 0.959 | $91,741 |
| 4 | $ - | $95,648 | - | $95,648 | 0.946 | $90,474 |
| 5 | $ - | $95,648 | 15,000 | $110,648 | 0.933 | $103,218 |
| 6 | $ - | $95,648 | - | $95,648 | 0.920 | $87,993 |
| 7 | $ - | $95,648 | - | $95,648 | 0.907 | $86,778 |
| 8 | $ - | $95,648 | - | $95,648 | 0.895 | $85,580 |
| 9 | $ - | $95,648 | - | $95,648 | 0.882 | $84,398 |
| 10 | $ - | $95,648 | 15,000 | $110,648 | 0.870 | $96,286 |
| 11 | $ - | $95,648 | - | $95,648 | 0.858 | $82,084 |
| 12 | $ - | $95,648 | - | $95,648 | 0.846 | $80,951 |
| 13 | $ - | $95,648 | - | $95,648 | 0.835 | $79,833 |
| 14 | $ - | $95,648 | - | $95,648 | 0.823 | $78,731 |
| 15 | $ - | $95,648 | 15,000 | $110,648 | 0.812 | $89,820 |
| 16 | $ - | $95,648 | - | $95,648 | 0.801 | $76,572 |
| 17 | $ - | $95,648 | - | $95,648 | 0.790 | $75,515 |
| 18 | $ - | $95,648 | - | $95,648 | 0.779 | $74,472 |
| 19 | $ - | $95,648 | - | $95,648 | 0.768 | $73,444 |
| 20 | $ - | $95,648 | 15,000 | $110,648 | 0.757 | $83,789 |
| 21 | $ - | $95,648 | - | $95,648 | 0.747 | $71,430 |
| 22 | $ - | $95,648 | - | $95,648 | 0.736 | $70,443 |
| 23 | $ - | $95,648 | - | $95,648 | 0.726 | $69,471 |
| 24 | $ - | $95,648 | - | $95,648 | 0.716 | $68,512 |
| 25 | $ - | $95,648 | 15,000 | $110,648 | 0.706 | $78,162 |
| 26 | $ - | $95,648 | - | $95,648 | 0.697 | $66,633 |
| 27 | $ - | $95,648 | - | $95,648 | 0.687 | $65,713 |
| 28 | $ - | $95,648 | - | $95,648 | 0.678 | $64,806 |
| 29 | $ - | $95,648 | - | $95,648 | 0.668 | $63,911 |
| 30 | $ - | $95,648 | 15,000 | $110,648 | 0.659 | $72,913 |
| | | | | Total Present Worth = | | $2,629,063 |

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# APPENDIX E
## Responsiveness Summary

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## Responsiveness Summary

Comment 1: The groundwater alternative involves the potential use of the Northrop Grumman OU 2 On-site Containment (ONCT) groundwater treatment system. Therefore, the monitoring program that will be created for the remedial design needs to be reviewed by Northrop Grumman. Please assure that the ROD notes this requirement.

Response: The Navy will develop a groundwater monitoring plan for evaluating attenuation and potential migration of PCBs and metals toward the Northrop Grumman ONCT system. This plan will be distributed to NYSDEC and other stakeholders, including Northrop Grumman, for review and comment.

Comment 2: The Summary of Preferred Alternatives includes Figure 7 to illustrate the location of existing on-site, long-term groundwater monitoring locations which will be used to evaluate residual contamination (i.e., PCBs, arsenic, chromium) and to determine if additional actions are required at the ONCT groundwater treatment system. Information concerning the location and number of additional groundwater monitoring wells, however, is not provided. Similar to the approximate locations of new soil vapor extraction wells (ref. Figure 6), the ROD should provide information on the approximate location and estimated number of additional groundwater monitoring wells expected to be included in the long-term monitoring program.

Response: As presented in the cost estimate for G2, approximately four new monitoring wells are anticipated to be used in combination with the existing monitoring wells. The exact location and number of wells will be determined after careful analysis of the existing extent of PCB- and metal-impacted groundwater and the capture zones for the existing ONCT recovery wells. Based on current information, the wells are anticipated to be located south of Site 1 and the Long Island Railroad on former Northrop Grumman property. The groundwater will be monitored for PCBs, VOCs, arsenic, and chromium. This plan will be distributed to NYSDEC and other stakeholders for review and comment.

Comment 3: The soil vapor alternative/component must continue to be protective of human health and, therefore, any modifications to the soil vapor extraction system operation, maintenance and monitoring needs to be reviewed by the NYSDEC and NYSDOH. Please assure that the ROD notes this requirement.

Response: The plan for construction, operation, maintenance, and monitoring of the existing and new soil vapor extraction system will be distributed to NYSDEC and NYSDOH for review and comment.

Comment 4: Although the new OU 1 Proposed Plan does not include a detailed schedule, recent discussions with the Navy indicate that the excavation and off-site disposal process may require two to three years to complete. The NYSDEC requests that the Navy identify and evaluate opportunities to shorten the overall project schedule.

Response: The estimated schedule for completion of the onsite activities is anticipated to require approximately 7 years to complete, including preparation of planning documents, construction, and the initial post-construction monitoring. Construction activities are anticipated to require 2 to 3 years to complete. The duration for construction is based on the ability to safely and effectively excavate, manage, and dispose of large volumes of contaminated soil in a relatively small area. The Navy will attempt to minimize the time for construction.

## Responsiveness Summary (Continued)

Comment 5: The ROD, when issued, must clearly state this ROD is only for Site 1 of OU 1, and that Sites 2 and 3 are complete and those remedies remain unchanged from the first OU 1 ROD, dated May 1995.

Response: The OU 4 ROD states that the OU 4 Remedy addresses Site 1, several AOCs located on Site 1, and two dry well located in close proximity to Site 1. The ROD also indicates that construction activities at Sites 2 and 3 are complete and the monitoring activities for these sites continue. The remedies for Sites 2 and 3 remain unchanged from the OU 1 ROD.

Comment: The Site 1 groundwater remedy should include a monitoring program and Contingency Plan focused on determining if additional remedial steps are appropriate, including upgrading the ONCT treatment system and/or adding other remedial wells to the ONCT system to address PCBs and metals impacts. Funding of the Site 1 monitoring program and any upgrades to the ONCT, which is currently operated and funded by Northrop Grumman, should be treated as a Site 1 cost under the upcoming Site 1 ROD.

Response: The OU 4 ROD includes a groundwater monitoring program to evaluate attenuation and potential migration of PCBs and metals toward the ONCT. This program would also include trigger values to identify those concentrations in the monitoring program that if exceeded, would be used to take additional actions. Due to the attenuation factors and planned implementation of a source area remedy that will significantly reduce the continued release of these chemicals into the groundwater, it is unlikely that PCBs or metals will adversely affect water quality in the ONCT to the point that additional treatment would be required. As indicated in the remedy, monitoring will be conducted to confirm this scenario, and also provide lead time in the event that additional action is required. The additional action would normally be identified during the Five-year Review process, but it could also be triggered based on the results of annual monitoring activities.

In the event that PCBs and/or metals are attributable to sources at Site 1, they would be addressed as a Site 1 cost.